Chapter One: Quantitative Methods

Overview

In financial analysis, you will need to determine the present and future value of predicted future cash flows. You will need an understanding of probability distributions and measures of central tendency and dispersion. This chapter is designed to prepare you for those challenges.

In Section 1 of this chapter, you will learn fundamental concepts regarding the time value of money. In Section 2 you will learn the meaning and use of many of the most important terms in statistics. In Section 3 you will learn the principles of regression analysis.

Section 2: Time Value Of Money

One of the most important tools the financial services professional has is the ability to calculate present and future values. In addition, the competent financial services professional is very comfortable calculating the amortization of a loan, the payout from an insurance annuity, or the annual investments necessary to achieve the desired funds available at retirement.

In this section we introduce and explore the tools necessary for making such calculations.

An annuity is a finite number of equal cash flows occurring at equal intervals over a defined period of time. Those intervals could be single days, weeks, months, years, etc. A perpetuity is an infinite annuity (i.e., an annuity that continues indefinitely).

Terminology

In this section, we will utilize timelines to calculate the present and future values of lump sums and annuities. Timelines will help you keep cash flows organized and allow you to see the timing of one cash flow in relation to the other cash flows and in relation to the present (i.e., today). Although certainly not a requirement for producing time value of money calculations, timelines are invaluable in visually identifying the timing of cash flows. Before we set up a timeline, however, let’s look at more of the terms we will utilize throughout the discussion.

A lump sum is a single cash flow. Lump sum cash flows are one-time events and therefore are not recurring.
A very simplistic rule that can be used to keep present and future values separate in your mind is this: The present value will always fall to the left of its relevant cash flows, and the future value will always fall to the right.

An **annuity** is a finite number of equal cash flows occurring at equal intervals over a defined period of time (e.g., monthly payments of $100 for three years).

**Present value** is the value today of a cash flow to be received or paid in the future. On a timeline, present values occur before (to the left of) their relevant cash flows.

**Future value** is the value in the future of a cash flow received or paid today. On a timeline, future values occur after (to the right of) their relevant cash flows.

A **perpetuity** is a series of equal cash flows occurring at the same interval forever.

Think of discounting as removing or subtracting value, and think of compounding as increasing or adding value.

The **discount rate** and **compounding rate** are the rates of interest used to find the present and future values, respectively.

**Chapter Objective**: Calculate and interpret the present and future values of a lump sum.

**Lump Sums**

**Future Value of a Lump Sum**

We’ll start our discussion with the future value of a **lump sum**. Assume you put $100 in an account paying 10 percent and leave it there for one year. How much will be in the account at the end of that year? The following timeline represents the one-year time period.

![Figure 2: Determining Future Value at t = 1](image)

In one year, you’ll have $110. That $110 will consist of the original $100 plus $10 in interest. To set that up in an equation, we say the future value in one year, $FV_1$, consists of the original $100 plus the interest, $i$, it earns.

$$FV_1 = 100 (i \times 100)$$
Since $100 is the present value, the original deposit, we can substitute PV_0 for the $100 in the equation.

\[ FV_1 = PV_0 + (i \cdot PV_0) \]

Factoring PV_0 out of both terms on the right side of the equation we are left with:

\[ FV_1 = PV_0(1 + i) \] \hspace{1cm} (1)

The effect of compounding is powerful because it allows an investment to earn interest not only on the principal but also on the interest earned in previous periods. This is referred to as earning interest on interest.

The result of these mathematical manipulations is the general equation for finding the future value of a lump sum invested for one year at a rate of interest \( i \). Had it not been so easy to do the calculation in our heads, we would have substituted for the variables in the equation and gotten:

\[ FV_1 = $100(1.10) = $110 \]

What if you leave the money in the account for two years? After one year you'll have $110, the original $100 plus $10 interest (or 10% times 100). At the end of the second year you will have the $110 plus interest on the $110 during the second year. The interest earned in the second year equals 10% times the $110 balance with which you began the year. Therefore, the interest earned in the second year consists of interest on the original $100 plus interest earned in the second year on the interest earned during the first year but left in the account. When interest is earned or paid on interest, the process is referred to as compounding. This explains why future values are sometimes referred to as compound values.

Now our timeline expands to include two years. Although the numbering is totally arbitrary and we could have used any number to indicate today, we are assuming we deposit $100 at time 0 on the timeline. We already know the value after one year, FV1, so let's start there.

\[ FV_1 = PV_0(1 + i) \]

\[ FV_2 = FV_1 (1+ i) \]

\[ FV_2 = $110(1.10) = $121 \]

To take this example a step further, we make some additional adjustments. We know from Equation (1) that FV1 is equal to PV0(1 + i). Let's further develop relationships between future and present value.
We start with:  
\[ FV_2 = FV_1 (1 + i) \]

Substituting, we get:  
\[ FV_2 = PV_0 (1 + i)(1 + i) \]

And we end with:  
\[ FV_2 = PV_0 (1 + i)^2 \]  \hspace{1cm} (2)

Equation (2) is the general equation for finding the future value of a lump sum invested for two years at interest rate \( i \). In fact, we have actually discovered the general relationship between the present value of a lump sum and its future value at the end of any number of periods, as long as the interest rate remains the same. We can state the general relationship as:

\[ FV_2 = PV_0 (1 + i)^2 \]  \hspace{1cm} (3)

Variable interest rate securities can also benefit from compound interest. The calculation of the compound interest is more complicated, however, since the interest rate for each period is not known in advance.

Equation (3) says the future value of a lump sum invested for \( n \) years at interest rate \( i \) is the lump sum multiplied by \( (1 + i)^n \). Let’s look at some examples. We’ll assume an initial investment today of $100 and an interest rate of 5 percent.

Future value in 1 year: $100(1.05) = $105

Future value in 5 years: $100(1.05)^5 = $100(1.2763) = $127.63

Future value in 15 years: $100(1.05)^{15} = $100(2.0789) = $207.89

Future value in 51 years: $100(1.05)^{51} = $100(12.0408) = $1,204.08

Regardless of the number of years, as long as the interest rate remains the same, the relationship in Equation (3) holds. Up to this point we have assumed interest was paid annually (i.e., annual compounding). However, most financial institutions pay and charge interest over much shorter periods. For instance, if an account pays interest every six months, we say interest is “compounded” semiannually. Every three months represents quarterly compounding, and every month is monthly compounding. Let’s look at an example with semiannual compounding.

The nominal rate is stated in the contract and does not include the effects of compounding or fees, such as closing fees on a mortgage.

Again, let’s assume that we deposit $100 at time zero, and it remains in the account for one year. This time, however, we’ll assume the financial institution pays interest semiannually. We will also assume a stated or nominal rate of 10 percent, meaning it will pay 5 percent every six months.
Present value and future value formulas can be adjusted to accommodate any compounding period by dividing the annual interest rate by the number of compounding periods per year and multiplying the number of years by the number of compounding periods per year.

In order to find the future value in one year, we must first find the future value in six months. This value, which includes the original deposit plus interest, will earn interest over the second six-month period. The value after the first six months is the original deposit plus 5 percent interest, or $105. The value after another six months (one year from deposit) is the $105 plus interest of $5.25 for a total of $110.25.

The similarity to finding the FV in two years as we did in Equation (2) is not coincidental. Equation 2 is actually the format for finding the FV of a lump sum after any two periods at any interest rate, as long as there is no compounding within the periods. The periods could be days, weeks, months, quarters, or years. To find the value after one year when interest is paid every six months, we multiplied by 1.05 twice. Mathematically this is represented by:

\[ \text{FV} = 100(1.05)(1.05) = 100(1.05)^2 \]

\[ \text{FV} = 100(1.1025) = 110.25 \]

The process for semiannual compounding is mathematically identical to finding the future value in two years under *annual compounding*. In fact, we can modify Equation 2 to describe the relationship of present and future value for any number of years and compounding periods per year.

\[ \text{FV}_n = \text{PV}_0 \left( 1 + \frac{i}{m} \right)^{m \times n} \quad (4) \]

where:
- \( \text{FV}_n \) = the future value after n years
- \( \text{PV}_0 \) = the present value
- \( i \) = the stated annual rate of interest
- \( m \) = the number of compounding periods per year
\[ m \cdot n \] = the total number of compounding periods (the number of years times the compounding periods per year)

For semiannual compounding \( m = 2 \); for quarterly compounding \( m = 4 \); and for monthly compounding \( m = 12 \). If you leave money in an account paying semiannual interest for four years, the total compounding periods would be \( 4 \times 2 = 8 \). Interest would be calculated and paid eight times during the four years. Let’s assume you left your $100 on deposit for four years, and the bank pays 10 percent interest compounded semiannually. We’ll use Equation 4 to find the amount in the account after four years.

\[
FV = \$100 \left(1 + \frac{0.10}{2}\right)^{4 \times 2}
\]

\[
FV = \$100(1.05)^8
\]

\[
FV = \$100(1.4775) = \$147.75
\]

where:

\[
n = 4, \text{ because you will leave the money in the account for four years}
\]

\[
m = 2, \text{ because the bank pays interest semiannually}
\]

\[
i = 10\% \text{ (the annual stated or nominal rate of interest)}
\]

If the account only paid interest annually, the future value would be:

\[
FV = \$100 \left(1 + \frac{0.10}{1}\right)^{4 \times 1}
\]

\[
FV = \$100 (1.10)^4
\]

\[
FV = \$100 (1.4641) = \$146.41
\]

The additional $1.34 (i.e., $147.75 – $146.41 = $1.34) is the extra interest earned from the compounding effect of interest on interest. Although the differences do not seem profound, the effects of compounding are magnified with larger values, greater number of compounding periods per year, or higher nominal interest rates. In our example, the extra $1.34 was earned on an initial deposit of $100. Had this been a $1 billion deposit, the extra interest differential from compounding semiannually rather than annually would have amounted to $13,400,000!

An investor who invests in a security promising an annual rate of 10 percent will earn an effective rate of return greater than 10 percent if the compounding frequency is greater than annually (i.e., quarterly, monthly, etc.)
To demonstrate the effect of increasing the number of compounding periods per year, let’s look at several alternative future value calculations when $100 is deposited for one year at a 10 percent nominal rate of interest. In each case, \( m \) is the number of compounding periods per year.

\[
\begin{align*}
\text{m} \quad &\quad \text{FV} \\
1 &\quad \text{(annually)} \quad FV = $100(1.10) = $110 \\
2 &\quad \text{(every 6 months)} \quad FV = $100(1.05)^2 = $110.25 \\
4 &\quad \text{(quarterly)} \quad FV = $100(1.025)^4 = $110.38 \\
6 &\quad \text{(every 2 months)} \quad FV = $100(1.0167)^6 = $110.43 \\
12 &\quad \text{(monthly)} \quad FV = $100(1.008333)^{12} = $110.47 \\
52 &\quad \text{(weekly)} \quad FV = $100(1.001923)^{52} = $110.51 \\
365 &\quad \text{(daily)} \quad FV = $100(1.000274)^{365} = $110.52
\end{align*}
\]

You will notice two very important characteristics of compounding:
- For the same present value and interest rate, the future value increases as the number of compounding periods per year increases.
- Each successive increase in future value is less than the preceding increase. (The future value increases at a decreasing rate.)

**Effective Interest Rates.** The concept of compounding is associated with the related concept of **effective interest rates**. In our semiannual compounding example, we assumed that $100 was deposited for one year at 10 percent compounded semiannually. We represented it graphically using a timeline as follows:

**Figure 5: Effective Interest Rates**

The stated (nominal) rate of interest is 10 percent. However, determining the actual rate we earned involves comparing the ending value with the beginning value using **Equation 5**. You can determine the actual or “effective” rate of return by taking into consideration the impact of compounding. **Equation 5** measures the change in value as a percentage of the beginning value.

\[
\text{effective return} = \frac{V_1 - V_0}{V_0} \tag{5}
\]

where:
- \( V_0 \) = the total value of the investment at the beginning of the year
- \( V_1 \) = the total value of the investment at the end of the year

You will notice **Equation (5)** stresses using the values at the beginning and the end of the year (actually, any twelve month period). By convention, we always state effective interest rates in terms of one year.
Returning to our previous example, let’s substitute our beginning-of-year and end-of-year values into Equation (5). Because the interest was compounded semiannually instead of annually, we actually earned 10.25 percent on the account rather than the 10 percent stated rate.

\[
\text{effective return} = \frac{V_1 - V_0}{V_0} \quad (5)
\]

\[
\text{effective return} = \frac{\$110.25 - \$100}{\$100} = 0.1025 = 10.25\%
\]

Let’s employ algebraic principles and rewrite Equation 5 in the following form:

\[
\text{effective return} = \frac{V_1}{V_0} - 1 \quad (6)
\]

Now let’s restate Equation (6) in terms of FV and PV:

\[
\frac{V_1}{V_0} - 1 \text{ is equivalent to } \frac{FV_t}{PV_0} - 1, \text{ and } FV_t = PV_0 \left(1 + \frac{i}{m}\right)^{m \cdot t} \quad (7)
\]

\[
\frac{FV_t}{PV_0} - 1 \text{ can be rewritten as } \frac{PV_0 \left(1 + \frac{i}{m}\right)^{m \cdot t}}{PV_0} - 1
\]

Remember, we always state effective returns in annual terms. Thus we can set \(n = 1\) in the equation and the PV0 in the numerator and denominator cancel each other out. Substituting Equation (7) back into Equation (6) we get:

\[
\text{effective return} = \left(1 + \frac{i}{m}\right)^m - 1 \quad (8)
\]

We have arrived at the general equation to determine any effective interest rate in terms of its stated or nominal rate and the number of compounding periods per year. Let’s investigate a few examples of calculating effective interest rates for the same stated interest at varying compounding assumptions. Notice that the effective rate increases as the number of compounding periods increase.

Although we don’t demonstrate it in this book, an investment could be compounded continuously. This compounding frequency would provide the greatest effective rate of return possible for a given annual rate of interest.

\[
m = 1 \text{ (annual compounding)} \left(1 + \frac{0.12}{1}\right)^1 - 1 = (1.12)^1 - 1 = 0.12 = 12\%
\]
m = 2 (semiannual) \( \left(1 + \frac{0.12}{2}\right)^2 - 1 = (1.06)^2 - 1 = 0.1236 = 12.36\% \)

m = 4 (quarterly) \( \left(1 + \frac{0.12}{4}\right)^4 - 1 = (1.03)^4 - 1 = 0.1255 = 12.55\% \)

m = 12 (monthly) \( \left(1 + \frac{0.12}{12}\right)^{12} - 1 = (1.01)^{12} - 1 = 0.1268 = 12.68\% \)

m = 365 (daily) \( \left(1 + \frac{0.12}{365}\right)^{365} - 1 = (1.0003288)^{365} - 1 = 0.12758 = 12.75\% \)

**Geometric Mean Return.** The geometric mean return is a compound annual growth rate for an investment. For instance, assume you invested $100 at time 0 and that the investment value grew to $220 in 3 years. What annual return did you earn, on average? Using our future value formula from Equation (3):

\[
100(1+i)^3 = 220 \tag{7}
\]

The interest rate in Equation (7) is the geometric mean or compound average annual growth rate earned on the investment. Solving Equation (7), gives \( i = 30 \) percent. \[17\]

More formally, the geometric mean is found using the following equation:

\[
\text{GM} = \sqrt[n]{\frac{FV_n}{PV}} - 1 \quad \text{or} \quad \left(\frac{FV_n}{PV}\right)^{1/n} - 1 \tag{8}
\]

where:

GM = the geometric mean

FV<sub>n</sub> = future value of the lump sum investment

PV = present value, or the initial lump sum investment

n = the number of years over which the investment is held

Thus if you invested $500 in an mutual fund\[18\] five years ago and now the original investment is worth $901.01, we would find the geometric mean return as follows:

\[
\left(\frac{901.01}{500}\right)^{1/5} - 1 = (1.80202)^{1/5} - 1 = 1.125 - 1 = 12.5\%
\]

The mutual fund provided an average annual return of 12.5 percent.
The geometric mean can also be stated using returns over several periods using the following formula:

\[ GM = \sqrt[n]{(1 + x_1)(1 + x_2)...(1 + x_n)} - 1 \quad (9) \]

where:

- \( GM \) = the geometric mean
- \( x_i \) = the \( i^{th} \) return measurement (the first, second, third, etc.)
- \( n \) = the number of data points (observations)

We add 1 to each observation’s value, which is a percentage expressed as a decimal, multiply all the observations together, find the \( n \)\(^{th} \) root\(^{19} \) of the product, and then subtract one.

Let’s return to our mutual fund example. This time we will calculate the geometric mean return differently. Assume that over the last five years the fund has provided returns of 15, 12, 14, 16, and 6 percent. What was the geometric mean return for the fund?

\[
GM = \sqrt[5]{(1 + 0.15)(1 + 0.12)(1 + 0.14)(1 + 0.16)(1 + 0.06)} - 1
\]

\[
= \sqrt[5]{1.15 \times 1.12 \times 1.14 \times 1.16 \times 1.06} - 1
\]

\[
= \sqrt[5]{1.80544} - 1 = 0.125
\]

\[ GM = 12.5\% \quad (20) \]

The geometric mean shows the average annual growth in your cumulative investment for the five years, assuming no funds are withdrawn. In other words, the geometric mean assumes compounding. In fact, when evaluating investment returns, the geometric mean is often referred to as the compound mean.

The geometric mean is the compound annual growth rate for a multi-period investment.

**Present Value of a Lump Sum**

Recall that Equation (3) showed us the relationship between the present and future values for a lump sum.

\[ FV_n = PV(1 + i)^n \quad (3) \]

In Equation (3) the future value is determined by multiplying the present value by \((1 + i)^n\). To solve for the present value, we can divide both sides of the equation by \((1 + i)^n\).

\[ PV = \frac{FV_n}{(1 + i)^n} \quad (3) \]

When an interest rate is used to discount a future cash flow to its present value, it is often referred to as a discount rate.
Finding a present value is actually deducting interest from the future value, which we refer to as **discounting**. The present value can be viewed as the amount that must be invested today in order to accumulate a desired amount in the future. The “desired amount in the future” is known as the “future value.” Returning to the future value examples used earlier, we can demonstrate how to calculate present values. We will assume the same discount rate of 5 percent.

\[
(FV) \text{ The value in 1 year of $100 deposited today: } $100(1.05) = $105
\]

\[
(PV) \text{ The value today of $105 to be received in 1 year: } 100 = \frac{105}{(1.05)}
\]

\[
(FV) \text{ The value in 5 years of $100 deposited today: } $105 \times (1.05)^5 = $127.63
\]

\[
(PV) \text{ The value today of $127.63 to be received in 5 years: } 100 = \frac{127.63}{(1.05)^5}
\]

\[
(FV) \text{ The value in 15 years of $100 deposited today: } $100(1.05)^{15} = $207.89
\]

\[
(PV) \text{ The value today of $207.89 to be received in 15 years: } 100 = \frac{207.89}{(1.05)^{15}}
\]

\[
(FV) \text{ The value in 51 years of $100 deposited today: } $100(1.05)^{51} = $1,204.08
\]

\[
(PV) \text{ The value today of $1,204.08 to be received in 51 years: } 100 = \frac{1,204.08}{(1.05)^{51}}
\]

**Chapter Objective:** Calculate and interpret the present and future values of an annuity

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**Annuities**

Recall that an annuity is a series of equal payments, equally spaced through time. The series may consist of two or more cash flows. We begin by using **Equation (3)** for each cash flow in the series. For instance, consider the timeline and associated cash flows shown in **Figure 6**.

**Future Value of an Annuity Due.** Assume the cash flows represent deposits to an account paying 10 percent, and you want to know how much you will have in the account at the end of the fifth year. Point zero on the timeline is when the first deposit is made. Each successive deposit is made at the beginning of each year, so the last deposit is made at the beginning of year five. When cash flows come at the beginning of the period, the annuity is known as an **annuity due**. An annuity due is typically associated with leases or other situations where payments are made in advance of services or products received or rendered. Our goal is to determine the amount we will have in the account at point five (i.e., the end of year five).

Consider an equipment lease. The user of the equipment (the lessee) pays the owner of the equipment (the lessor) a fee for the right to use the equipment over the next period. That is, leases are prepaid. An
example of an ordinary (or deferred) annuity is a mortgage loan (or any debt) with end of period payments. When the money is borrowed, the borrower makes payments at the end of set periods, usually every month or semi-annually.

Each payment will include interest, which reflects the cost of the money over the previous period. When a mortgage is fully amortized, each of the fixed payments includes interest on the outstanding principal as well as a partial repayment of principal. Since the outstanding principal decreases with each payment, the proportion of each successive payment representing interest decreases, and the proportion representing principal increases.

The two forms of annuity are ordinary (or deferred) and annuity due. If cash flows come at the beginning of the period, the annuity is an annuity due. In contrast, if cash flows come at the end of the period, the annuity is an ordinary or deferred annuity.

The process of finding the future value of an annuity in this manner is equivalent to summing the future value of each individual cash flow. The cash flow stream is illustrated in Figure 6. Each cash flow is assumed to earn a 10 percent return for each of the indicated number of years. For example, the $100 at time 0 will remain on deposit for a total of five years, so we multiply $100 by (1 + i)^5 and obtain $161.05. When all the cash flows are compounded to find their future values, we add them to find the total future value of the five cash flows, which totals $671.56. In other words, if you deposit $100 per year in an account paying 10 percent, you will have $671.56 in five years.

A lease is an example of an annuity due.

**Future Value of an Ordinary Annuity.** Now we’ll consider the same annuity of five $100 deposits, but we’ll assume that the deposits occur at the end of each year. When cash flows are at the end of the period, the annuity is known as an ordinary annuity. An ordinary annuity represents the typical cash flow pattern for loans, such as those for automobiles, homes, furniture, fixtures, and even businesses. The time line and cash flows are illustrated in Figure 7.
You will notice that the future value of the ordinary annuity is less than the future value of the annuity due, although the number of equal deposits is the same. Upon further inspection, you should notice that the four deposits at points one through four are exactly the same for both annuities. The difference between the two types of annuities is the treatment of the remaining deposit. With the annuity due (Figure 6), the remaining deposit is made at time zero and earns interest for five years.

With the ordinary annuity (Figure 7), the remaining deposit is made at the end of year five immediately before the account is closed and the money withdrawn. Since the last deposit in the case of the ordinary annuity earns no interest, the difference between the future values of the two annuities must be the interest earned on the deposit made at time 0 in the case of the annuity due. The future value of the ordinary annuity is $610.51. The future value of the annuity due is $671.56, exactly $61.05 larger.

It is essential to understand the present value and future value concepts and formulas. As a practical matter, however, most people use a financial calculator or a spreadsheet to perform present value and future value calculations.

**Figure 7: Ordinary Annuity**

The solutions presented for both annuities were more for demonstration purposes than for actually calculating the future values. If you find yourself needing to calculate the future value of an annuity, you will use one of two other approaches: a financial calculator or a formula.

Let’s illustrate the use of a financial calculator to find the future value of an annuity. Our example will rely on the keystrokes using a Texas Instruments (TI) Business Analyst II Plus® calculator.

**Ordinary Annuity:** Your calculator should be set to end of period payments and one payment per year. To set to end of period payments, press 2nd → BGN and press 2nd → SET until END is displayed, then 2nd → QUIT. (Since end is default, the display will not indicate end of period payments.) To set to one payment per year, press 2nd → P/Y → 1 → ENTER, 2nd → QUIT. The keystrokes to find the future value are:

\[
\begin{align*}
-100 & \quad \text{PMT [The calculator assumes one of the payments is an outflow and one is an inflow. The negative sign indicates an outflow (the deposit)].} \\
5 & \quad \text{N} \\
10 & \quad \text{I/Y} \\
\text{CPT} & \quad \text{FV = $610.51}}
\end{align*}
\]
Annuity Due. For an annuity due, set the financial calculator for beginning-of-period payments and one payment per year. To set to one payment per year, press 2nd → P/Y → 1 → ENTER, 2nd → QUIT. To set to end-of-period payments, press 2nd → BGN and press 2nd → SET until BGN is displayed, then 2nd → QUIT. (BGN will show in the calculator display.) The keystrokes to find the future value are:

\[
\begin{align*}
-100 & \text{ PMT [The calculator assumes one of the payments is an outflow and one is an inflow.} \\
5 & \text{ N} \\
10 & \text{ I/Y} \\
\text{CPT} & \text{ FV = $671.56}
\end{align*}
\]

While using a financial calculator is the recommended procedure, you can also use a formula for calculating the future value of an annuity. To find the future value of an ordinary annuity, multiply the cash flow (payment) by the formula and the result is the future value. Assume the same $100 deposits made each year for five years earning a 10 percent return, compounded annually.

\[
FV_n = PMT \frac{(1+i)^n - 1}{i}
\]

\[
FV_5 = $100 \frac{(1.10)^5 - 1}{0.10} = $100(6.1051) = $610.51
\]

To adjust the future (present) value of an ordinary annuity to an equivalent future (present) value of an annuity due, multiply (divide) the ordinary annuity value by the quantity \( (1 + i) \).

The same process would be used to calculate the future value of an annuity due, but we must multiply the future value of the ordinary annuity by \( (1 + i) \) to adjust for the fact that each cash flow is shifted back by one period with the annuity due.

\[
FV_5 = $100 \left( \frac{1.6105 - 1}{0.10} \right) = $100(6.1051)(1 + 0.10) = $671.56
\]

Present Value of an Annuity Due. When we found the future value of an annuity, we compounded each cash flow individually and summed them at a future date. To find the present value of an annuity, we discount all the future values and sum them up. We’ll start with the annuity due we used before. The cash flows are assumed to be paid/received at the beginning of each year, and we want to find the aggregate present value of the five cash flows at point zero on the timeline. Again we assume an interest rate of 10 percent. The process of finding the present value of an annuity due is equivalent to summing the present value of each individual cash flow. The cash flow stream is illustrated in Figure 8. Each cash flow is discounted at a 10 percent rate for each of the indicated number of years. For example, the present value of $100 at time 4 equals 100 divided by \((1 + 0.10)^4\) = $68.30; the present value of $100 at time 3 equals 100 divided by \((1 + 0.10)^3\) = $75.13, and so on. When all the cash flows are discounted to find their present values, we add them to find the total present value of the five cash flows, which totals $416.99. Figure 8 illustrates the calculation of the present value of an annuity due.
Figure 8: Present Value of an Annuity Due

The present value of an ordinary annuity or annuity due can be interpreted as the price or amount an investor would pay today for an investment promising to provide multiple cash flows over time.

To find the present value of this annuity due using a TI Business Analyst II Plus calculator, you would make the following key entries (be sure to turn on BGN):

\[
\begin{align*}
-100 & \quad \text{PMT} \\
5 & \quad \text{N} \\
10 & \quad \text{I/Y} \\
\text{CPT} & \quad \text{PV} = 416.99
\end{align*}
\]

There are several ways of interpreting the $416.99. The $416.99 is the present value of the five $100 payments/receipts, but what does “present value” really mean? A simple interpretation is that if you put $416.99 in an account paying 10 percent interest, you will be able to withdraw $100 per year for five years. Another somewhat more sophisticated interpretation is that $416.99 is the maximum you would pay for an investment paying $100 per year with a required return of 10 percent. A third interpretation is that if you borrow $416.99 to be paid in five equal annual payments, you will pay $100.00 per payment. Regardless, assuming a 10 percent interest rate, $416.99 today is equivalent to five annual $100 cash flows, the first cash flow occurring today.

Present Value of an Ordinary Annuity. Likewise, the present value of an ordinary annuity may be calculated by summing the present value of each individual payment. Figure 9 illustrates the cash flow stream for the ordinary annuity. In this case the first cash flow occurs one year from today with the other four coming yearly after that. The present value of each cash flow is found and then added to the others to get a total of $379.08.
Figure 9: Present Value of an Ordinary Annuity

The keystrokes to find the present value of an ordinary annuity are (be sure to turn BGN off):

\[-100 \quad \text{PMT}\]
\[5 \quad \text{N}\]
\[10 \quad \text{I/Y}\]
CPT \quad \text{PV} = \$379.08

In addition, we may calculate the present value of an ordinary annuity using the following formula:

\[PV_A = PMT \left[ \frac{1}{i} - \frac{1}{i(1+i)^N} \right]\]

\[PV_A = \$100 \left[ \frac{1}{0.10} - \frac{1}{0.10(1.10)^5} \right]\]

\[PV_A = \$100 \left[ 10 - 6.2092 \right]\]

\[PV_A = \$100 \left[ 3.7908 \right] = \$379.08\]

When loan payments include both principal and interest, we say the loan is amortized. Amortized loans are most common for home mortgage loans but are also used to finance automobiles, boats, and other assets.

Thus we are able to confirm the present value of the ordinary annuity is $379.08.
When both principal and interest are included in a loan payment (rather than a series of interest payments followed by the repayment of principal at the maturity of the loan), we say the loan is **fully amortized**. Let’s use the ordinary annuity of $379.08 as an example. Let’s assume you have borrowed $379.08 for the purchase of a household item and have agreed to pay for it in five equal payments at 10 percent interest. We know from the previous example that the payments will be $100 each. **Figure 10** shows how each payment would be broken down into interest and principal if the loan were fully amortized.

For a fully amortized loan, the interest portion of each payment decreases over time, while the principal portion of each payment increases over time. The total payment for each period, however, remains the same.

<table>
<thead>
<tr>
<th>Payment</th>
<th>Interest</th>
<th>Principal</th>
<th>Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$100</td>
<td>37.91</td>
<td>62.09</td>
</tr>
<tr>
<td>2</td>
<td>$100</td>
<td>31.70</td>
<td>68.30</td>
</tr>
<tr>
<td>3</td>
<td>$100</td>
<td>24.87</td>
<td>75.13</td>
</tr>
<tr>
<td>4</td>
<td>$100</td>
<td>17.37</td>
<td>82.64</td>
</tr>
<tr>
<td>5</td>
<td>$100</td>
<td>9.09</td>
<td>90.91</td>
</tr>
</tbody>
</table>

\[ \text{PV}_{\text{perpetuity}} = \frac{\text{CF}}{i} \]

**Figure 10**: Amortized Loan (amortization of $379.08 for five years at 10 percent)

Each of the five payments repays a portion of the principal borrowed and pays interest on the balance remaining after the previous payment. The first payment includes 10 percent interest on the entire loan amount of $379.08, or $37.91. The remainder of the payment ($100 – $37.91 = $62.09) is applied to the principal, leaving a balance of $316.99. The second payment includes 10 percent interest on the new balance of $316.99, or $31.70. Again, the remainder of the payment, $68.30, is applied to the principal. This process continues until the loan is fully paid. You can see in **Figure 5** that the interest in each payment decreases while the principal increases.

**Present Value of a Perpetuity**. As explained earlier, a perpetuity is a series of equal cash flows occurring at the same interval forever. The present value of a perpetuity equals the periodic cash amount divided by the discount (interest) rate. For example, assume you own a stock paying $2 dividends forever. Further, assume the appropriate discount rate on the stock is 10 percent. The present value of the perpetuity equals $2 divided by 10 percent, which equals $20. In other words, you should be willing to pay $20 for a stock expected to pay $2 dividends per year forever, using a discount rate of 10 percent. More formally, we can state the formula for finding the present value of a perpetuity as follows:
where:

\[ CF = \text{the periodic cash flows of the perpetuity} \]
\[ i = \text{the discount rate} \]

An example of a perpetuity is preferred stock. Shares of preferred stock pay a fixed dividend to the investor forever. The investor can purchase the preferred stock for a price today that is equal to the present value of the perpetual stream of dividends.

\[ \text{To solve this problem, divide both sides of the equation by 100, then take the third root and subtract 1; } i = \left[ \frac{220}{100} \right]^{0.33} - 1. \]

A mutual fund is an investment company that gathers together the investments of many individuals and invests the total amount for them. This provides professional management and greater diversification of individual investments. Diversification will be discussed in a later chapter.

\[ n^{th} \text{ refers to the number of observations. If there were two observations, you would find the square root. With twenty observations you find the 20th root.} \]

You will notice that, although they are close, the geometric mean is smaller than the arithmetic mean. In fact, the geometric will always be less than or equal to the arithmetic mean.

Calculator Tip: Note that PV, FV, PMT, I/Y, and N are just memory registers. If there are values in these registers from previous computations, you will need to clear them. There are two ways to do this. The brute force method is to simply put a zero into the register that you’re not using. The second and more elegant method is to press 2nd → → → → CLR TVM to completely clear the time value of money register before you enter the next set of data points.

Similar to calculations related to future value, the present value of an annuity due can be calculated from the present value of the ordinary annuity by multiplying the present value of the ordinary annuity by \((1 + i)\).

### Section 3: An Introduction To Statistics

*Webster’s Collegiate Dictionary* defines statistics as “a branch of mathematics dealing with the collection, analysis, interpretation, and presentation of numerical data.” When we are trying to determine certain characteristics about a large population, we take a sample from that population. We then use that sample to derive certain statistics and make inferences about the population. In order to understand what this means, it is useful to become familiar with some of the more valuable statistics vocabulary.

#### Statistic

Statistics help us organize and analyze financial data to gain insight into usable trends and characteristics that are not readily observable without statistical analysis.

A statistic is a piece of information which can be agonizingly trivial and totally uninteresting, or extremely controversial and provocative. An example of a statistic is 51 percent of Americans are female.
Chapter Objective: Distinguish between populations and samples.

Population

A population is the collection of all possible individuals, objects, measurements, or other items; (e.g., the population of the U.S. is all people who call the U.S. their home country). The population of carp in the world is not just those that live in beautifully maintained and landscaped pools in Japan. The carp population would include every single carp, no matter where it lives.

A population encompasses every observation with a certain characteristic. An example would be all of the people in the world who are over six feet tall.

An important characteristic of a population is its size. For instance, the population of the U.S. is over 290 million people. That means there are over 290 million members of that particular population. If you wanted to estimate the average height of an American, you would not want to go around to every single person and measure his or her height. Even if you could afford the extreme cost in both time and money, it would be a logistical nightmare. How about weighing every carp in the world to find the average weight of an adult carp?

It is not always easy or even possible to collect data on an entire population. When population data is not obtainable, statisticians turn to representative samples of the overall population.

The field of statistics allows us to estimate these values without actually measuring each member of the population. Also, it would be far easier to draw and measure a sample from the U.S. population to estimate average height than it would be to measure every member of the population.

Sample

A sample is a portion or subset of a population that is used to estimate characteristics of (i.e., make inferences about), the population. If we were interested in the average height of a U.S. citizen, we could select people from all over the U.S. (a sample of people), measure them, and find the average height. The average height of the individuals in the sample is then used to infer the average height of all people in the U.S.

When it is unreasonable or even impossible to collect data on a population, statisticians will utilize a representative sample (i.e., a smaller number of observations from the population) to draw conclusions about the population as a whole.

There are a few characteristics of samples that are very important. One is randomness. You don’t want to force the sample to yield statistics that are biased because of the way the sample is taken. For example, if you are trying to estimate the percentage of people in the U.S. who are over age 65, you would not take your sample observations from a retirement community. If you were to do that, you could estimate that nearly 100 percent of the U.S. population is over 65! An appropriate sample would be drawn from many different areas across the country in a completely random, or unbiased way.
To avoid a biased estimate of the statistic, the sample should be randomly drawn from the population. A random sample has no detectable plan or pattern. Observations are drawn in a random manner with no preference given to any particular value, size, location, etc.

Another characteristic important to the sample is size. When an extremely large sample is drawn, the costs can be very high, and the inferences not significantly stronger than those of a somewhat smaller sample. However, if the sample is too small, the inferences drawn from the sample may not be trustworthy. Even though we will not pursue ideal sample size in this chapter, it is important to remember that sample size is very important to the value (the confidence) you can place on the inferences you make about a population.

**Chapter Objective:** Distinguish between qualitative and quantitative variables.

**Variables**

A variable is an unknown quantity (measurement) that can have different values. For example, if you were estimating average height and measured every person in your sample, the first value of the variable “height” would be the height of the first person measured. The second value would be the height of the second person; the third value would be the height of the third person, and so on. The variable “height” would have as many values (observations) as there are people in your sample. For example, we might use the letter $x$ to denote height. $x_1$ is the notation used to denote the height of the first person sampled. $x_2$ is the notation used to denote the height of the second person sampled, etc. For instance, if the first person is 70 inches tall, then $x_1 = 70$. If the second person is 71 inches tall, then $x_2 = 71$.

Any piece of data that can take on more than one value is called a variable. The value that the variable will take on is generally unknown in advance (i.e., before measuring the variable). For instance, the number of stars that you will be able to see on any given night is unknown until you count the stars.

There are two main categories of variables, qualitative and quantitative. A qualitative variable measures attributes. These could include gender, religious preference, eye color, type of running shoe preferred, and state of birth. In other words, qualitative variables do not use numbers.

Conversely, quantitative variables are expressed numerically. These could include the average number of children in the typical household, the average height of American females, the percentage of people in the population with false teeth, or the average number of computers sold daily.

Quantitative variables can be divided into discrete and continuous. Think of discrete as meaning that the variable can only have a countable number of easily identified values. If the variable can only take on a whole number value from 1 to 10, it would be considered discrete. Its only possible values are 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10. You’ll notice that you can easily count each possible value.

Qualitative variables describe attributes of the sample, such as color. Quantitative variables measure numerical values of the sample, such as height.

Now let’s say the variable can have any incremental value between 1 and 10. In this case the variable can assume an infinite number of possible values and is called a continuous variable. When the variable was
discrete, two of its possible values were three and four, and it could not have a value *between* three and four. As a continuous variable, it can have the values three and four, but it can also take on any of the infinite values between three and four.

To illustrate, consider a continuous variable that is measured in inches. If the value of the first measurement is 3.0 inches, the next possible value could be so close to 3.0 that we have no instrument capable of measuring the distance. Consider the maximum number of zeros you can place between the decimal point and a one. An example would be 3.00001, but of course you can place many more than four zeros between the decimal and the one. In fact, the number of zeros you could place between the decimal point and the one is infinite.

A discrete variable can only have a countable number of easily identified values. A continuous variable can have an infinite number of values.

An example of a discrete variable is the outcome of the roll of a die (1, 2, 3, 4, 5, or 6). An example of a continuous variable is the amount of rainfall during July in a city.

Let’s turn our attention to the terminology that is used to describe data. When we wanted to estimate the average height of a large group of people, we measured a sample of them and wrote down each measurement. Let’s assume we collected the following measurements:

<table>
<thead>
<tr>
<th>Person</th>
<th>Height in Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>70</td>
</tr>
<tr>
<td>2</td>
<td>71</td>
</tr>
<tr>
<td>3</td>
<td>73</td>
</tr>
<tr>
<td>4</td>
<td>66</td>
</tr>
<tr>
<td>5</td>
<td>62</td>
</tr>
<tr>
<td>6</td>
<td>70</td>
</tr>
</tbody>
</table>

“Data point” means a single observation in a data set (sample).

These measurements are referred to collectively as the sample data (plural), while each individual measurement or observation is a data point. One observation would be the value 70 inches. Another would be 66 inches. Once we have collected our data, we will look for ways of describing them as a whole (i.e., we will describe the distribution of the data).

**Frequency Distribution**

Often, we do not want to see all the data points (especially if the sample size is large) but rather are interested in seeing merely a summary of the data. One popular way to summarize the data is to tabulate the frequency of observations falling in various categories. The tally of observations falling in equally spaced intervals is called the frequency distribution of the data. The frequency distribution shows how the data are scattered. For instance, consider the following frequency distribution.
### Height Interval (inches) | Frequency Tally
---|---
64 up to 66 | 10
66 up to 68 | 35
68 up to 70 | 40
70 up to 72 | 10
72 up to 74 | 5

The table indicates that from our sample of 100 individuals, 10 individuals are 64 up to 66 inches tall; 35 individuals are 66 up to 68 inches tall, etc. One way to summarize the data visually is by graphing the frequency distribution as follows:

**Figure 11: Frequency Distribution Histogram**

The graph of the frequency distribution is often called a histogram. Notice how the histogram illustrates how the data are scattered. There is a center (at the 3rd category) with a pattern around the center. In this example, the distribution is skewed, meaning that there are not an equal number of observations on either side of the middle interval. Alternatively, a symmetric distribution is one in which there are an equal number of observations on either side of the middle interval (i.e., follows a bell-shape).

To describe the data further, we often want to find the center point of the data. The center point of the data is known as the central tendency of the distribution. There are a few statistical measures of central tendency, the most popular of which are the mean, median, and mode, which are discussed below.

**Chapter Objective:** Calculate measures of central tendency.

The tally of observations falling in equally spaced intervals is called the frequency distribution of the data. A graph of the frequency distribution is called the histogram.
Measures Of Central Tendency

Mean

Mean is just another word for *average*, or the center of the data. For instance, when we previously mentioned estimating the average height, we could have used the expression “mean height.” The most common measure of central tendency is the arithmetic mean.

The arithmetic mean for a sample is denoted by: [27]

\[
\bar{X} = \frac{x_1 + x_2 + \ldots + x_n}{n}
\]

(7)

When a histogram is heavily weighted toward the right-hand side or left-hand side, the data is said to be skewed.

Earlier, to estimate the average height of the U.S. population, we took a sample of people and measured their heights. By substituting the data (individual measurements) into the equation to find the sample mean, we get:

Central tendency is used to refer to any measure of the center or middle of the sample of population.

\[
\bar{X} = \frac{70 + 71 + 73 + 66 + 70 + 62}{6} = 68.7 \text{ inches}
\]

Median

The median is the middle observation of the ranked data. If we ranked our height observations from the smallest to the largest, the same number of observations will fall above and below the median value. Our observations are 62, 66, 70, 70, 71, and 73. The median of the six observations falls between the third- and fourth-ranked observations. Thus, the simple average of the third and fourth observations, 70, represents the median of our sample. There are two observations greater than 70 (71 and 73), and there are two observations less than 70 (62 and 66).

The arithmetic mean is the sum of all the observations divided by the number of observations.

Mode

The mode is the observation that appears most often. In our case both the median and the mode are 70. The mean, median, and mode are all measures of central tendency. They all locate the center of the observations or population.

A note is necessary at this point. You probably questioned why the mean and median, both measures of the center of the distribution, are different. In fact, you might even be asking yourself, “Why do we need so many measures of the center of the distribution in the first place?”
The median of a data set is less heavily influenced by extreme data points (i.e., observations high above or below the majority of the data points) than the mean. Using the mean and median together can provide significant insight into a data set.

This question deserves some attention. The median finds the center of the distribution by number of observations. There are an equal number of observations above and below the median, regardless of their values. The mean, on the other hand, actually adds all the observations together and divides by the number of observations to find the mathematical center. You probably noticed that the mean of the sample observations, 68.7, isn’t even one of the observations. This is quite frequently the case. The reason we calculate both the mean and median of a data set is to get an idea of where the true center lies. Since the median and mean find the center in different ways, a more accurate estimation of where the center is and what is influencing its location can be gained by observing both the mean and median.

**Chapter Objective:** Define and calculate measures of dispersion.

**Measures Of Dispersion**

Measures of central tendency show the location of the center of the distribution. We often also want a measure of how spread out or dispersed the data are. There are several popular measures of dispersion. Here, we will discuss the range, mean deviation, and standard deviation.

**Range**

The range is simply the “distance” between the lowest and the highest observation for height. In our case we say the observations ranged from 62 inches to 73 inches, or 11 inches. The range shows us how disperse the sample observations are. The larger the range is, the greater the dispersion of observations, and the smaller the range is, the smaller the dispersion of the data.

The median is the middle observation, and the mode is the value that appears most often.

We now have information about the central tendency and the dispersion of the data. We can look at these statistics together and learn much about the sample. For instance, we see its center is around 70 inches, and there is a range of 11 inches between the smallest and largest observations in the sample.

A weakness of the range, however, is that it uses only two data points among all the data points in the distribution. In contrast, the alternative measures discussed in the following section use all the data points.

**Mean Deviation**

The mean (average) deviation is a measure of the dispersion of the sample observations around the center of the distribution. It measures the average deviation from the mathematical mean. A deviation is measured as the distance from the mean to each observation.

With a mean of 68.7”, the deviations for our sample are:

- 70.0” – 68.7”
- 71.0” – 68.7”
- 73.0” – 68.7”
and the mean deviation, MD is:

\[
MD = \frac{\sum |x - \bar{x}|}{n} \quad (8)
\]

where:

\(x\) = the value of each observation

\(\bar{x}\) = the arithmetic mean of the observations

\(n\) = the number of observations

\(|x - \bar{x}|\) = the absolute value of each deviation

Since summing the negative and positive deviations would tend to cancel them out, we have to ignore their signs and sum their absolute values.

The range of a sample is the “distance” between the largest and the smallest observations.

\[
MD = \left[\frac{70 - 68.7}{6} + \frac{71 - 68.7}{6} + \frac{73 - 68.7}{6}\right] + \left[\frac{66 - 68.7}{6} + \frac{62 - 68.7}{6} + \frac{70 - 68.7}{6}\right]
\]

and

\[
MD = \frac{1.3 + 2.3 + 4.3 + 2.7 + 6.7 + 1.3}{6} = 3.1
\]

The range of a data set is highly subject to extreme values in the data. It only takes one extreme observation to significantly widen the range.

The average, or mean, deviation for our sample is 3.1 inches. Therefore, on average, the sample observations fall 3.1 inches from the sample mean. If the mean deviation had been 1.0 inch, the observations would be much more closely grouped around the mean, or much less dispersed. Had the mean deviation been 6 inches, the observations would be more spread out or dispersed.

**Variance and Standard Deviation**

Another way to measure the dispersion of our sample is with the variance and standard deviation. Both the variance and standard deviation are measures of dispersion of the data around the mean of a distribution. The calculation of the variance is similar to the mean deviation calculation. For instance, once again we begin with the deviations of each data point from the mean. Instead of averaging the deviations, however, we average the squared deviations.
Look at the following equation, which gives us the population variance.

\[
\sigma^2 = \frac{\sum (X - \mu)^2}{N} \tag{5}
\]

where:

\( \sigma^2 \) = the population variance  
( the arithmetic mean of the squared deviations from the population mean)  
\( \mu \) = the mean of the population  
\( X \) = an individual member of the population  
\( N \) = the number of observations

When calculating variance, we square the deviations instead of using their absolute values as we did with the mean deviation. After we calculate the variance for the population, we find the standard deviation. The standard deviation, \( \sigma \), is simply the square root of the variance, \( \sigma^2 \)

\[
\sigma = \sqrt{\sigma^2} 
\]

or

\[
\sigma = \sqrt{\frac{\sum (X - \mu)^2}{N}} \tag{6}
\]

If we assume that our earlier data set of heights for six people included the entire population, the standard deviation would be calculated as follows:

\[
\sigma = \sqrt{\frac{\sum (X - \mu)^2}{N}} = \sqrt{\frac{1.69 + 5.29 + 18.49 + 7.29 + 44.89 + 1.69}{6}} = \sqrt{13.22} = 3.64
\]

Thus, the standard deviation of our population is 3.64 inches.

The equations for variance and standard deviation of the sample are slightly different than those for the population. Since the sample is smaller than the population, finding the arithmetic mean of the squared deviations tends to underestimate the true value. We have to adjust the formula slightly to account for this effect. The variance for a sample is as follows:

\[
s^2 = \frac{\sum (x - \bar{x})^2}{n - 1} \tag{7}
\]

where:

\( s \) = the sample variance  
\( x \) = an individual observation in the sample
\( \bar{X} \) = the sample mean
\( n - 1 \) = the number of sample observations minus 1

Notice we divided by \( n - 1 \) rather than \( n \). This is the modification for the size of the sample compared to the population. As with the population, the standard deviation of the sample is the square root of its variance, or

\[
\sigma_s = \sqrt{s^2}
\]

or

\[
s = \sqrt{\frac{\sum (X - \bar{X})^2}{n - 1}} \tag{8}
\]

For our previous example related to estimating the average height of a large population of people, we calculate the standard deviation as follows:

\[
s = \frac{\sqrt{\sum (X - \bar{X})^2}}{n - 1}
\]

\[
= \frac{\sqrt{(70 - 68.7)^2 + (71 - 68.7)^2 + (71 - 68.7)^2 + (66 - 68.7)^2 + (62 - 68.7)^2 + (70 - 68.7)^2}}{6 - 1}
\]

\[
= \frac{\sqrt{1.69 + 5.29 + 18.49 + 7.29 + 44.89 + 1.69}}{5}
\]

\[
= \frac{\sqrt{72.15}}{5} = 3.98
\]

Thus, the standard deviation of our sample is 3.98 inches.

The larger the standard deviation, the greater the dispersion of the observations about the mean. This means that the observations are relatively spread out. This is often referred to as a "loose" distribution. The smaller the standard deviation, the more the observations are grouped around the mean. The observations are less spread out. We would describe this as a "tight" distribution.

**Chapter Objective:** Calculate probabilities and confidence intervals for events.

**The Normal Distribution And The Empirical Rule For Probabilities**

Used extensively in financial analysis, the normal distribution is the famous “bell-shaped curve” of which statisticians and others speak. In a normal distribution, the mean, median, and mode are equal. Although the normal distribution may not precisely describe the pattern of returns for common stock, it is commonly used because of its statistical properties, especially symmetry.

Perfect symmetry implies:
- The center point of the distribution is the mean, median, and mode.
- 50% of all possible returns are to the right of (above) the mean
- 50% of all possible returns are to the left of (below) the mean.
- Easy application of the empirical rule.

**Figure 12** shows the normal distribution. Of particular interest are the symmetry of the distribution and the counting of standard deviations from the mean. To the right of (above) the mean, lines are drawn that would approximate the returns within one and two standard deviations of the mean. Symmetry implies we can
include lines on the other side of (left of) the mean that are the same distance from the mean as their counterparts to the right.

Figure 12: Normal Distribution

The empirical rule states that approximately 68% of the data lie within 1 standard deviation of the mean; approximately 95% of the data lie within 2 standard deviations of the mean; and nearly all the data lie within 3 standard deviations of the mean.

In many business settings, we wish to estimate the likelihood of certain events (e.g., likelihood of positive earnings, of debt rating change, etc). A very helpful rule for estimating the likelihood of events using the normal distribution is known as the empirical rule, which states that approximately 68% of the data lie within 1 standard deviation of the mean, and 95% of the data lie within 2 standard deviations of the mean.

For instance, assume you have been hired to manage a portfolio for a client. Assume your portfolio has an expected mean annual return of 10 percent and a standard deviation of 5 percent. Your client asks you to estimate the probability that she will lose money next year on your portfolio.

You can use the empirical rule to answer the question. For instance, the empirical rule states that there is approximately a 95 percent chance that next year’s portfolio return will lie within 2 standard deviations of the mean. Since the mean is 10 percent and the standard deviation is 5 percent, then 95 percent of the time the annual return will range from 0 percent to 20 percent (i.e., the mean return plus and minus 2 standard deviations). The remaining 5 percent of the time, the portfolio return will lie either below 0 percent or above 20 percent. If we assume the portfolio returns are symmetric (equal probabilities for returns above and below the mean), there is a 2.5 percent chance the return will lie below 0 percent and another 2.5 percent chance the return will lie above 20 percent. This client should feel pretty safe about her investment: There is only a 2.5 percent chance she will lose money next year.

The mean deviation is the average of the absolute values of the distances between each observation and the mean.

The empirical rule also can be used to derive confidence intervals, which are approximate ranges within which events might fall. Confidence intervals are a popular tool for finding a range in which an unknown parameter (e.g., the population mean) may fall. Using the empirical rule:

- The 68% confidence interval equals the sample mean plus and minus 1 standard error.
- The 95% confidence interval equals the mean plus and minus 2 standard errors.
For instance, assume we sample a large number (over 30) of oil drilling projects. Assume the sample mean profit equals $100 million and the standard error equals $150 million. The 68% confidence interval for the population mean profit equals $100 million plus and minus $150 million. Loosely speaking, we are 68% confident that the population mean falls within a –$50 million to $250 million interval.

Variance and Standard Deviation are two of the most commonly used statistics in finance and pervade financial theory. You should know how to calculate and interpret both measures well.


[24] In this case a biased sample statistic is one whose value is forced to be higher or lower than the true population measure simply by the way the sample is drawn.

[25] An observation is one member of a sample. A sample of size 30 has 30 observations.

[26] We are assuming a very small sample size to make the example easier. In reality, you would measure anywhere from several dozen to several thousand people, depending upon the size of the population.

[27] Sometimes the summation symbol, Σ, is used to define the arithmetic mean as -x/n. Also, the Greek symbol µ is often used when deriving the mean of the entire population; \( \bar{X} \) is used when deriving the mean of a sample. The method of calculating the population and sample means is the same, however.

[28] The formula for the variance is slightly different when examining only sampled data (rather than the entire population). In the population variance, notice that the sum of squared deviations is divided by the total population size, N. In the sample variance, the sum of squared deviations is divided by the sample size less 1 (n – 1). The sample standard deviation is the square root of the sample variance.

[29] A standard error is the standard deviation of the sample mean. Theoretically, we could take many samples from the same population. Moreover, we could calculate the mean (the arithmetic average) for each sample. The standard error equals the standard deviation of the sample means.

Section 4: An Introduction To Regression

The prior section presented the basics of statistics. Concepts were introduced to calculate the mean and standard deviation of a data distribution. For instance, given historical data, you could easily chart the frequency distribution and calculate the average and standard deviation for sales growth for any company. You could also find confidence intervals and derive probabilities that sales growth targets will be reached.

The variance of a sample must be found before the standard deviation can be found. The variance is the mean of the squared deviations from the mean. The standard deviation is the square root of the variance.

Suppose, however, that you want to predict sales growth for a single company or industry contingent on how the broad economy will perform next year. This objective differs from those of the prior section in which we were interested in calculating statistics from a single set of data. Now we wish to predict the future value for a variable, contingent on assumptions about external factors. For most companies, sales growth rises and falls along with the broad economy, so the sales growth forecast will change depending on broad economic growth assumption.
Chapter Objective: Calculate a prediction for the dependent variable in a regression.

Our objective is to predict sales growth for a single company contingent on the assumed growth in the economy. A good starting point is to examine the historical relationship between sales growth and a variable that measures economic growth, such as the percent change in Gross Domestic Product. Suppose we gather yearly data for the past 12 years:

<table>
<thead>
<tr>
<th>Year</th>
<th>Company Sales Growth</th>
<th>GDP Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.11</td>
<td>0.06</td>
</tr>
<tr>
<td>2</td>
<td>0.12</td>
<td>0.05</td>
</tr>
<tr>
<td>3</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>4</td>
<td>0.07</td>
<td>0.03</td>
</tr>
<tr>
<td>5</td>
<td>0.06</td>
<td>0.02</td>
</tr>
<tr>
<td>6</td>
<td>0.01</td>
<td>0.01</td>
</tr>
<tr>
<td>7</td>
<td>0.03</td>
<td>0.00</td>
</tr>
<tr>
<td>8</td>
<td>0.06</td>
<td>0.02</td>
</tr>
<tr>
<td>9</td>
<td>0.11</td>
<td>0.05</td>
</tr>
<tr>
<td>10</td>
<td>0.06</td>
<td>0.04</td>
</tr>
<tr>
<td>11</td>
<td>0.07</td>
<td>0.03</td>
</tr>
<tr>
<td>12</td>
<td>0.01</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Regression analysis is used to predict the value of a variable based on assumed values of related variables. Using regression analysis in this manner is referred to as forecasting.

The table reports paired observations for company sales growth and economy growth for each of the past 12 years. For example, in year 1, the broad economy fell 6 percent. During that same year, our company sales dropped 11 percent. And in year 12, both the broad economy and our company sales grew 1 percent.

To visually inspect the relationship between the two variables, we often construct a scatter plot, which is a plot of all the paired observations. The scatter plot using our 12 paired observations is provided in Figure 13.
Figure 13: Scatter Plot: Company Sales Growth vs. Economic Growth

Notice that there is a positive relationship between company sales growth and broad economy growth. The scatter slopes upward and to the right. Generally speaking, company sales growth increases as the general economy grows, and vice versa.

Now let’s get back to our original objective—to predict the percentage sales growth for your company contingent on the assumed growth in the broad economy. Assume you think the economy will grow 6 percent next year. How can you use the data to derive your best guess about your company’s sales growth for next year? To answer this question, note that a line, called the **regression line**, can be inserted that splits right through the middle of the scatter plot. The regression line not only represents the historical relationship between sales growth for your company and growth in the broad economy, but it can also be used to predict future sales growth for your company contingent on the strength of the economy.

Figure 14: Scatter Plot With Regression Line

A scatter plot is a plot of paired observations for two variables. Scatter plots can be used to visually determine the strength of a relationship between two variables.
In order to predict company sales growth, we first provide the mathematical equation, called the **regression equation**, for the regression line. Define $S$ to represent the percentage growth in your company sales and $G$ to represent percentage growth in GDP. The regression equation is:

\[
\text{predicted value for } S = 0.004 + 2G
\]

A regression line is the line that best fits or represents a scatter plot between two variables.

Now, on to the simple step to predict $S$, given $G$. If we think GDP will rise 6 percent next year, then our predicted value for company sales growth is:

\[
\text{predicted value for } S = 0.004 + 2(0.06) = 12.4\%
\]

The location of the regression line is determined by two important statistics: the **intercept** and the **slope**. The intercept is the point at which the regression line crosses the vertical axis. In our graph, the intercept equals 0.004. The slope tells us how tilted the line is. As the line flattens, the slope falls to zero. As the line gets steeper, the slope increases. In our graph, the slope equals 2.

How do we interpret the intercept and the slope? The answers to these questions lie in simple use of the regression equation. Notice, if $G$ equals zero, then our predicted value for $S$ will equal the intercept. For example, if we think the economy will be flat next year (zero growth in GDP), then we would predict that our company sales will rise only 0.4 percent:

\[
\text{predicted value for } S = 0.004 + 2(0) = 0.4\%
\]

The standard deviation is the square root of the variance. This means that the variance must be calculated before the standard deviation is calculated.

So much for the intercept. The slope is much more important because it tells us how company sales growth changes as the broad economy changes. More formally, the slope equals the predicted change in the company sales growth for every 1 point change in GDP growth. Our slope equals 2. Therefore, every time our GDP assumption changes by 1 percentage point, there would be a corresponding 2 percentage point change in our company sales growth prediction.

A regression equation is the mathematical representation of the regression line.

Don’t worry about how the intercept value (0.004) and slope value (2) are derived. Focus more on the interpretation. For the interested reader, formulas are available in most statistics books.

**Summary**

**Section 1: Algebra**

The dependent variable is the variable we wish to predict. The independent variable is the variable we use to help predict the dependent variable.
A. The sign of the sum of a positive number and a negative number is determined by the absolute values of the two numbers.
B. When subtracting two numbers, change the sign of the second number and add the two.
C. When multiplying negative numbers, the sign of the product depends upon the number of negative numbers.
D. An equation shows (defines) the relationships among the terms (variables) in the equation.
   1. An even number of negative signs results in a positive product.
   2. An odd number of negative signs results in a negative product.
E. An equal sign (=) shows that all the items (terms) on the left side of the equation are equal to all the terms on the right side of the equation. The unknown terms can have only one value.
F. The intercept equals the predicted value for the dependent variable assuming the independent variable equals zero. The slope is the expected change in the dependent variable for every 1-unit change in the independent variable.
H. An equal to or less than sign shows that the value of all of the terms on the left side of the equation must be equal to or less than the value of all of the terms on the right side of the equation.
I. A greater than or equal to sign shows that the value of all the terms on the left side of the equation must be equal to or greater than the value of all of the terms on the right side of the equation.
J. When a term moves from one side of the equation to the other, its sign changes, either from negative to positive or from positive to negative.
K. Multiplying or dividing all terms in an equation by the same number or letter does not change the structure of the equation or the value of the unknown, but it does have the following two effects:
   1. All terms are increased or decreased by the same proportion.
   2. The value of the unknown term(s) is unaffected.
L. Multiplying or dividing by one does not affect the value of a number or letter.
M. Changing the order in which terms are multiplied does not affect the equation or the value of the unknown terms (i.e., the product of $a \times b$ is the same as the product of $b \times a$).
N. When the same letter or number is added to or subtracted from all terms in an equation, neither the structure of the equation nor the value of the unknown term(s) changes.
O. Changing the order of the equation affects neither the equation nor the value of the unknown term(s).
P. A set of parentheses and all terms within them are referred to as a quantity.
Q. The parentheses and their contents can be treated as a single term.
R. When multiplying a number or letter by a quantity inside a parentheses, you must multiply the number or letter by each term inside the parentheses.
S. A quantity within a set of parentheses can be the result of factoring. To factor, look for the largest number that goes evenly into two or more terms in the equation. Then divide the applicable terms by this number and place parentheses around the remaining numbers and letters.
T. An exponent of a number or letter is referred to as its power (e.g., $x^3$ says $x$ cubed, or $x$ to the third power).
U. The power refers to the times the letter or number is multiplied by itself.
V. An exponent can be any value $i$. In order to solve for an unknown variable that has an exponent, the exponent of that variable must removed (i.e., made equal to one).
W. To remove an exponent, multiply it by its root. To remove any exponent $i$, take the $i$th root [i.e., $(x^i)^{1/i} = x$ or $\sqrt[i]{x^i} = x$].
X. Quantities within parentheses can have exponents.
Y. Exponents with parentheses are removed as any other exponent:
   
   $[ (x+1)^i ]^{1/i} = (x+1) = x+1$ or $\sqrt[i]{(x+1)^i} = (x+1) = x+1$.
Z. There must be at least two equations in order to solve for the values of two unknown variables.
AA. Set up the two equations as if you are adding them.
BB. Multiply one of the equations by a number, which will enable you to eliminate one of the unknowns.
CC. Add the two equations together by adding the \( x \) terms, the \( y \) terms, and the numbers.
DD. Solve for the remaining unknown variable.
EE. Plug the value for the first unknown variable into one of the original equations and solve for the second unknown variable.
FF. Plug both values back into both of the original equations to check your answers.

**Section 2: Time Value Of Money**

A. A lump sum is a single cash flow.

1. The present value of a lump sum is the equivalent value today of a lump sum to be received or paid sometime in the future.
   a. As interest rates increase (decrease), present values decrease (increase).
   b. As the number of periods increase (decrease), present values decrease (increase).

2. The future value of a lump sum is the equivalent value in the future of a lump sum to be received or paid today.
   a. As interest rates decrease (increase), future values decrease (increase).
   b. As the number of periods increase (decrease), future values increase (decrease).

B. The effective interest rate (i.e., return) depends upon the nominal rate and the number of compounding periods per year. As the number of compounding periods increases, the effective rate increases.

C. The geometric mean return is a compound annual growth rate for an investment. It represents the average annual growth rate earned on an investment over time. Geometric mean return takes into account the effects of compounding.

D. An annuity is a countable number of equal cash flows occurring at equal intervals over a defined period of time.

1. The future value of an annuity is the equivalent lump sum value in the future of a series of cash flows to be received or paid. As interest rates decrease (increase), the future value of an annuity decreases (increases).

2. The present value of an annuity is the equivalent lump sum value today of a series of cash flows to be received or paid. As interest rates increase (decrease), the present value of an annuity decreases (increases).

E. When loan payments include both principal and interest, we say the loan is amortized. With each successive payment, the proportion of the payment applied to interest decreases, and the proportion applied to principal increases.

F. The present value of a perpetuity (an annuity that never ends) is the cash flow divided by the discount rate.

**Section 3: An Introduction To Statistics**

A. A population is the collection of all possible individuals, objects, or other items (e.g., all the people in a country).

B. A sample is an unbiased, randomly selected representative portion of the population that is used to estimate characteristics of the population.

C. Qualitative variables measure attributes (e.g., color, gender, size, height.)

D. Quantitative variables are expressed numerically, (e.g., the number of children per household).

E. Quantitative variables can be discrete or continuous.
   1. Discrete quantitative variables are easily counted.
   2. Continuous quantitative variables have an infinite number of possible values.

F. The arithmetic mean is the simple average of the values, (i.e., the sum of the values divided by the number of values.

\[
\bar{X} = \frac{x_1 + x_2 + \ldots + x_n}{n} \quad (7)
\]

G. The median is the middle observation of the ranked data.
H. The mode is the observation that occurs the most.
I. The range is the distance between the largest and smallest data point.
J. The mean deviation is the average distance from the mean.
K. The variance and standard deviation are measures of dispersion of the data around the mean of the distribution.
   1. Standard deviation equals the square root of the variance.
   2. The population variance equals the average squared deviation from the mean:
      \[ \sigma^2 = \frac{\sum(X - \mu)^2}{N} \]  
   3. The sample variance is similar to the population variance but has n-1 in the denominator instead of N:
      \[ s^2 = \frac{\sum(x - \overline{x})^2}{n - 1} \]
L. The empirical rule states that 68% of the data will lie within 1 standard deviation of the mean and that 95% of the data will lie within 2 standard deviations of the mean. This rule can be used to construct confidence intervals.
M. The empirical rule can be used to estimate probabilities of events that occur at 1 or 2 standard deviations away from the mean.
N. The 68% confidence interval equals the sample mean plus and minus 1 standard error, and the 95% confidence interval equals the sample mean plus and minus 2 standard errors.

Section 4: An Introduction To Regression

A. A scatter plot is a plot of the paired observations for two variables.
B. A regression line is the line that best fits or represents the scatter plot.
C. The regression equation is the mathematical representation of the regression line and takes the form \( Y = a + bX \), where \( Y \) is the dependent variable that is being predicted and \( X \) is the independent variable used for prediction.
   1. The intercept is the point at which the regression line crosses the vertical axis. It equals the predicted value for the dependent variable when the independent variable equals zero.
   2. The slope measures the tilt of the regression line. It equals the expected change in the dependent variable for every 1-unit change in the independent variable.
D. We predict the dependent variable by inserting a reasonable value for \( X \) into the regression equation: \( Y = a + bX \), where \( a \) is the intercept and \( b \) is the slope of the regression line.

Practice Questions: Quantitative Methods

Note: All dollar values are rounded to the nearest whole dollar.

1. A student has $25,000 in her bank account, and the University charges a total of $500 per credit hour. How many credit hours can she purchase before she must borrow money?
   A. 5.
   B. 12.
   C. 50.
   D. 150.

2. If \( c = 3 \) which of the following represents the value of \( c \)?
3. \[ \frac{25}{5} \]

If \( p \leq \frac{25}{5} \), which of the following represents the value of \( p \)?
A. Less than or equal to 5.
B. Greater than or equal to 5.
C. Equal to 5.
D. Equal to 25.

4. In the equation \( 3(x + 5) = 45 \), which of the following represents the value of \( x \)?
A. 10.
B. 15.
C. 20.
D. 25.

5. If \( 4x + 4y = 24 \) and \( 2x + 3y = 24 \), which of the following statements is TRUE?
A. \( x = 6 \).
B. \( x = 12 \).
C. \( y = 6 \).
D. \( y = 12 \).

6. If \( x = 2 - y \) and \( y = x - 4 \), which of the following relationships is TRUE?
A. \( x = 3 \).
B. \( x = 6 \).
C. \( y = 1 \).
D. \( y = 14 \).

7. Jill invested $100,000 in stocks and bonds. Equities earned a total return of 12 percent, and the fixed income component earned 8 percent. If she had invested twice as much in equities, she would have made $1,800 more. How much was invested in equities?
A. $45,000.
B. $10,000.
C. $90,000.
D. $55,000.

8. A client invested $1.5 million both in stocks earning 13 percent total return and in bonds earning 5 percent. Total earnings for the clients was $143,000. What percentage was invested in fixed income?
A. 17.2%.
B. 25.4%.
C. 43.3%.
D. 85.9%.

9. For a given present value and interest rate, the future value:
A. increases as the number of compounding periods per year increases.
B. decreases as the number of compounding periods per year increases.
C. remains the same as the number of compounding periods per year increases.
D. remains the same as the number of compounding periods per year decreases.

10. For a given future value and interest rate, the present value:
A. increases as the number of compounding periods per year increases.
B. decreases as the number of compounding periods per year increases.
C. remains the same as the number of compounding periods per year increases.
D. remains the same as the number of compounding periods per year decreases.

11. Jim Wilson is planning to purchase a high performance sports car for $100,000. He will finance the purchase with a 5-year fully amortized loan at an interest rate of 5.0 percent with payments due at the end of each year. What is the interest portion of the payment in year three and the remaining principal balance at the end of year three?

<table>
<thead>
<tr>
<th>Interest</th>
<th>Principal</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. $5,000</td>
<td>$42,948</td>
</tr>
<tr>
<td>B. $3,145</td>
<td>$30,708</td>
</tr>
<tr>
<td>C. $5,000</td>
<td>$30,708</td>
</tr>
<tr>
<td>D. $3,145</td>
<td>$42,948</td>
</tr>
</tbody>
</table>

12. Samantha Tyson must decide which of four investments are the most attractive in terms of future value. The details of each investment opportunity are as follows:
   1. $1,000 annuity due with an interest rate of 7.1% and annual payments for three years.
   2. $2,800 invested at an interest rate of 7.0% compounded monthly for three years.
   3. $1,000 ordinary annuity with an interest rate of 7.1% and annual payments for three years.
   4. $2,800 invested at an interest rate of 7.0% compounded semiannually for three years.

Tyson has decided to rank each of the investments in order from highest future value to lowest. Which of the following answers correctly ranks the investments?
A. 2, 4, 1, 3.
B. 1, 2, 4, 3.
C. 1, 2, 3, 4.
D. 2, 1, 4, 3.

13. What is the value of $1,000 after 12 years at a semiannually compounded stated annual rate of 10 percent?
A. $2,200.
B. $3,138.
C. $3,225.
D. $3,600.

14. What is the value of $1,000 after 12 years at a quarterly compounded stated annual rate of 10 percent?
A. $3,271.
B. $3,304.
C. $2,200.
D. $3,385.

15. What is the value today for a lump sum of $1,000 to be received 5 years from now, using a 10 percent rate of interest?
A. $500.
B. $621.
C. $667.
D. $909.

16. If $5,000 is deposited into an account paying 6 percent, compounded monthly, what is the
expected effective rate of return?
A. 6.00%.
B. 6.17%.
C. 6.33%.
D. 6.50%.

17. For any nominal rate of interest, when the number of compounding periods per year increases, the effective rate of interest:
A. increases.
B. decreases.
C. remains the same.
D. decreases at an increasing rate.

18. Cliff Bernstein is about to inherit his grandfather’s estate. Over the next twenty years Cliff will receive $17,250 at the end of each year as part of the trust set up in his name by his grandfather. In addition, Cliff will receive two one-time payments of $250,000 six years from now and $675,000 thirteen years from now. What is the present value of Cliff’s inheritance using a 12 percent interest rate?
A. $425,660.
B. $528,117.
C. $224,740.
D. $410,198.

19. An investor plans to make five year-end deposits of $10,000 into an account paying 8 percent, compounded annually. At the end of five years (at the time of the last deposit) how much will be in the account?
A. $50,000.
B. $54,000.
C. $58,666.
D. $63,359.

20. An investor plans to make deposits of $10,000 into an account paying 8 percent, compounded annually. If she makes the deposits at the beginning of each year for the next five years, how much will she have in the account at the end of five years?
A. $50,000.
B. $54,000.
C. $58,666.
D. $63,359.

21. Suppose a 30-year, $200,000 mortgage loan is taken from a bank charging 6 percent interest, with annual compounding. What are the 30 year-end payments?
A. $6,667.
B. $7,067.
C. $13,707.
D. $14,530.

22. The cash flow from an investment is expected to pay $100 one year from today, $200 two years from today, and $500 three years from today. If the required return is 8 percent, the value of this investment today is closest to:
A. $600.
B. $661.
C. $740.
D. $800.

23. Mike will retire in 30 years and wants to have $2.0 million for his retirement years. Mike expects
to earn 10 percent (compounded annually) on annual deposits to an investment account starting one year from today. How much should Mike deposit annually for each of the next 30 years to reach his goal?
   A. $11,010.
   B. $11,053.
   C. $12,159.
   D. $212,158.

24. Ben purchased a computer on credit. The store will charge an annual interest rate of 15 percent compounded annually. Payments are made at the end of each year. The term of the loan is two years. The annual cost to Ben is $750. How much did Ben pay for the computer?
   A. $1,154.
   B. $1,219.
   C. $1,304.
   D. $1,500.

25. Your money market quotes a rate of 2 percent with an effective annual rate of 2.0184 percent. Which of the following is the correct compounding period?
   A. Annual.
   B. Semiannual.
   C. Quarterly.
   D. Monthly.

26. You consider adding an investment with the following cash flow stream to the portfolio.

   Annual Cash Flow
   $10,000
   $12,000
   $14,000
   X
   $18,000

   The present value of the following cash flow stream is $44,381.54 and assumes a discount rate of 8 percent. Calculate the missing cash flow amount (denoted by X in the table).
   A. $2,000.
   B. $4,000.
   C. $8,000.
   D. $16,000.

27. If $5,000 is invested today and $3,000 is invested one year from today, both at the annual interest rate of 6 percent compounded annually, the total amount in the account two years from today is closest to:
   A. $8,000.
   B. $8,671.
   C. $8,798.
   D. $8,800.

28. Suppose your client owns a perpetuity with a present value of $1 million. What annual amount can your client withdraw every year, using an annual interest rate of 10 percent?
   A. $100,000.
   B. $100,100.
   C. $500,000.
   D. $1,000,000.
29. At a growth rate of 7.2 percent, approximately how long does it take a lump sum to double?
   A. 5 years.
   B. 1 year.
   C. 10 years.
   D. 8 years.

30. Assume you invest a lump sum of $100 today. Further assume your investment value grows to $210 in 5 years. What is your geometric mean annual return?
   A. 16%.
   B. 20%.
   C. 22%.
   D. 25%.

31. If returns for the last five years are 2 percent, 15 percent, 17 percent, 19 percent, and 23 percent, which of the following represents the geometric mean?
   A. 12.39%.
   B. 14.97%.
   C. 15.21%.
   D. 18.03%.

Use the following information regarding Rector, Inc. to answer Questions 32 through 34.

<table>
<thead>
<tr>
<th>Year</th>
<th>Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999</td>
<td>35%</td>
</tr>
<tr>
<td>2000</td>
<td>10%</td>
</tr>
<tr>
<td>2001</td>
<td>5%</td>
</tr>
<tr>
<td>2002</td>
<td>–20%</td>
</tr>
<tr>
<td>2003</td>
<td>35%</td>
</tr>
</tbody>
</table>

32. What is the arithmetic mean for the annual returns of Rector’s stock over the past five years?
   A. 10%.
   B. 11%.
   C. 13%.
   D. 15%.

33. What is the geometric mean for the annual returns of Rector’s stock over the past five years?
   A. 10%.
   B. 11%.
   C. 13%.
   D. 15%.

34. What are the range, mode, and median for the annual returns of Rector’s stock over the past five years?
   A. Range: 35%, Mode: 10%, Median: 55%
   B. Range: 55%, Mode: 10%, Median: 35%
   C. Range: 35%, Mode: 55%, Median: 10%
35. All of the following are measures of dispersion **EXCEPT**:  
A. mean average deviation.  
B. standard deviation.  
C. median.  
D. variance.

36. All of the following are properties of the arithmetic mean **EXCEPT**:  
A. the sum of the deviations of each value from the mean will always be zero.  
B. a set of data has only one mean.  
C. the mean is not affected by extremely large or small values.  
D. all values are included in computing the mean.

37. Joe has received a simple random sample of a partial year’s sales for Oryx Company. The five months of sales are as follows: $940,000, $980,000, $870,000, $940,000 and $920,000. The sample standard deviation is:  
A. $40,000.  
B. $60,000.  
C. $80,000.  
D. $100,000.

38. All of the following are correct statements about a sample **EXCEPT**:  
A. a sample should be representative of the population.  
B. the sample should be unbiased.  
C. a sample is used to estimate characteristics of the population.  
D. a sample includes all possible items.

**Use the following information to answer Questions 39 through 44**

Below are the monthly salaries for six people. Round all answers to the nearest whole number.

<table>
<thead>
<tr>
<th>Person</th>
<th>Salary per Month ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5,000</td>
</tr>
<tr>
<td>2</td>
<td>3,000</td>
</tr>
<tr>
<td>3</td>
<td>3,500</td>
</tr>
<tr>
<td>4</td>
<td>4,000</td>
</tr>
<tr>
<td>5</td>
<td>4,250</td>
</tr>
<tr>
<td>6</td>
<td>4,300</td>
</tr>
</tbody>
</table>

39. Which of the following represents the arithmetic mean salary for the population?  
A. 4,000.  
B. 4,008.  
C. 4,200.  
D. 5,280.

40. Which of the following represents the mean deviation of the salaries for the population?  
A. 508.  
B. 793.  
C. 1,492.
D. 4,008.

41. Which of the following represents the variance of the salaries for the population?
   A. 400,347.
   B. 716,480.
   C. 741,680.
   D. 768,410.

42. Which of the following represents the standard deviation of the salaries for the population?
   A. 525.16.
   B. 632.73.
   C. 816.20.
   D. 861.20.

43. Which of the following represents the variance of the salaries if the data represent a sample?
   A. 400,347.
   B. 480,417.
   C. 890,016.
   D. 891,600.

44. Which of the following most closely represents the standard deviation of the salaries, if the data represent a sample?
   A. 632.
   B. 693.
   C. 934.
   D. 940.

Use the following information to answer Questions 45 and 46

Assume you examine the population of oil drilling projects. The projects follow a normal distribution (e.g., a symmetric distribution) with a mean profit of $100 million and a standard deviation of $50 million.

45. What is the probability that a randomly selected oil drilling project is profitable?
   1. 2.5%.
   2. 16%.
   3. 95%.
   4. 97.5%.

46. What is the probability that a randomly selected oil drilling project will earn more than $150 million?
   A. 2.5%.
   B. 16%.
   C. 95%.
   D. 97.5%.

Use the following information to answer Questions 47 and 48.

Assume you extract a large sample of oil drilling projects. The sample average profit equals $100 million and the standard error equals $50 million.

47. What is the approximate 68 percent confidence interval for mean profits for the population of oil drilling projects?
   A. $0 to $200 million.
   B. $0 to $150 million.
C. $50 million to $150 million.
D. $50 million to $200 million.

48. What is the approximate 95 percent confidence interval for mean profits for the population of oil drilling projects?
   A. $0 to $200 million.
   B. $0 to $150 million.
   C. $50 million to $150 million.
   D. $50 million to $200 million.

Use the following regression equation to answer Questions 49 and 50.

Net profit = 5 + 0.30 sales

Assume all numbers are reported in millions.

49. Assume that you think sales will be $100 million. What is your prediction for net profit?
   A. $5 million.
   B. $5.3 million.
   C. $30 million.
   D. $35 million.

50. Assume you think sales will increase by $1 million, by how much do you expect net profit to increase?
   A. $300,000.
   B. $350,000.
   C. $3,333,333.
   D. $5,300,000.

Answers

1. C

Let n represent the number of credit hours (the unknown). We know that the number of hours multiplied by the cost per hour, $500, yields the total spent, which cannot be more than $25,000. We represent this in equation form as:

\[
500n = 25,000
\]

\[
n = \frac{25,000}{500} = 50
\]

2. B

Multiplying both sides of the equation by c, we are left with:

\[
15 = 3c
\]

\[
c = \frac{650,000}{1,500,000} = 5
\]
3. A

Dividing 25 by 5 we are left with \( p \leq 5 \). The \( \leq \) sign indicates "less than or equal to," so the interpretation of the equation is \( p \) is less than or equal to 5.

4. A

First we multiply through the parentheses by 3 and are left with \( 3x + 15 = 45 \). We then subtract 15 from both sides and get \( 3x = 30 \). Dividing both sides by 3 leaves us with \( x = 10 \).

5. D

First set up the equations as simultaneous equations:

**Equation 1:** \( 4x + 4y = 24 \)

**Equation 2:** \( 2x + 3y = 24 \)

Next multiply both sides of **equation 2** by \(-2\) and add the two equations:

\[
\begin{align*}
4x + 4y &= 24 \\
-4x - 6y &= -48 \\
-2y &= -24
\end{align*}
\]

Dividing both sides of the result by \(-2\) leaves us with \( y = 12 \). Substituting this value of \( y \) into our first equation gives us \( 4x + 4(12) = 24 \). Subtracting 48 from both sides and dividing by 4 leaves us with \( x = -6 \).

6. A

First set up the simultaneous equations:

\[ x = 2 - y \]

\[ y = x - 4 \]

Now get all the variables on the left and all the numbers on the right. (Remember that a number or variable changes signs when it "crosses the bridge.")

\[ y + x = 2 \]

\[ y - x = -4 \]

Add the two together:

\[ 2y = -2 \]

\[ y = -1 \]

Substitute \(-1\) for \( y \) in the first equation:

\[ x = 2 - (-1) = 3 \]

7. A
Define the variable, set up an equation based on the information, and solve for the variable.

\[ x = \text{amount of money invested in equities} \]
\[ 100,000 - x = \text{amount of money invested in fixed income securities} \]

\[
0.12x + 0.08(100,000 - x) + 1800 = 0.12(2x) + 0.08(100,000 - 2x) \\
0.12x + 8,000 - 0.08x + 1,800 = 0.24x + 8,000 - 0.16x \\
-0.04x = -1,800 \\
x = 45,000
\]

8. C

Define the variable, set up an equation based on the information, and solve for the variable.

\[ x = \text{bonds also known as fixed income} \]
\[ 1,500,000 - x = \text{stocks also known as equities} \]

\[
0.05x + 0.13(1,500,000 - x) = 143,000 \\
0.05x + 195,000 - 0.13x = 143,000 \\
-0.08x = -52,000 \\
x = 650,000
\]

The question asks for the percent invested in fixed income as follows:

\[
\frac{650,000}{1,500,000} = 0.433 \text{ or } 43.3\%
\]

9. A

\[
\left(1 + \frac{i}{m}\right)^m - 1
\]

As illustrated in the equation \(\left(1 + \frac{i}{m}\right)^m - 1\), the effective interest rate increases as the number of compounding periods per year, \(m\), increases. As the effective rate increases, the future value increases since you are compounding at a higher rate.

10. B

As the effective rate increases, the present value must decrease since you are discounting at a higher rate.

11. D

When a loan is fully amortized, the payments are typically equal for the life of the loan, and each payment includes interest on the amount of the loan still outstanding (remaining principal) with the rest of the payment applied to the principal balance. The payment is found using the ordinary annuity method as follows:

\[
\begin{align*}
-100,000 & \quad \text{PV} \\
5 & \quad \text{I/Y} \\
5 & \quad \text{N} \\
\text{CPT} & \quad \text{PMT} = 23,097
\end{align*}
\]
Interest in each year equal the interest rate (5.0 percent) times the principal balance at the end of the previous year. For the third year, the interest portion of the payment is 0.05 \times 62,900 = \$3,145. The principal portion of the payment is 23,097 – 3,145 = \$19,952. Thus the principal balance gets reduced to 62,900 – 19,952 = \$42,948 at the end of year three. The following amortization table demonstrates the interest, principal, and outstanding balance for each of the five years the loan is outstanding.

<table>
<thead>
<tr>
<th>Year</th>
<th>Payment</th>
<th>Interest</th>
<th>Principal</th>
<th>Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>100,000</td>
<td></td>
<td></td>
<td>100,000</td>
</tr>
<tr>
<td>1</td>
<td>23,097</td>
<td>5,000</td>
<td>18,097</td>
<td>81,903</td>
</tr>
<tr>
<td>2</td>
<td>23,097</td>
<td>4,095</td>
<td>19,002</td>
<td>62,900</td>
</tr>
<tr>
<td>3</td>
<td>23,097</td>
<td>3,145</td>
<td>19,952</td>
<td>42,948</td>
</tr>
<tr>
<td>4</td>
<td>23,097</td>
<td>2,147</td>
<td>20,950</td>
<td>21,998</td>
</tr>
<tr>
<td>5</td>
<td>23,097</td>
<td>1,100</td>
<td>21,998</td>
<td>0</td>
</tr>
</tbody>
</table>

12. D

Begin by calculating the future value of each investment as follows:

**Investment 1:**
Calculator strokes:
- \(2^{\text{nd}} \rightarrow \text{BGN}\)
- \(2^{\text{nd}} \rightarrow \text{SET}\)
- \(2^{\text{nd}} \rightarrow \text{QUIT}\)
- \(-1,000\) \(\text{PMT}\)
- 7.1 \(\text{I/Y}\)
- 3 \(\text{N}\)
- \(\text{CPT}\) \(FV = \$3,447\)

**Investment 2:**
Calculator strokes:
- \(-2,800\) \(\text{PV}\)
- 7 / 12 \(\text{I/Y}\)
- 3 * 12 \(\text{N}\)
- \(\text{CPT}\) \(FV = \$3,452\)

**Investment 3:**
Calculator strokes:
- \(-1,000\) \(\text{PMT}\)
- 7.1 \(\text{I/Y}\)
- 3 \(\text{N}\)
- \(\text{CPT}\) \(FV = \$3,218\)
Investment 4: Calculator strokes:

Calculator strokes:  
- 2,800 PV  
  7 / 2 I/Y  
  3 * 2 N  
  CPT FV = $3,442

Therefore the investments in order of largest to smallest future value are 2, 1, 4, 3.

For problems 13 and 14 use the following formula:

\[ FV_n = PV \left(1 + \frac{i}{m}\right)^{mn} \]

- \( m \) = the number of compounding periods per year
- \( i \) = the stated or nominal rate of interest
- \( n \) = the number of years

\( PV \) = the beginning amount or present value

\( FV \) = the ending amount or future value

Alternatively, you can plug the values into your TI BA II Plus as shown. If you prefer to do that, set your P/Y value to 1.0 and enter the values. Remember, the calculator will assume one cash flow is an inflow and the other an outflow.

13. C

\[ FV = 1,000(1 + 0.10/2)^{12\times2} = 3,225.10, \text{ or} \]

\( PV = 1,000, \text{ years} = 12, \text{ compounding period per year} = 2, \text{ interest rate} = 10\% \)

Calculator strokes:  
- 1,000 PV  
  10/2 I/Y  
  12 x 2 N  
  CPT FV = $3,225.10

14. A

\[ FV = 1000(1 + 0.10/4)^{12\times4} = 3,271.49, \text{ or} \]

\( PV = 1000, \text{ years} = 12, \text{ compounding periods per year} = 4, \text{ interest rate} = 10\% \)

Calculator strokes:  
- 1,000 PV  
  10/4 I/Y  
  12 x 4 N  
  CPT FV = $3,271.49

15. B
\[
PV = \frac{1000}{(1.10)^5} = 620.92, \text{ or }
\]

FV = 1000, years = 5, compounding periods per year = 1, interest rate = 10%

Calculator strokes:

1. Enter -1000 as FV
2. Enter 10/1 as I/Y
3. Enter 5 as N
4. CPT PV = $620.92

16. B

The effective return for an account is the same regardless of the amount of money deposited. Using the effective interest rate formula:

\[
\left(1 + \frac{i}{m}\right)^m - 1 = 12, \ i = 0.06, \ \text{effective rate} = 1.0617 - 1 = 6.17%
\]

17. A

See the formula in the answer to question 8.

18. D

The key to a problem such as this one is to find the present value of each investment separately and then add the present values together. There are three investments in this problem: an annuity of $17,250 that will last 20 years, a lump sum payment of $250,000 that will occur in six years, and a lump sum payment of $675,000 that will occur in thirteen years. We find the present values as follows:

Annuity (make sure the calculator is in end mode):

Calculator strokes: PMT 12 I/Y 20 N

Calculator strokes: 

1. Enter -17,250 as PMT
2. Enter 12 as I/Y
3. Enter 20 as N
4. CPT PV = $128,848

First Lump Sum:

Calculator strokes: 

1. Enter -250,000 as FV
2. Enter 12 as I/Y
3. Enter 6 as N
4. CPT PV = $126,658

Second Lump Sum:

Calculator strokes: 

1. Enter -675,000 as FV
2. Enter 12 as I/Y
3. Enter 13 as N
4. CPT PV = $126,658
Thus the total value of the inheritance is $128,848 + $126,658 + $154,693 = $410,198.

19. C

These are end-of-year payments. Your calculator should be set to END. Calculator strokes:

\[
\text{Note} \quad \text{Since it is default, END does not display on your calculator. If BGN is displayed, perform the following keystrokes:}
\]

\[
\begin{align*}
2^{\text{nd}} & \rightarrow \text{BGN} \\
2^{\text{nd}} & \rightarrow \text{SET} \\
2^{\text{nd}} & \rightarrow \text{QUIT} \\
-10,000 & \text{ PMT} \\
8 & \text{ I/Y} \\
5 & \text{ N} \\
\text{CPT} & \text{ FV} = \$58,666.01
\end{align*}
\]

20. D

These are beginning-of-year payments. Your calculator should be set to BGN.

\[
\text{Note} \quad \text{BGN must be displayed on your calculator to use beginning-of-year cash flows. If BGN is not displayed, perform the following keystrokes:}
\]

\[
\begin{align*}
2^{\text{nd}} & \rightarrow \text{BGN} \\
2^{\text{nd}} & \rightarrow \text{SET} \\
2^{\text{nd}} & \rightarrow \text{QUIT} \\
\text{Calculator strokes:}
-10,000 & \text{ PMT} \\
5 & \text{ N} \\
8 & \text{ I/Y} \\
\text{CPT} & \text{ FV} = \$63,359.29
\end{align*}
\]

21. D

The present value of the payments must equal the amount borrowed. Be sure your calculator is set to END.

Keystrokes:

\[
\begin{align*}
-200,000 & \text{ PV} \\
6 & \text{ I/Y} \\
30 & \text{ N} \\
\text{CPT} & \text{ PMT} = \$14,529.78
\end{align*}
\]
22. \[ PV = \frac{100}{(1.08)^1} + \frac{200}{(1.08)^2} + \frac{500}{(1.08)^3} = 92.59 + 171.47 + 396.92 = $660.98 \]

23. C

Be sure your calculator is set to END.

Keystrokes:

| 2,000,000 | FV |
| 10 | I/Y |
| 30 | N |

CPT PMT = $12,158.50

24. B

Be sure your calculator is set to END.

Keystrokes:

| 750 | PMT |
| 15 | I/Y |
| 2 | N |

CPT PV = $1,219.28

25. D

\[ \left(1 + \frac{i}{m}\right)^m - 1 = \left(1 + \frac{0.02}{m}\right)^m - 1 \]

Effective return = 0.02 =

To use trial and error, plug different choices for m:
- annual = 1, gives an effective rate of 2%, easy choice to eliminate
- semiannual = 2, gives an effective rate of 2.01%, not the correct answer
- quarterly = 4, gives an effective rate of 2.0151%, not the correct answer
- monthly = 12; gives an effective rate of 2.0184%, the correct answer

26. A

\[ PV = \frac{FV_1}{(1+i)} + \frac{FV_2}{(1+i)^2} + \frac{FV_3}{(1+i)^3} + \frac{FV_4}{(1+i)^4} + \frac{FV_5}{(1+i)^5} \]
27. C

\[ FV = CF1(1 + i)^2 + CF2(1 + i)^1 \]
\[ FV = 5,000(1.06)^2 + 3,000(1.06)^1 \]
\[ FV = 5,618 + 3,180 = $8,798 \]

28. A

The present value of a perpetuity equals the periodic amount divided by the interest rate.

\[ PV = \frac{PMT}{i} \]
\[ PV \times i = PMT = $1,000,000 \times 0.10 = $100,000 \]

29. C

\[ FV = PV(1 + i)^n \]

**Note** if an investment doubles, the future value of each $1 will be $2. Therefore:

\[ FV = 2 = 1(1.072)^n \]

Use trial and error, plugging for \( n \):
- \( n = 1, FV = 1.072, \) too low—not the correct answer
- \( n = 5, FV = 1.42, \) too low—not the correct answer
- \( n = 8, FV = 1.74, \) too low—not the correct answer
- \( n = 10, FV = 2.004, \) close enough! The answer is 10 years.

30. A

Geometric mean return =

\[ \sqrt[n]{\frac{FV}{PV}} - 1 \] or \[ \left( \frac{FV}{PV} \right)^{1/n} - 1 \]

Geometric mean return = \[ \left( \frac{210}{100} \right)^{1/5} - 1 = 16\% \]

31. B

The geometric mean, GM, is:
32. C

\[
\frac{[35\% + 10\% + 5\% + (-20\%) + 35\%]}{5} = 13\%
\]

33. B

\[
(1.35 \times 1.10 \times 1.05 \times 0.80 \times 1.35)^{\frac{1}{5}} = 11\%
\]

34. D

- Range (high minus low) = 35% – (–20%) = 55%
- Mode (most observations) = 35%
- Median (in the middle) = 10%

35. C

Median is a measure of central tendency. Median is a descriptive statistic that measures the center of the distribution. Mean average deviation measures the average deviation from the mathematical mean. Average is calculated using the number of observations and deviation is measured as the distance from the mean of each observation. Standard deviation is the square root of the variance. Variance is the squared deviations from the mean.

Be aware that a sample variance would have a denominator of \(n - 1\), rather than \(n\).

36. C

Statistically described as outliers, these values have a distorting impact not only on the mean, but on all other descriptive statistics. Advanced statistical methods can be used to lessen the problem.

37. A

\[
\text{mean} = \frac{940,000 + 980,000 + 870,000 + 940,000 + 920,000}{5} = 930,000
\]

\[
\sqrt{\frac{[(940,000 - 930,000)^2 + (980,000 - 930,000)^2 + (870,000 - 930,000)^2 + (940,000 - 930,000)^2 + (920,000 - 930,000)^2]}{5 - 1}} = 40,000
\]

38. D

The inclusion of all possible items is the definition of a population. All other statements accurately describe a sample.
39. B

\[
\frac{5,000 + 3,000 + 3,500 + 4,000 + 4,250 + 4,300}{6} = 4,008.3
\]

40. A

The mean deviation, MD, is:

\[
MD = \frac{\sum |x - \bar{x}|}{n}
\]

where:
- \(x\) = the value of each observation
- \(\bar{x}\) = the arithmetic mean of the observations
- \(n\) = the number of observations
- \(|x - \bar{x}|\) = the absolute value of each deviation

\[
MD = \frac{5,000 - 4,008 + 3,000 - 4,008 + 3,500 - 4,008 + 4,000 - 4,008 + 4,250 - 4,008 + 4,300 - 4,008}{6}
\]

\[
MD = \frac{992 + 1,008 + 508 + 8 + 242 + 292}{6} = \frac{3050}{6} = 508.3
\]

41. A

The variance of a population is found using:

\[
\sigma^2 = \frac{\sum (X - \mu)^2}{N}
\]

where:
- \(\mu\) = the mean of the population
- \(X\) = an individual member of the population
- \(N\) = the number of observations in the population
42. B

The standard deviation is the square root of the variance, so:

\[ \sigma = \sqrt{400,347} = 632.73 \]

43. B

The variance of a sample is found using:

where:

\[ s^2 \quad = \text{the sample variance} \]
\[ x \quad = \text{an individual observation in the sample} \]
\[ \bar{X} \quad = \text{the sample mean} \]
\[ n - 1 \quad = \text{the number of sample observations minus 1} \]

Since the numerator is exactly the same as the numerator in problem 41, we need only change the denominator to find the variance of the sample:

\[ s^2 = \frac{984,064 + 1,016,064 + 258,064 + 64 + 58,564 + 85,264}{5} \]

\[ = \frac{2,402,084}{5} \]

\[ = 480,417 \]

44. B

Again, the standard deviation is the square root of the variance, so:

\[ s = \sqrt{480,417} = 693.12 \]

45. D

The empirical rule states that approximately 95% of the data lie within 2 standard deviations of the mean (e.g., from zero up to $200 million). Using the rule, notice that a zero profit is 2 standard
deviations below the mean. Thus, there is a 2.5% chance that a randomly selected oil venture will lose money (profit is less than zero) and a 97.5% chance that a randomly selected oil venture will make money. Similarly, there is a 97.5% chance that a randomly selected oil drilling project will make less than $200 million.

46. B

The empirical rule also states that approximately 68% of the data lie within 1 standard deviation of the mean. Using the rule, notice that $150 million is 1 standard deviation above the mean. Thus, there is a 16% chance that a randomly selected oil drilling project will make more than $150 million. Similarly, there is a 16% chance that a randomly selected oil drilling project will make less than $50 million.

47. C

The 68% confidence interval approximately equals the sample mean plus or minus 1 standard error. The sample mean is $100 million, and the standard error is $50 million. Therefore, the 68% confidence interval for the population mean ranges approximately from $50 million up to $150 million.

48. A

The 95% confidence interval approximately equals the sample mean plus or minus 2 standard errors. The sample mean is $100 million, and the standard error is $50 million. Therefore, the 95% confidence interval for the population mean ranges approximately from zero up to $200 million.

49. D

Simply plug into the equation:

\[ \text{net profit} = 5 + 0.30(100) \]

\[ \text{net profit} = 5 + 30 = 35 \]

Since all numbers are in millions, our net profit prediction equals $35 million.

50. A

The slope in the equation equals the change in the dependent variable (net profit) for every 1-unit change in the independent variable (sales). The slope equals 0.30. Therefore, every time sales changes by 1 unit (e.g., 1 million), we should expect a 0.30 unit change in net profit. Therefore, we should expect a $300,000 increase in net profit ($0.30 \times 1,000,000)$.
Chapter Two: Economics

Overview

Economics is the study of how people make choices. Every time a person makes a choice, he or she does so in terms of utility. That is, people always choose the selection that maximizes satisfaction or pleasure. For the individual, the choice is typically one of weighing the costs and potential outcomes of two or more alternatives. Business decisions are also driven by some form of cost/benefit analysis. Although the outcomes of business decisions are usually fairly straightforward (e.g., increased revenues, reduced costs, or some combination of the two), the manager must determine whether the reduced costs and/or increased revenues are worth the investment of time and money.

This chapter is arranged as follows:
- In Section 1 we will discuss the evolution of economic thought from the era of Adam Smith to John Maynard Keynes, one of the most widely studied and respected economists of modern times.
- Section 2 discusses supply and demand, the basic forces of any economic system.
- Section 3 covers macroeconomics, the branch of economics dealing with entire economies.
- Section 4 covers microeconomics, the branch of economics dealing with individual firms.
- Section 5 moves into the international arena, with such topics as exchange rates and the balance of payments.

Section 1: Three Great Economists

Chapter Objective: Describe the contributions of Adam Smith, Karl Marx, and John Maynard Keynes to modern economic theory.

The exact point in time when scholars started to take notice of the economic nature of decision-making (and calling it economics, for that matter) is anybody’s guess, but many early philosopher-economists wrote on the nature of business and the lengths to which man will go to achieve wealth. Let’s investigate the writings of three well-known economists who have made significant contributions to the development of economics.

Adam Smith

Adam Smith is probably the most famous of all early economists. He was Professor of Moral Philosophy at Edinburgh from 1748 to 1751 and published his Theory of Moral Sentiments in 1759. In Theory, Smith, as most philosophers before and after him, dealt with the role of standards of ethical conduct as the glue that holds society together. In 1776, he published what would be his greatest work and one of the most influential works of all time, An Inquiry into the Nature and Causes of the Wealth of Nations. Wealth of Nations introduces us to the “invisible hand” and the idea of a “free enterprise” system.

Smith puts into words what many others of the time suspected but were unable to articulate. This may be compared to the wonderful bread your grandmother baked. She knew how she made it but couldn’t write down the recipe because she did it by memory (i.e., a pinch of this, a handful of that, mix until it looks like this). Smith contends that in a free market, participants’ actions are controlled by competition. Competition is widely understood and accepted today, but it was quite an enlightening concept at the time. Smith makes the point that participants in the market make selfish decisions as if an “invisible hand” were guiding them. This invisible hand, or market pressure, will ultimately direct the self-seeking activities of the individual to the betterment of society as a whole. The end result is that only those goods and services that society needs are provided. The invisible hand principle holds that market prices will penalize or reward individual economic decisions, such that the overall economy will produce those goods that lead to the betterment of society.
With the common goal of maximizing personal wealth, market participants (sellers and buyers) will strive to buy or sell at the best possible price. As long as there is no price collusion, each seller will try to attract new customers by offering prices lower than their competitors. Since manufacturers want to pay the lowest possible price, they will naturally buy from the supplier offering the best prices. When the high-priced suppliers realize they are losing business, they will lower their prices in order to remain competitive.

However, there is a minimum price at which a supplier is willing to sell. This price depends upon the price that the supplier, as a customer, must pay for the product. His suppliers are in the same competitive struggle with rival suppliers. The process continues in this way until prices reach a minimum, or equilibrium level. When they can no longer compete on price, suppliers begin competing on the basis of service and product quality. The process continues in both directions, backward up the chain of suppliers and forward through the chain of customers. Theoretically, consumers are guaranteed the highest possible quality product at the best possible price.

The same argument can be applied to ensure society produces only those products it needs and wants. Products that are in high demand get the most attention from manufacturers, and the supply of these products will increase. Products with relatively low demand receive less attention, and their supply is reduced. In this way, the supply of all products will reach an equilibrium level with their respective demands.

To illustrate this concept, assume your company manufactures equal quantities of two products, forks and spoons. Now assume soup suddenly becomes very popular, and your customers rush to buy more spoons. Although your customers still occasionally eat with forks, they don’t have to buy new forks. Since your customers are only buying spoons and your production mix of spoons and forks has not changed, your inventory (supply) of forks increases. Thus, you reduce fork production and shift much of your fork-making resources into producing spoons. You now produce more spoons, which are in higher demand, and fewer forks, which are in lower demand. Society is happy, due to the ready supply of reasonably priced spoons, and you spend less of your scarce resources (labor, raw materials, and cash) on a product that no one wants to buy. If and when the demand for forks increases, you and your competitors will once again realign your production resources.

Smith’s “invisible hand” makes sense to us today, as it probably did to readers in his day. As a result of the widespread respect and acceptance for his contribution to economic thought, Smith is considered the “father” of the free enterprise system, what we call capitalism today. Capitalism is an economic system in which free markets determine the allocation of scarce resources. There are, however, economists with other ideas of the ideal system. Our next economist did not believe capitalism was a viable long-term economic system.

### Karl Marx

Karl Marx, who lived from 1818 to 1883, was born in Trier, Germany. Marx spent much of his time analyzing capitalism and is widely known as the chief antagonist of the capitalist economic system. His devotion to dialectic materialism led him to study the workings of the capitalistic economic system as it relates to the workingman (the proletariat). In the spring of 1847, Marx and his closest friend, Frederick Engels, joined a society called the Communist League. It was at the request of the League’s Second Congress (London, November, 1847) that they drew up *The Communist Manifesto*, which appeared in February 1848.

The Manifesto outlines a new world order based upon materialism.

Marx was chiefly concerned with what he saw as the glaring flaw in capitalism, the conflict inherent to a system that encourages social classes. His words, “Freedom consists in converting the state from an organ superimposed upon society into one completely subordinate to it.” Rather than the elite being more important and controlling society, the working people themselves should hold this position. He saw ownership and control of industry by individuals as causing an irreversible class struggle, which ultimately would lead to revolution. His thoughts are best summarized in his own words.
“And now as to myself, no credit is due to me for discovering the existence of classes in modern society or the struggle between them. Long before me bourgeois historians had described the historical development of this class struggle and bourgeois economists, the economic anatomy of classes. What I did that was new was to prove:

1. that the existence of classes is only bound up with the particular, historical phases in the development of production,
2. that the class struggle necessarily leads to the dictatorship of the proletariat, and
3. that this dictatorship itself only constitutes the transition to the abolition of all classes and to a classless society.”

Marx believed that industrialization created a world where labor became just a commodity—another input in the production process. The inevitable result would be that workers would become alienated from their jobs—the product was not theirs, and they had no real attachment to it. Alienated workers would become more and more dissatisfied, and ultimately would revolt against the system that had victimized them.

As you can imagine, Marx was not typically welcomed with open arms wherever he went. In fact, he spent a lot of time in exile from one country or another, whose leaders felt his ideas were dangerous. It was with both spoken and written words that Marx drew the attention—and spurn—of governments:

“From the moment all members of society, or at least the vast majority, have learned to administer the state themselves, have taken this work into their own hands, have organized control over the insignificant capitalist minority, over the gentry who wish to preserve their capitalist habits and over the workers who have been thoroughly corrupted by capitalism—from this moment the need for government of any kind begins to disappear altogether. The more complete the democracy, the nearer the moment when it becomes unnecessary. The more democratic the ‘state’ which consists of the armed workers, and which is ‘no longer a state in the proper sense of the word,’ the more rapidly every form of state begins to wither away.”

Marxists believe that capitalism is doomed to evolve into socialism, then into communism. Private ownership of property is the source of economic classes and leads to greed and avarice.

Private property ownership ultimately will give rise to a revolution and socialism. Under the socialist system, the government owns all income-producing assets, and private property will be abolished. The socialist government will allocate goods and services according to effort, not need. This unequal distribution will in turn give rise to further revolution leading to a classless society (communism). In the communist state, there is no formal government, and a central party controls the distribution of goods and services. All property is owned collectively and is available to each according to need.

John Maynard Keynes

Completely opposed to Marxist thought, John Maynard Keynes (pronounced “canes”) was totally devoted to capitalism. Philosopher, economist, and mathematician, Keynes was born in Cambridgeshire, England. Keynes taught economics at Cambridge during World War I and in 1915 went to work in the Treasury. Never a dedicated politician, Keynes was always quick and blunt with his comments and criticism. At one point he called the comments of Lloyd George, then Chancellor of the Exchequer, “rubbish.” In 1919 he even attacked the leading political figures of the Versailles Peace Conference (at the end of World War I) in The Economic Consequences of the Peace, in which he strongly criticized the peace terms that punished the defeated Germany. He would probably respond to the later rise of Adolph Hitler with an admonishing “I told you so!”

Keynes recognized the importance of government intervention during the Great Depression of the 1930s. In 1936, he published The General Theory of Employment, Interest, and Money in which he revolutionized the way economists thought about macroeconomics. He clearly laid out how and why recessions happen and what must be done to recover from them. His very controversial strategy for recovery from a recession was for government to run deficits in order to stimulate demand and employment. In this, he varies widely from classical economists like Adam Smith who advocate a strict “hands off” approach to government.
Classical economists argue that market wages and prices will decline quickly enough during a recession to bring about economic recovery.

Classical economists favor a school of thought referred to as supply-side economics. Supply-side economics holds that supply creates demand by providing jobs and wages. The prices of goods for which there is excess supply will fall, and the prices of goods in demand will rise. Deficient demand can never be a problem because the production of goods will always generate (through employment) sufficient demand to purchase the goods produced. The markets will always adjust quickly to direct the economy to full employment. It is argued that if unemployment is temporarily high, wages will fall, which will reduce costs and prices. Reduced prices will increase product demand, which will increase the demand for labor until the excess supply of labor is eliminated. Keynes, however, believed that wages and prices are “sticky,” meaning they will resist downward adjustment. It is only through the help of the national government’s spending that demand is stimulated and employment increased.

Keynes’ views can be summarized with the following quote: “Businesses will produce only the quantity of goods and services they believe consumers, investors, governments, and foreigners will buy... When aggregate expenditures are deficient, there are no automatic forces capable of assuring full employment. Prolonged unemployment will persist.” Keynes argues that the aggregate expenditures of these four sectors (consumers, investors, governments, and foreigners) determine the extent of employment, and that the government must step up expenditures during a recession to make up for deficiencies in the other three sectors. This concept, whether universally accepted or not, is recognized as at least partially responsible for recovery from the Great Depression of the 1930s.

We’ve looked at three of the most respected and widely read philosopher- economists in history. Whether they are completely right, partly right, or completely wrong, they remain very influential in economics today. The writings of these three individuals, along with the ideas of many others, led people to think, discuss, and debate economics as a legitimate and separate discipline.

[1] Collusion, which is illegal in the U.S., is when competitors secretly agree to maintain high prices or agree not to compete on price, so as to keep prices high.

[2] The concept of market equilibrium is discussed in Section 2.

[3] The concepts of supply and demand are discussed in Section 2.

[4] Of course, your competitors will shift production to spoons, and all suppliers will compete on price, quality, and service. This ensures consumers the best quality spoons at the best possible price.

[5] Dialectics is the method of reasoning which tries to understand things by form and substance, rather than appearance. Materialism is the philosophy that asserts that the material world is the foundation of thought.

[6] Although The Communist Manifesto is probably the best-known work of Karl Marx, Das Capital, 1867, his study and analysis of capitalism, is probably his most influential work.

[7] In this context, materialism does not mean what it means today.

[8] Letter to Weydemeyer, March 5, 1852.

[9] Bourgeois refers to business owners, capitalists. Collectively, they are called the bourgeoisie.

[10] Transition is Marx’s mild word for change, not necessarily peacefully.

The Exchequer is the department of state in Great Britain charged with the receipt and care of the national revenue.

Economists from Adam Smith to before the time of Keynes are referred to as “classical.”


Section 2: Supply And Demand

Chapter Objective: Discuss supply and demand, and describe how the interaction of supply and demand establishes an equilibrium price.

In this section we will explore supply and demand, without resorting to graphs and charts. (They will come later!)

Supply

Supply and demand are probably two of the most commonly used words in our economics vocabulary, so a discussion of each is quite appropriate. Although the textbook definition for supply might include such words as aggregate production, marginal cost, or marginal revenue, let’s think of supply as the amount of an item available for purchase.

The supply of any good or service is the amount available for consumption in the marketplace. The amount of an item available for purchase is based upon factors such as the number of producers, the profit from producing the item, the number of customers, the selling price, and the costs for shipping the item around the country or globe. Of course, the typical consumer could care less about these factors. What is important is whether the item we want is available when and where we want it and at the price we want to pay. Many variables must be considered, so let’s take a look at an example.

Assume you are a wholesaler and your company supplies two products: gerbil bedding and gold necklaces. You purchase gold chain directly from the manufacturer in 1000-inch rolls at $2.00 per inch. It costs you another $25.00 per necklace to cut the chain to length, add clasps, and prepare it for shipping. The bedding material is actually wood chips and mulch left over from a lumberyard. It costs you $0.10 per pound and comes by truckload. (A pound of the bedding material is about one cubic foot, which is about right for the typical gerbil cage.) It costs you another $0.15 to put one pound in a labeled plastic bag and prepare it for shipping.

Shipping presents an interesting problem for these vastly different products. Since shipping costs are based upon weight and size (volume), a small, heavy item costs no more than a large (bulky), light item. This makes gold necklaces very value-intensive products, meaning they are valuable, light, and small. The bedding, on the other hand, is very cost intensive. It is very light and inexpensive but must be shipped in much larger containers. The result is that 100 necklaces can be shipped for about the same cost as 20 bags of bedding. (Let’s assume the shipping cost for either is $10.00.) So where is this discussion going? Let’s take a look at the total cost to prepare and ship one necklace versus one bag of bedding.

The gold for a twenty-inch necklace costs $40.00 ($2 per inch), and the clasps and packaging cost another $25.00, resulting in a total of $65.00 to assemble and prepare one necklace for shipping. Since jewelers place orders for 100 necklaces at a time, and 100 necklaces can be shipped for $10.00, shipping adds only an additional $0.10 to the cost of each necklace. This brings the total cost to assemble and ship one necklace to $65.10. In turn, we assume that we can sell the necklace to a jeweler for $100.
Next, let's look at the bedding. The costs for the material and packaging for one bag of bedding is $0.25. Since it costs $10.00 to ship 20 bags, the cost to ship one bag is $0.50. This brings the total to $0.75 per bag. Let's assume that you can sell them to pet stores for $0.65. The result? It is very cost effective for you to ship gold necklaces just about anywhere. The bedding, on the other hand, can only be sold locally, since to package, prepare it for shipping, and ship it costs more than the price for which you can sell it.

The bottom line is that you will not ship your gerbil bedding any distance. In fact, unless you can distribute the bedding locally at a total cost that is lower than your selling price, you won't supply gerbil bedding at all. And as long as costs are about the same for all suppliers of gerbil bedding, all suppliers are faced with the same situation.

Now, let's assume it costs about $0.10 per bag to distribute bedding locally, as opposed to $0.50 to ship it longer distances. That means it costs a total of $0.35 per bag ($0.25 material and packaging plus $0.10 transportation) to supply bedding locally. If you can sell it for $0.65, a gross profit of $0.30 per bag will be realized. As long as you don't try to charge local retailers more than $1.00 or so, out-of-town suppliers won't be enticed to compete with you. (Remember, out-of-town suppliers can ship it in to your local market at a total cost of $0.75 per bag. As long as the local selling price doesn’t make it profitable for outside suppliers to sell in your market, they won’t.)

Local suppliers want to maximize profits, so they want to sell at the highest price possible, without reaching the estimated $1.00 that would attract non-local competition. Note that price is the only thing that matters when gerbil-bedding suppliers compete among themselves in the local market. Gerbil bedding is gerbil bedding! Customers don’t care about the label on it or who provides it, so suppliers can’t compete on quality or service.

The bottom line is that the supply of bedding is constrained by the amount the local suppliers can provide. Gold chains, on the other hand, are a totally different product. Since it is profitable to ship them anywhere, the gold chains that consumers see in stores can be from anywhere in the world. This makes the supply of gold chains limited only by the worldwide supply of gold.

The above arguments are completely dependent upon the price suppliers receive. If the total cost to make and ship an item is sufficiently below the selling price, that item will be supplied. When the selling price does not provide revenues sufficient to cover all costs and provide a profit, the item is not supplied. This leads us to the **law of supply**, which states that as the price of a product moves higher, more of that product will be supplied. The higher price will make it more attractive for producers to produce and deliver more of the product.

**Demand**

Demand is how much society wants of a good or service. Demand will be a function of how many potential buyers there are for a product, as well as whether there are other products that could serve the same purpose. The selling price will usually affect demand, but not always. The demand for soft drinks would probably change if the price changed very much. If the price went up, consumers would shift to other brands of soft drinks, or possibly to juice or water. If the price declined, consumers would likely purchase more. However, demand for a good like milk would be less subject to changes in price. Increases in price may not affect demand much because there are no good substitutes for milk. Similarly, a decrease in price might not create more demand for milk. This difference in sensitivity of demand to price changes is called elasticity and is discussed in depth in the microeconomics section.

Let's return to our gold necklace and gerbil bedding example. Demand for gold necklaces will depend to some extent on fashion trends. If it became “trendy” to wear gold necklaces, demand would increase. The desire to be in fashion could cause many consumers to buy a gold necklace, even though they had not owned one before. This increase in demand would probably lead to higher prices, as producers realized that they could charge more. Why are they able to charge more? Because there are more potential buyers for their product. More buyers means higher demand.
Demand could also decrease if gold necklaces became unfashionable. If such necklaces were considered an ostentatious display of wealth, for example, consumers would hesitate to wear them. Fewer buyers would exist, and demand would fall.

Demand for gold necklaces would also depend on prices. If gold prices increased dramatically, consumers would buy fewer gold necklaces. Consumers might even consider other types of necklaces, such as necklaces made of silver. If gold prices dropped, consumers would likely buy more. For one thing, more consumers could afford to buy gold necklaces, and demand would increase due to the higher number of potential buyers. In fact, the law of demand states that consumers will buy more of a good as the price of that good declines.

Demand for gerbil bedding will also be a function of the number of potential buyers, and of the price. For example, if a popular children’s movie starred a gerbil in the leading role, more children would want gerbils. Presumably, more gerbils would mean a greater need for gerbil bedding, and demand would increase. Gerbil bedding probably has less price sensitivity than gold necklaces. A decrease in price would be unlikely to inspire consumers to rush out and buy a gerbil because bedding was so cheap. However, a price increase would affect demand. High prices for gerbil bedding would push consumers to find other products that would serve the same purpose. Since there are several cheap alternatives (e.g., shredded newspaper, leaves), demand for gerbil bedding would fall.

The alternative products mentioned above (silver necklaces, shredded newspaper) are called substitutes. They are products that serve the same purpose. If prices for a product change, it will affect demand for substitutes, and vice versa. With substitutes, an increase in demand for one product will lead to a decrease in demand for the other.

There are also situations where demand for one product will affect demand for a related product that is not a substitute. For example, we mentioned how increased popularity of gerbils would lead to an increase in demand for gerbil bedding. Gerbils and gerbil bedding would be considered complements. With complements, an increase in demand for one product leads to an increase in demand for another.

From our discussions of supply and demand, you have probably come to the conclusion that it is the interaction of these two economic conditions that sets prices. Neither supply nor demand alone is sufficient. We see that regardless of whether a product is expensive or cheap to produce, if no market exists (no demand for the product), it won’t sell at any price. If a strong market exists for the product, it will sell, regardless of the cost to produce it. However, profits depend upon the price received. That price, in turn, depends upon the number of buyers relative to the number of sellers (i.e., the demand relative to the supply).

**Equilibrium**

In the gold chain and bedding discussions we took the selling price as a given. Whether gerbil bedding was shipped or not depended upon the total cost to package and ship the bags compared to the given selling price. We assumed a sufficiently low price such that it was not feasible to ship the bags of gerbil bedding cross-country. On the other hand, the gold necklaces sold at a high enough price that you could ship them anywhere and still make a profit. Just what determined the selling prices for those items?

Gold, as you probably are aware, is considered a precious metal. There is a limited (actually, carefully controlled) supply of gold on the world market at any time. Since gold is highly sought after worldwide, there is a more or less constant demand. As long as the supply of gold does not run ahead of demand, its price will remain relatively high.

Gerbil bedding, on the other hand, is not a precious commodity. Although gerbil owners might consider commercial bedding superior, they will resort to newspaper if the commercial product gets too expensive. This means there is a maximum retail price that consumers are willing to pay, so the costs to package and ship gerbil bedding become extremely important. Even though gerbil bedding is a very inexpensive product to produce, package, and ship, its limited demand constrains possible sales opportunities and profits.
We’ve discussed supply, demand, and the relationships among them. Another term you will often hear is equilibrium, which can be thought of as two equal and opposing forces. Supply and demand must be in equilibrium for prices to be stable. For example, if everyone in the world suddenly wanted a gold necklace, the demand would far outstrip the supply of necklaces, and gold prices would increase dramatically. In a similar fashion, if the huge increases in gold prices caused an abnormally large number of gold suppliers to increase their supply, the price would stabilize, or maybe even drop. As long as demand and supply are equal, the price for gold will remain about the same.

Without resorting to too much economic jargon to explain equilibrium, let’s just leave it as meaning equal forces (or pressures). In our example, the demand and supply for gold are equal. Suppliers are willing to provide the amount of gold that consumers are willing to purchase (i.e., the upward pressure on price caused by demand and the downward pressure on price caused by supply are perfectly balanced). Prices are stable because there is no pressure to push them higher or lower.

Equilibrium is shown graphically below. Notice how higher prices will create excess supply, while lower prices generate excess demand.

![Figure 1: Supply and Demand Equilibrium](image)

Think of an equilibrium price as the price to which the good returns if there are no forces acting upon it. That is, unless some factor or combination of factors causes a disequilibrium, supply and demand tend to converge at the equilibrium price. As a very simple example, think of a ball sitting in the middle of a room. Unless some force acts directly on the ball, it remains still. A force can cause it to roll, but if the force isn’t continued, the ball again comes to rest. In other words, you can think of just sitting still as the ball’s equilibrium state. It is the state to which the ball will always return, unless some force causes it to move. In a like fashion, without some force, such as a temporary shortage or surplus, the price of a good will always tend to return to its equilibrium level.

For example, a drought in a coffee producing region can artificially reduce supply (create a temporary shortage), causing the price of coffee to rise temporarily above its long run equilibrium price. When weather conditions return to “normal,” the supply returns to normal and the price falls back to the equilibrium price. In a similar way, due to a surplus the market price of a good could temporarily fall to a level below the long run equilibrium price. Once again, as conditions return to normal, the price rises back to the equilibrium price.

In the microeconomics section, we discuss some of the factors that affect equilibrium prices.

**Chapter Objective:** Discuss how artificial price controls and taxes can affect equilibrium pricing conditions.
Distortions To Equilibrium

Price controls are maximum or minimum prices for goods, established by the government. A maximum price is a price ceiling, and a minimum price is a price floor. If price controls are set very far from equilibrium prices, they can have significant negative economic consequences. A price ceiling below the equilibrium price for a product will create higher demand, while simultaneously reducing the available supply. Assume that a price ceiling is set at the low price (PLOW) shown in Figure 1. Demand will be higher than at the equilibrium price because the lower price will make more consumers willing to buy the good. At the same time, the low price discourages suppliers from producing the good. The result will be a shortage of the good.

Price floors also create problems. If the price of a resource is minimized at a level above the equilibrium price (PHIGH), demand will fall due to the high price, while supply will increase. There will be an excess supply of the good, and consumers will pay an artificially high price for whatever amount of the good they purchase.

Sometimes, artificial pricing for a good will give rise to a black market for that good. A black market is a market independent of the normal, legal markets for goods. Items that are illegal or heavily taxed often develop black markets, as do items with prices set artificially high or low. Illegal drugs are traded in a black market, and there are black markets for copyrighted materials such as music and software. Because black markets operate outside the law, the risks are higher for buyers and sellers alike. Buyers must be wary of poor quality goods, and sellers face criminal prosecution if they are caught. Also, because there are no legal remedies, any disputes between buyer and seller must be settled in other ways, usually involving violence. A black market system sacrifices economic efficiency and rewards the parties willing and able to use the most force to support their position.

Effects Of Taxes

Equilibrium prices are also distorted by taxes. Taxes that are imposed on a good can affect both the buyer and the seller. Tax incidence measures how the tax actually paid is allocated between buyers and sellers. Buyers will probably pay a higher price for a good that is taxed, and sellers will probably receive less from selling the good. The statutory incidence of a tax identifies the party responsible for paying the tax. This may or not be the party who bears the true economic burden of the tax, however.

For example, assume that the government imposes a 2 percent tax on house paint to help cover the negative environmental impact of disposing of old paint. The producer of paint would like to pass the entire tax along to consumers by raising the price of paint by 2 percent. It is quite possible, however, that raising all prices by 2 percent would reduce demand for paint. Consumers might seek substitutes, such as stains, or they might postpone painting jobs. Consumer resistance to higher prices may allow the producer to raise prices by only 1 percent. In this case, the tax burden would be borne equally by producers and consumers. Consumers would pay 1 percent more for paint, and producers would receive 1 percent less. A gallon of paint that cost $10.00 before the imposition of the tax would now sell for $10.10. If a producer made a profit of $1.00 on each gallon, the profit would be reduced by $0.10 to $0.90 per gallon.

The tax incidence will depend on how sensitive supply and demand are to changes in price. The sensitivity of supply and demand to changes in price is called elasticity, which is discussed in the Microeconomics section. The more elastic either demand (or supply) is, the more sensitive quantity demanded (supplied) will be to changes in price. Graphically, more elastic demand (supply) will have a flatter demand (supply) curve, where small changes in price result in large changes in quantity demanded (supplied). If demand is inelastic relative to supply (i.e., the demand curve is steeper than the supply curve), the tax incidence will fall more heavily on buyers. This makes sense, as inelastic demand means buyers are not that sensitive to changes in price, so they would be willing to pay more of the tax burden. If supply is inelastic relative to demand (i.e., the supply curve is steeper than the demand curve), then the tax incidence will fall more heavily on sellers, as they will be less able to pass along any price increase.
Obviously, this odd mix of products is only for demonstration purposes.

**Section 3: Macroeconomics**

Macroeconomics refers to large or economy-wide forces. A macroeconomic variable (e.g., inflation, unemployment, or monetary policy) is a factor that affects the entire economy or a major portion of it.

Macroeconomic variables are beyond the control of individuals or individual companies. For instance, no matter how much money you save or spend, you will have no affect on the rate of inflation in your country. However, the aggregate spending or saving habits of the entire population of a country greatly affect that country's inflation or even overall economic growth.

For the individual company, macroeconomic variables are simply something with which to contend. For example, an increase in inflation increases input costs, which increases the total cost to manufacture goods. Whether the company can raise the selling price to absorb the increased cost is not certain since that will depend upon consumers' willingness to pay a higher price. Whether caused by inflation or not, consumers tend not to blindly accept price increases.

Let's take a look at some macroeconomic factors, starting with gross domestic product (GDP), inflation, and unemployment. We will also discuss aggregate demand and aggregate supply. We will conclude our macroeconomics section by exploring macroeconomic policy, specifically fiscal and monetary policy.

**Chapter Objective:** Describe measures of overall economic activity, such as GDP and GNP.

GDP measures both output and income, which are equal. If the value of output per person increases, per capita income also increases. Thus, achieving a higher standard of living involves producing more output per worker (increasing productivity).

**Gross Domestic Product**

Gross domestic product (GDP) is by far the most commonly used measure of economic performance. It is computed as the total market value of all domestically produced final goods and services during a given year. GDP is designed to measure the market value of production that flows through the economy:

- GDP includes only goods and services purchased by their final or ultimate users, so GDP measures final production. Intermediate stages of production are not included. For example, the price of flour sold to a baker is not included in GDP. Value added during the intermediate steps (i.e., harvesting, milling, and baking) are all included in the final selling price of the baked goods sold by the baker.
- GDP counts only the goods and services produced within the country's borders during the year, whether by citizens or foreigners. Therefore, goods produced at a factory in the U.S. and sold in the U.S would be included in GDP, regardless of whether the factory was owned by a U.S. company or a Japanese company. Sales of used or secondhand goods are excluded, but sales commissions charged on the sale of used products are included.
GDP excludes financial transactions and transfer payments since they do not represent current production. For example, stock and bond sales along with welfare and social security payments are excluded. These payments represent exchanges of goods, not production of goods.

Two Approaches To Measuring Gdp

GDP may be measured using either the expenditure approach or the resource cost-income approach. Both approaches yield the same results because aggregate expenditures must equal aggregate income as illustrated in Figure 2.

Expenditure Approach

The total expenditure approach considers total spending on all final goods and services produced during the year. The expenditure approach is a demand-based concept measured by summing the following expenditure items:

- **Personal consumption.** This represents household purchases for consumption purposes and represents the single largest component of GDP. Over two-thirds of GDP is accounted for by personal consumption. This category of expenditures includes durable goods, nondurable goods, and services.
- **Gross private investment (expenditures of business).** This is an important component of GDP because it provides an indicator of the future productive capacity of the economy. As you will see later, fixed investment (investment in capital goods) is a key component of future economic growth. GDP includes replacement purchases plus net additions to the stock of capital assets plus investments in inventories (+/–). Inventory investments are the changes in the stock of unsold goods held by a business during the period.
- **Government consumption and gross investment.** Purchases of goods and services by federal, state, and local governments are included in GDP. Transfer payments (Social Security, welfare) are excluded. Hence, not all government spending is included in GDP.
- **Net exports of goods and services (+/–).** Since we only want to measure domestic production, net exports are calculated as total exports (domestically produced goods and services purchased by consumers outside the country) minus total imports (foreign-produced goods and services purchased by domestic consumers).

Resource Cost-Income Approach

The resource cost-income approach is a supply (i.e., production) oriented approach and measures GDP by summing the following components:

- Employee compensation.
- Proprietors’ income.
- Rents.
Corporate profits.  
Interest income.  
Indirect business taxes.  
Depreciation.  
Net income of foreigners (the income foreigners earn domestically minus the income that domestic citizens earn abroad).

The sum of the first five items, employee compensation, proprietors’ income, rents, corporate profits, and interest income, equals national income. National income includes income earned by United States citizens abroad as well as what they earn in the United States. National income plus depreciation and indirect business taxes equals GNP.

Gross National Product

Gross national product (GNP) is the total market value of all final goods and services produced by the citizens of a country, no matter where they are residing.

- Prior to 1991 GNP was used to measure U.S. production.
- GNP and GDP are closely related concepts. GDP is a measure of domestic output, regardless of who produces it (i.e., citizens or foreigners). GNP is a measure of the output produced by the citizens of a country, regardless of where they live.

GDP differs from GNP in that it includes the income foreigners earned in the United States and excludes the income U.S. citizens earned outside the United States. To calculate GDP, the national income must be adjusted for the difference between what Americans earned abroad and what foreigners earned domestically.

Gdp Deflator

- The GDP deflator is a general price index that corresponds to the price change exhibited by a very large market basket—all final goods and services produced. An important point to note is that the contents of the market basket of goods changes every year depending on current production. The GDP deflator is useful for measuring economy-wide inflation. The current base year is 2000 (GDP Deflator = 100).
- The consumer price index (CPI) differs from the GDP deflator in several ways. First, a relatively small market basket (364 items) is used for the CPI. Second, the market basket is fixed from year to year. Finally, the CPI measures consumer price changes and does not directly measure the price changes of items purchased by businesses and government.

The net result of all these differences is very small. However, the CPI tends to overstate the inflation rate because its market basket is fixed and does not consider that consumers will substitute away from goods that have risen dramatically in price. However, the CPI is useful for measuring inflation in the consumer goods sector.

Calculating Real Gdp

To calculate real GDP from nominal GDP, you need three pieces of information: (1) the GDP deflator in the base year, (2) the GDP deflator in the current period, and (3) the nominal GDP in the current year. These values are related as follows:

\[ \text{real GDP}_{cp} = \frac{\text{nominal GDP}_{cp}}{\text{GDP deflator}_{by}} \times \frac{\text{GDP deflator}_{cp}}{\text{GDP deflator}_{by}} \]

where:

\( cp = \text{current period} \)
by = base year

Because inflation will cause the level of nominal GDP to rise over time, economists are often interested in changes in the level of real (i.e., inflation-adjusted) GDP to determine how quickly the economy is expanding.

### Limitations Of GDP

GDP is the most comprehensive measure of the aggregate output of the economy, but there are several activities that are not included:

- **Household goods and services**—domestic chores such as cleaning, washing the car, or gardening are not captured in GDP unless someone is paid to do them. This may distort historical GDP comparisons if, for example, over time more households employ outsiders to perform these tasks.
- **Black market activities**—these goods and services sold in illegal markets are not captured in GDP.
- **Quality of life**—GDP does not reflect productivity or the quality of goods produced and sold. A computer produced in 1980 and sold for $5,000 counts the same in GDP as a computer produced in 2005 and sold for $5,000, despite the fact that the 2005 computer would be considerably more powerful. GDP also does not reflect that the 1980 computer may have taken 50 hours to assemble, while the 2005 computer may take only 6 hours.
- **Pollution**—GDP does not adjust output for any damaging side effects, such as air or water pollution. Cleaning up pollution will add to GDP as it occurs, but there is no adjustment to current GDP for creating the problem in the first place.

### Other Measures Of Output And Income

Besides GDP, GNP and national income, discussed above, there are two other measures of aggregate economic income/output:

- **Personal income**—the total income earned by individuals and non-corporate business entities.
- **Disposable income**—personal income less personal taxes on that income.

### Chapter Objective: Describe inflation and how it affects measures of economic activity.

### Inflation

Inflation is a very commonly used word, but does everyone who uses it really know what it means? Inflation is the continuing rise in the general level of prices of goods and services. The purchasing power of the monetary unit, such as the (American) dollar, declines when inflation is present. It is easier to think of inflation as the artificial increase in prices due to excess demand, usually caused when there is too much money present in the economy.

Let’s think about that for a moment. If you received a totally unexpected large sum of money, an inheritance or lottery prize for example, wouldn’t you spend at least some of it? Now, are you contributing anything of value to the economy that warrants your receipt of this extra money? Is your increase in spending due to an increase in your productivity or an increase in your work output? If not, you could say the spending creates demand that is related not to need, but to excess spending ability.

This excess spending usually increases demand for luxury goods such as cars, electronic equipment, and housing. The increased demand for those items increases their prices. Meanwhile, the rest of us are sitting around wondering why in the world prices are going up. There hasn’t been an increase in the overall output of the economy. No more goods and services are being supplied that can absorb the excess spending. The result is an increased demand for a relatively constant supply.
Of course, you could argue that the inheritances of one or even several individuals shouldn’t be sufficient to cause such dire results, and you would probably be correct. The point is that whenever we see more money in the system than the system justifies on the basis of its productive output, the result is inflation (i.e., a general rise in the level of prices in the economy caused by excess demand for goods and services). Whenever the level of spending in the economy is not due to economic reasons such as increased productivity (increased output from increased effort), the result is “artificial” demand. In other words, if wage increases are not due to economic reasons (e.g., increased efficiency, better or more work), the money added to the system causes “unearned” increased demand. Let’s look at a very simple example.

A common definition of inflation is that it represents “too much money chasing too few goods.”

Bob is a carpenter who works rather slowly and is not all that dependable, but when the rest of the carpenters on the job get a raise, Bob also gets one. Is Bob getting a raise because he deserves it? Has his work improved? Does he do more in a given day that would justify the increase in his wages? Whether or not Bob deserves the raise, his spending will increase, causing increased demand. This is the “artificial” demand referred to above. Whether real or artificial, increased demand causes prices to rise.

There is a seemingly logical argument in support of Bob receiving a raise along with his productive and dependable coworkers. If Bob doesn’t get a raise, his “real” income declines. Due to the inflation already in the economy, the dollars Bob earns are worth slightly less each week. After a while, without a raise, this constant erosion of his buying power will reduce Bob’s ability to pay his living expenses.

Does this mean that inflation causes inflation? No. When raises are only sufficient to cover inflation, there is no new demand. Bob is only able to buy the amount of goods and services he could before the raise. Only if Bob’s raise exceeds the current rate of inflation (the current rise in prices) does it cause increased demand.

Now, even if it is more than the current rate of inflation, Bob’s raise doesn’t necessarily have to cause inflation. If Bob has become more productive or if he does more or better work in a given day, his raise is due to increased productivity. He has increased his input to the system, thus justifying the extra money. He has not only increased his demand, he has also added more value (goods and/or services) to the economy. His work is “worth” more. We don’t see more money “chasing” the same amount of goods and services. We see more money “chasing” more goods and services. The result? Stable prices—no inflation.

Inflation is measured and tracked using the Consumer Price Index (CPI). The CPI is a basket of consumer goods and services, the total price of which is recorded across time. Changes in the CPI (sometimes referred to as changes in the price level) indicate the amount of inflation (or deflation) in the economy. As the CPI increases over time, an increased price level of goods and services signals positive inflation in the economy. Using the CPI, inflation is calculated as follows:

\[
\text{inflation} = \frac{\text{CPI}_T}{\text{CPI}_{T-1}} - 1
\]

Assuming:

\[
\text{CPI}_{12/31/04} = 185.5
\]

\[
\text{CPI}_{3/31/05} = 187.3
\]

Inflation for the first quarter of 2005:
As demonstrated in the preceding example, inflation is simply a measure of the overall change in the price level of common goods and services representative of the economy in general.

There is a very important difference between anticipated inflation and unanticipated inflation. When most economic decision makers expect a given level of inflation, they can plan accordingly. When inflation is unanticipated, however, the potential effects on economic activity are much worse.

Chapter Objective: Define unemployment, and differentiate among structural, cyclical and frictional unemployment.

Unemployment

The U.S. civilian workforce is the total number of people over 16 years of age who are either employed or unemployed. Notice the distinction between the total population over 16 and those who are either employed or unemployed. To be considered unemployed an individual must be actively seeking employment or waiting to go back to work after a layoff. Although they may be at least 16 years of age, individuals who have never been employed or have no intention of seeking employment are not considered among the country’s workforce. These individuals would include children living at home, students, and retirees. Also missing from unemployment data are those classified as discouraged workers. An individual is classified as discouraged if he or she is unemployed but has given up trying to find work.

The U.S. Bureau of Labor Statistics maintains many different types of employment data. To measure and present the number of unemployed during a given month, the Bureau first estimates the total civilian workforce. Then the number of unemployed is estimated and stated as a percentage of the total. The table below, which shows the monthly unemployment rate from January 1994 through December 2004, was generated at http://stats.bls.gov/cps/.

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Figure 3: Unemployment Statistics

Types Of Unemployment

Frictional unemployment is the result of employers not being aware of qualified workers and workers not being aware of available jobs. In other words, frictional unemployment exists because the location of the jobs and the workers has not been conveyed to interested parties, so they don’t connect (lack of communication). The implication is that with proper information and willingness to relocate, this form of unemployment is avoidable.

When the structural characteristics of the economy change, the result is structural unemployment. For a variety of reasons, economic conditions often shift such that jobs are lost in one sector, while new jobs are created in another sector. It becomes difficult for those seeking employment to find jobs because they are not qualified. A historical example was the shift in the early 20th century United States from an agrarian society to an industrial society. Millions of farm workers were unemployed because they did not have the skills to work in factories. Technological advances, such as the increased use of computers, often lead to situations where workers have to acquire new skills or training. Until such training is widely available, unemployment will increase. Under these circumstances, employers also find it difficult to find qualified workers because they need people with different skills.

The third type of unemployment, cyclical unemployment, which derives its name from the business cycle, is due to decreases in the aggregate demand for goods and services. During such periods, firms produce less output and need fewer employees. Employees are typically laid off and return to their positions when the economy improves.

Full employment is the rate of employment resulting from the efficient utilization of the total labor force. This takes into consideration such factors as the levels of frictional and structural unemployment, which are to be expected in an expanding and evolving economy. In the United States full employment is thought to be around 95 percent. This means that at full employment, approximately 5 percent of the U.S. labor force will be unemployed. Related to full employment is the concept of a natural rate of unemployment, which is the long-run average unemployment rate caused by structural and frictional factors. In the U.S. the natural rate of unemployment is approximately 5 percent (i.e., 100 percent minus the full employment rate.)

Chapter Objective: Describe aggregate demand and aggregate supply.
Aggregate Demand

As shown in Figure 4, the aggregate demand (AD) curve depicts all equilibrium combinations of goods and services demanded at a given price level. The aggregate demand curve, which represents the effects of decisions made by all market participants, is downward sloping. The downward slope is indicative of the inverse (opposite direction) relationship between price and quantity demanded (in the aggregate) by consumers.

![Figure 4: Aggregate Demand](image)

One interesting characteristic of the aggregate demand curve is that it represents the quantity demanded of a good at all price levels, given the current level of wealth (income) in the economy. For example, the number of $25.00 steak dinners you are willing to purchase will depend to some degree on how much money you have. In other words, a general increase in wealth will cause an increased demand for goods and services at every price level, and the AD curve will shift to the right. By “shift to the right,” we simply mean that the entire curve will move to the right, maintaining the same downward slope, indicating that at every price consumers will demand (consume) more.

Aggregate Supply

The aggregate supply curve depicts the amount of goods and services that firms, in the aggregate, are willing to produce (supply) at any given price level. Once again, we are concerned with factors that can shift the long-run aggregate supply curve. As with demand, we must always make a clear distinction between long-run aggregate supply (LRAS) which represents the long-run productive capacity of the economy, and short-run aggregate supply, SRAS, which represents short-run deviations from the long-run potential.

Chapter Objective: Describe the self-correcting forces that move an economy toward equilibrium.

Self-Correcting Mechanism In A Market Economy

When an economy experiences a shock, there are naturally occurring self-correcting forces that tend to “push” the economy back toward equilibrium. Three mechanisms that are responsible for self-correcting the economy after a shock are:

- **Consumption demand.** Demand is relatively stable over the business cycle. During periods of economic expansion, the incomes of many households increase significantly. However, households tend to save a larger proportion of their income instead of spending it all. This helps avoid a strong increase in demand that would aggravate the inflationary pressures. During recessions, households save less or even dip into their savings. Thus, demand will not decline as much as the decline in income suggests. Both situations tend to stabilize the economy.
### Real interest rates
Changes in real interest rates help to stabilize aggregate demand and redirect economic fluctuations. During periods of economic expansion, real interest rates rise due to increased demand for borrowed funds. The higher real interest rates reduce consumer borrowing and capital spending by businesses. During recessions, real interest rates decline, encouraging consumers to borrow for purchases and businesses to raise capital for investment projects.

### Resource prices
Changes in real resource prices will redirect economic fluctuations. When the economy is operating at greater than full employment capacity, prices of resources increase and discourage continued expenditures. For example, when housing starts and new construction is high, prices of lumber and other building materials tend to increase. Conversely, when the economy is operating at less than full capacity, the costs of resources are low, encouraging increased spending by businesses.

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### Chapter Objective: Describe fiscal policy and monetary policy

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### Fiscal Policy And Monetary Policy

The government may try to stimulate or dampen the economy in order to achieve certain macroeconomic goals. There are two primary methods that can be used to control the economy: fiscal policy and monetary policy.

**Fiscal policy** refers to the government’s use of taxation and spending policies to achieve various macroeconomic goals. Taxation affects disposable income. To stimulate the economy, the government can reduce taxes, which increases disposable income, thus increasing expenditures (demand) in the private sector. Alternatively, increasing taxes reduces disposable income and private sector spending.

Remember from our discussion of Keynesian economics that government spending can be used to smooth fluctuations in aggregate demand. Fiscal policy is what sets government spending levels. Government spending was used extensively during the Great Depression to stimulate the economy of the United States, due in no small measure to Keynes’ work. During the Great Depression, the U.S. government started public works projects, such as the Hoover Dam in Nevada, a series of drainage canals running through St. Louis, Missouri, and hundreds of other major projects throughout the U.S. This fiscal policy had the effect of putting people to work. It increased overall expenditures in the economy, which eventually brought the economy back toward full employment.

**Expansionary** fiscal policy attempts to stimulate the economy by either reducing taxes or increasing expenditures. **Restrictive** fiscal policy attempts to restrain the economy by increasing taxes or reducing government expenditures.

The government also uses **monetary policy** to help achieve macroeconomic goals by changing the amount of money in circulation. Like any other product, the higher the demand for money relative to its supply, the higher its cost. The cost of money is the rate of interest. The United States Federal Reserve (The Fed) can actually change the supply of money in the U.S. economy by buying and selling U.S. Treasury securities in open market operations. To reduce the supply of money in circulation, the Fed can sell Treasury securities from its inventory. The money used to purchase these securities is no longer in circulation. The resulting reduction in the money supply causes interest rates to rise. Consequently, companies and individuals who need to borrow money may have to postpone expansion plans or large purchases until interest rates decline.

If the economy is weak and unemployment is high, the Fed can buy Treasury securities, effectively increasing the money supply. This will cause interest rates to fall, and hopefully the companies that put expansion plans on hold and the individuals who decided to delay their large purchases can go ahead with their plans. This increases expenditures in the private sector and helps the economy move back to full employment.
Another way the Fed can control (adjust) the money supply is by changing the discount rate, the rate the Fed charges banks in need of short-term funds. By increasing the discount rate, the Fed effectively makes money more expensive. The increase in the discount rate ultimately affects all other interest rates, so we see an economy-wide increase in rates. Since money is now more expensive, we again have a situation where some borrowers may have to postpone their plans. There is less money in the economy, money is now more expensive, and the economy slows. To stimulate the economy, the Fed can lower the discount rate, causing the general level of interest rates to decline.

**Expansionary monetary policy** seeks to stimulate the economy by increasing the money supply. Fed purchases of Treasury securities or lowering of discount rates are expansionary policies. **Restrictive monetary policy** seeks to slow the economy by decreasing the money supply.

**Chapter Objective:** Define the marginal propensity to consume and the expenditure multiplier.

### Marginal propensity to consume and the expenditure Multiplier

As your income increases, you consume some of the increase and save some of the increase. The proportion of each additional dollar of income spent on personal consumption is called the marginal propensity to consume (MPC). Mathematically:

\[
MPC = \frac{\text{additional consumption}}{\text{additional income}}
\]

Think for a moment about this increase in income. Assume you receive an additional, unexpected $1,000 payment. You consume some of it ($1,000 \cdot MPC) and save the rest. What happens to the amount you spent? It represents someone else’s additional income ($1,000 \cdot MPC). They will spend some [($1,000 \cdot MPC) \cdot MPC] and save the rest. This process continues indefinitely. You can see that the original $1,000 of income expands or multiplies into more than $1,000 of total income for the economy. The amount of the expansion is called the expenditures multiplier and is equal to:

\[
M = \frac{1}{1 - MPC}
\]

Therefore, if investment spending increases by $1,000, aggregate spending will increase by \( M \cdot $1,000 \).

**Chapter Objective:** Compare and contrast classical economics and Keynesian economics.

### Classical Economics

Before the time of John Maynard Keynes, classical economists stressed the importance of aggregate supply and paid little attention to demand. The supply-side approach was spelled out in Say’s Law which suggested it was impossible to overproduce relative to total demand because supply (production) creates its own demand. The idea is that production generates the income necessary to buy things. If producers make too much of one thing and not enough of another, the price of one will decline, and the price of the other will increase.
According to classical economists, markets always adjust quickly to direct the economy toward full employment. When unemployment is high, wages decline, which reduces costs and prices and pushes the economy back to full employment. Meanwhile, interest rates bring savings and investment into balance. The supply side emphasis of classical economics gained popularity with the economic policies of Ronald Reagan.

**Keynesian Economics**

During the depression of the 1930s, John M. Keynes put forth an economic theory that tried to explain the inability of the economy to regain its long-run output level. His theory emphasized the importance of aggregate demand in determining the overall level of output in the economy. If spending decreases due to pessimism on the part of consumers and investors, business will respond by cutting output. Unlike the classical view, Keynes felt that resource prices, especially wages, were highly inflexible in a downward direction. In other words, wages would be slow to decline, and employers would instead be forced to lay off more workers. Hence, in Keynes’ view, the economy would languish for an extended period of time with high unemployment.

The Keynesian equilibrium occurs when spending is equal to output. Since extreme downward price rigidity is present, prices do not play a role in the Keynesian aggregate expenditure (AE) model. Hence, if demand is slack, there are no automatic forces capable of assuring full employment. Instability in a Keynesian world is driven from the demand side of the economy. The main sources of economic instability are consumer spending, private investment, and government expenditures. You know from our discussion of gross domestic product (GDP) in the macroeconomics section that these are the main components of GDP based on the expenditures approach of GDP measurement. Keynes believed that fluctuations in aggregate demand were the main cause of economic disruption. Keynes thought that an active fiscal policy, where the government varied its expenditures depending on economic conditions, could help smooth fluctuations in aggregate demand and thus promote economic stability.

Keynes believed that economies tended to move in cyclical patterns of expansion and contraction. Assume there is an increase in AD (perhaps from higher incomes abroad or an increase in consumer or business optimism). The multiplier magnifies the increased demand. The higher demand leads to income growth. The income growth leads to additional consumption and growing business sales. This leads to declining inventories, so businesses expand their output. Unemployment declines and the economy experiences a boom.

Eventually, the economy reaches full employment, which constrains additional growth. As growth slows, consumers and businesses become less optimistic and cut back on their expenditures. The multiplier magnifies the reduction in expenditures. Business inventories begin to build, so businesses cut back on production, and people are laid off. Some businesses begin to experience bankruptcy.

Keynes thought the primary problem was wide fluctuations in private investment. He also thought that recessions would be long because lower interest rates and falling resource prices are insufficient to offset the decline in incomes and spending.


\[17\] For a thorough discussion of the Consumer Price Index and other inflation indicators, see [http://stats.bls.gov/cpi](http://stats.bls.gov/cpi).

\[18\] One reason for the Fed to reduce the money supply is to slow the economy in times of rising inflation due to excess (unbalanced) demand.
Section 4: Microeconomics

Microeconomics deals with the decisions made by the individual firm. When we study microeconomics, we study how macroeconomic factors such as aggregate supply and demand, inflation, government actions, etc. affect the decisions and, hence, the operations of the individual firm. We know, for example, that as prices increase, consumers demand less of the good. This would imply that the individual supplier will try to produce at the lowest possible cost in order to sell products at a better price than its competitors.

For example, as a supplier of gerbil bedding and gold necklaces, you employ twenty people to process the products and prepare them for shipping or delivery. Ten of these people work on bedding and ten on necklaces. In times of very high inflation, increases in your wholesale costs cause you to increase your price to retailers, which causes demand for your products to decline.

The bedding is far more sensitive to inflationary pressures, and the demand for it will almost disappear if its price rises. The result is that ten people who used to work processing the bedding for delivery are now idle. As owner/manager of the firm, you don’t like to see people unemployed, but you must think of your family and other obligations. You hold on as long as you can, but ultimately you must lay off most of the bedding workers. You reassigned the most senior bedding processors to the gold necklace line for as long as possible. Finally, as the effects of inflation begin to show on the demand for gold necklaces, you must lay off the reassigned bedding processors as well as some of the gold processors.

Assume the gerbil bedding is processed in a separate building. You can close down that building to avoid paying for heating and cooling and some maintenance. This reduces much of your utility expenses and allows you to reduce your maintenance costs too. Hopefully, increased inflation and unexpected cost increases are temporary, and you can bring back the people you laid off and reopen your gerbil bedding building and production line.

We could continue with this example, but the point should be clear: macroeconomic factors (variables), such as inflation, are out of your control. With adverse changes, you simply try to maintain operations, absorbing profit reductions and increasing prices as much as you can. Microeconomic factors, such as the number of employees and certain overhead costs, are within your control to some degree. In hard times you may have some room to navigate; you can reduce some costs and temporarily eliminate others.

In the macroeconomics section, we discussed aggregate demand and aggregate supply, which are measures of overall economic activity. With microeconomics, we need to analyze demand and supply from the perspective of the individual firm.

Chapter Objective: Differentiate between movements along the demand curve and shifts in demand.

Shifts in demand vs. Movements along demand curves

The demand curve isolates the impact that price has on the amount of a product purchased. As indicated in panel (a) of Figure 5, a movement along a specific demand curve represents the change in quantity demanded resulting from a change in price.
Chapter Objective: Describe and calculate the price elasticity of demand, and describe how elasticity changes over the long run.

Elasticity Of Demand

The demand curve that represents the entire market for a product is downward sloping, indicating that demand changes as price changes. As price increases, consumers as a whole demand less. As price decreases, consumers as a whole demand more. Elasticity refers to the amount of the decrease or increase in demand, when prices are changed. In this section we will discuss two measures of elasticity: income elasticity of demand and price elasticity of demand.

Price Elasticity

Price elasticity is measured as the percentage change in demand given a percentage change in price and is described as follows:
Example:

Let’s assume you have been watching a product for a few months and have been counting the number of the product sold at different prices. You find that when the price is $3.00, 75 units are sold. When the price is raised to $3.25, only 60 units are sold. Calculate the product’s price elasticity of demand.

Answer:

\[ E_p = \frac{\% \text{ change in quantity demanded}}{\% \text{ change in price}} = \frac{\% \Delta Q}{\% \Delta P} \]

\[ \% \Delta Q = \frac{60 - 75}{60 + 75/2} = \frac{-15}{67.5} = -0.222 \]

\[ \% \Delta P = \frac{3.25 - 3.00}{3.00 + 3.25/2} = \frac{0.25}{3.125} = 0.080 \]

\[ E_p = \frac{-0.222}{0.080} = -2.78 \]

There are two important implications of this calculation:

1. Notice that the elasticity is negative. This means that prices and quantity demanded move in opposite directions. As price increases, demand decreases, and as price decreases, demand increases.

2. The percentage change in quantity demanded is 2.8 times the percentage change in price. This product is fairly elastic, meaning the demand for the good is strongly affected by its price. There are other goods, for example gasoline for your car, that are much less sensitive to price changes. Another example is food. Since people must eat, the amount consumed might be virtually unaffected by price changes. Note, however, that consumers will begin to substitute lower cost foods for the ones with the greatest increases (e.g., chicken for beef).

When elasticity is greater than 1, demand is said to be **elastic**. When elasticity is less than 1, demand is **inelastic**.

**Income Elasticity**

As we mentioned earlier, demand for a product is also affected by consumer income. Generally, as income increases, quantity demanded will also increase. Income elasticity of demand is defined as:

\[ E_I = \frac{\% \Delta Q}{\% \Delta I} \]

where:

- \( E_I = \) income elasticity of demand \% \ l
- \% \Delta I = \) percentage change in income
Demand tends to be more elastic the longer a price change lasts. For example, when gasoline prices move up quickly, consumers have little choice in the short run.

However, if gas prices stay high, consumers can carpool or buy more efficient automobiles, either of which would reduce gas demand.

Although you will rarely see a product whose demand increases as its price increases, there are actually different types of reactions to changes in income:

1. **Inferior goods** have negative income elasticity of demand. Their demand actually goes down as income increases. In many parts of the U.S., for example, people will stop riding public buses and start driving their own cars as their income increases.

2. **Normal goods** have income elasticities that are positive and can be divided into two categories.
   a. A *necessity* has income elasticity less than 1.0. An example might be food.
   b. A *luxury good* has income elasticity greater than 1.0. An example might be recreation (vacations).

**The Time Dimension**

One aspect of the demand curve we have totally ignored to this point is the time dimension. Although not specifically noted on the graph, time is a very important variable. When we talk about supply and demand, we generally refer to some long run, equilibrium condition. It’s almost like we think, “Well, given the number of consumers in the economy and the general price level for the product, this is how much should be consumed.” However, are we talking about the amount consumed today? The amount consumed over the coming week, month, or year? Actually, the time dimension is more or less irrelevant when we refer to demand at a given price. That is, the amount demanded could be representative of any of those time periods, as long as we are consistent in the way we handle it. More important than the specific time dimension are the concepts of long run and short run.

Remember when we talked about costs, we defined long run as the amount of time necessary to enable changing our fixed costs of production. When we refer to long run demand and supply, we are referring to the amount of demand or supply under “normal” conditions. Given the price of the good, how much would consumers “ordinarily” consume?

In the short run, there are many aberrations that could cause a “disequilibrium” condition. Disequilibrium simply means that demand is temporarily not determined by the current price. This could refer to fads or other economic “bubbles” during which consumer demand is driven by some psychological factor, rather than ordinary consumer needs and desires.

**Chapter Objective:** Describe the different types of capital that can be employed by a firm.

**Capital**

Any resource that has value because it assists in the production or supply of goods and services is considered *capital*. **Human capital** refers to the characteristics of people (e.g., physical strength, intelligence, education, manual dexterity, honesty, and reliability) that make them valuable to a company. Obviously, at your gerbil bedding and gold necklace company, you value reliability and honesty above strength. Shipping companies tend to place value on strength for most of their employees in addition to reliability and honesty. Engineering firms value intelligence and education, much like universities.
Physical capital refers to the nonhuman resources employed by the company (e.g., equipment, buildings, tools, and raw materials). Obviously, the amount of physical capital employed by a firm depends upon the industry. For instance, steel producers and auto manufacturers employ great amounts of physical capital. On the other hand, real estate development firms or brokers have little need for equipment, buildings, and tools. Firms often face a choice of producing a product by incurring high variable costs (e.g., labor, or incurring large fixed costs (e.g., robots).

The value of a firm depends upon its ability to fill a need in society (i.e., to provide a necessary function or product). In turn, that ability is dependent upon how well the firm uses capital (i.e., people, equipment, and other resources). When you value a firm, whether currently operating or not, you value that firm as if it is performing at its full potential. That is, you value it as though it is using all of its employed capital in the most efficient and productive manner. To illustrate this concept of value, consider the following situation.

You are at the beach one day, and you notice that a sandwich and ice cream shop (right on the beach) has gone out of business. You say to yourself, “How in the world could that place go out of business? An ice cream parlor in this location would have to be a goldmine!”

Your mental estimate of the value of the sandwich and ice cream shop is dependent upon the collective potential value of all the capital it employed (i.e., the location, the building, the equipment, the people, the supplies, and the money). If the shop went out of business, it is a good indication that management was not using its capital in the most efficient and productive manner. In other words, it was not using its capital to its full potential.

**Chapter Objective:** Describe different types of costs, including fixed costs, variable costs, and marginal costs, and how each is affected by changes in production levels.

**Costs (Factors) Of Production**

Let’s categorize manufacturing costs (factors) as either fixed or variable. **Fixed costs** are incurred through the passage of time and are independent of production output. They occur each period regardless of whether your firm is actually producing anything. Rent is a good example of a fixed cost. Assume you are leasing (renting) your building and equipment. It doesn’t matter if you ever turn the equipment on to produce your product, you must still pay the rent. When you begin production, the amount of rent you pay does not increase or decrease, so it is independent of production.

Alternatively, **variable costs** are associated with production, not the passage of time. Variable costs include the direct labor and material costs incurred in assembling the final product. Consider the production line you use to assemble gold necklaces and prepare them for shipping. There is a station where the chain is measured and cut. The twenty-inch pieces then go to another station, where clasps are attached. At the last station, the necklaces are packaged for shipping, and then moved to the shipping area.

Now consider the individual costs that are incurred in assembling one necklace: the cost of the material (gold chain), the cost of the clasps, the wages paid to the individuals at each station, the packaging material, and the shipping costs. All of these costs are related directly to the production of the gold necklaces, not the passage of time. They clearly are variable, not fixed, costs of production—if you produce no gold necklaces, none of these costs is incurred.

A concept which may not be immediately obvious is that classifying costs as fixed depends upon the time frame. In the short run, there is nothing that can be done to alter the classification of fixed costs. Fixed costs, such as rent and mortgage payments, cannot be changed in the **short run**. Given a long enough time period, however, fixed costs can change. For instance, we can pay off or refinance our mortgage, or we can negotiate a different rent. Thus, we refer to the period of time necessary for us to change our fixed costs as the **long run**. In the long run, all costs are variable.
There are several different ways of looking at costs, beyond just fixed vs. variable:

- **Average fixed costs** is total fixed costs divided by the number of units produced (output), so in the short run it declines as output increases.
- **Average variable cost** equals the total variable cost divided by the number of units produced (output). We will see that variable cost per unit can increase or decrease as output changes.
- **Average total cost** equals the total costs (fixed and variable) divided by the number of units produced.
- **Marginal cost** is the cost of producing one additional unit of output. When you see the word “marginal” in economics, think of the word “last.” A firm’s marginal cost, therefore, is the total (additional) cost associated with producing the last unit of output.

You will see later that the firm should, in theory, produce where marginal costs equal marginal revenues. That is, the firm should produce up to the point where the revenue received from producing the last unit of production equals the costs to produce that unit.

The **law of diminishing returns** states that as more and more resources (e.g., labor) are devoted to the production process, they increase output, but at an ever decreasing rate. For example, assume you have an acre of corn that needs to be harvested, and you have started the process by yourself. The addition of a second and third worker is highly beneficial. That is, adding a second worker doubles output and adding a third worker increases output by an additional 40 percent. But if you already have 300 workers in the field, the increase in productive capacity (harvesting) of adding a 301st worker is not near the increase that was achieved when the second worker was added. You will notice that the 301st worker will want to be paid just as much as everyone else, but his production will be very low. The result is that you have increased your costs by a greater percentage than you have increased your output.

The concept of diminishing marginal returns and the short-run average/marginal cost structure are illustrated in Figure 6. In Figure 6, total cost (TC) is equal to variable cost (VC) plus fixed costs (FC). You can see that as production increases, VC and TC increase at a decreasing rate (arch downward), flatten out, then increase at an increasing rate (arch upward).

The VC curve is at first upward-sloping and concave because at very low levels of output, variable costs per unit produced are high. Think of this as representing an inability to negotiate low input prices when purchasing small quantities or having too many workers in relation to the quantity produced. As production increases, you will reach a level of output where you can start to negotiate input prices (buy in bulk) and utilize workers more efficiently, so the VC per unit actually declines. As production continues to increase, you reach a point where there is a lot of waste and variable costs start to increase at an increasing rate (the curve turns upward and is convex).

![Figure 6: Total, Variable, and Fixed Cost Curves](image)

In Figure 6, fixed costs are represented by a horizontal line because they are assumed constant with respect to output. Remember, they are a function of time, not production. The total cost curve is simply the
addition of fixed costs to the variable cost curve at every point, so the total cost curve looks identical to the variable cost curve, only shifted upward.

Given enough time, even fixed costs can change (are variable). With enough time, you can negotiate a different lease, change the amount of equipment you are using, or even change the number of managers you employ. Also, fixed costs are only fixed over a range of output. If the amount of equipment you use can produce a limited number of units of output, to increase above that output you will have to add more equipment, and you might even have to add another manager.

**Chapter Objective:** Differentiate between movements along the supply curve and shifts in supply.

### Movement Along The Supply Curve

Other things held constant, the supply curve summarizes the willingness of producers to offer a product at a given price. The change in the quantity supplied as price changes represents movements along the supply curve. This is illustrated in panel (a) of Figure 7.

### Shifts In The Supply Curve

Some factors may cause producers to change the quantity they are willing to supply at all price levels simultaneously. These changes will shift the aggregate supply curve as shown in panel (b) of Figure 7.

**Figure 7:** Changes in the Supply Curve

The following are some of the reasons for a shift in the supply curve:

- **Changes in resource prices.** Higher costs in the resource markets will reduce supply (shift the supply curve left) and increase price in the product markets based on these resources.

- **Changes in technology.** The discovery of new, lower-cost production techniques will reduce the costs of production and increase supply in the product markets.

- **Natural disasters and political disruptions.** Natural disasters and changing political conditions can also alter (shift) supply.

**Chapter Objective:** Describe pure competition and explain how the purely competitive firm sets output so as to maximize profits.
The Purely Competitive Market

In a purely competitive market, there is intense competition, and prices are determined through an equilibrium process. The theory of pure competition assumes the following market and participant characteristics:

- All the firms in the market produce a homogeneous product. This simply means that the products produced by the firms in the market are more or less identical. As an example, the corn from one farmer is about the same as the corn from another farmer.
- There are a large number of independent firms. This means the firms do not collude in any way; they have to compete for your business (i.e., there is no oligopoly).
- Each seller is small relative to the total market. In other words, no seller controls a large enough portion of the market to manipulate the market in any way (i.e., there is no oligopoly or monopoly).
- There are no barriers to entry or exit. It is easy for a new competitor to enter the market (or leave) (i.e., the market is not too expensive to enter or regulated too heavily). You can probably think of industries that are somewhat difficult or impossible to enter because of high capital requirements or regulations (e.g., auto manufacturing or public utilities).

Competitors in a purely competitive market are **price-takers**, meaning they have no control over the price they receive for their output. Their product is identical to that of their competitors, and they have no advantage in terms of size or pricing power. Simply put, they accept the market price or nothing! Since each produces a small amount of output relative to the total market output, each faces a horizontal (perfectly elastic) demand curve. This means they can sell all of their output at the prevailing market price. If they try to set their price higher than the market price, however, they sell nothing.

![Figure 8: Demand Curve for the Individual Competitor](image)

Notice that the demand curve for the individual competitor is different from the aggregate demand curve for the entire market. The demand curve that represents the entire market is downward-sloping, indicating that demand changes as price changes. As price increases, consumers as a whole demand less. As price decreases, consumers as a whole demand more. The amount demand changes with a given price change is determined by the elasticity of the product, so the demand curve will have a slope between zero and $-1$ (downward-sloping). The individual competitor, on the other hand, faces a perfectly elastic (slope = 0) demand curve, as above, because demand for that competitor’s output goes to zero if he tries to raise his price.

**Determining Output**

How does the individual firm in a purely competitive market determine the amount it will produce and sell? An individual firm will continue to expand production (output) until marginal revenue (MR) equals marginal cost (MC). (MR is the revenue obtained from selling one more unit of output, and MC is the additional cost of producing the last unit of output.) If the producer goes beyond that amount, the price received will not
cover expenses. If he produces less, he is not maximizing profits because the marginal costs of producing units is less than the price that will be received. This production level should make intuitive sense. The firm will produce as many units as it can produce and sell for a profit. If producing another unit will cost more than the unit can be sold for, it makes no sense to produce that unit. The problem with applying this model in the real world is that it is often difficult to know the exact marginal cost of each single unit.

In pure competition with a constant market price, the firm’s marginal revenue is constant and equal to the selling price. In other words, no matter what amount the firm sells, it receives the market price (p) per unit. (This explains why the firm’s MR curve presented in Figure 9 is flat.) The graph indicates increasing marginal costs, as we have already discussed. When the firm’s marginal cost exactly equals its marginal revenue, the firm is at the optimal output level (Q).

**Figure 9:** Profit Maximizing Output for the Purely Competitive Firm

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**Chapter Objective:** Describe the various noncompetitive industry models, including monopoly and oligopoly.

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**Noncompetitive Markets**

In a price searcher market, firms enjoy a certain amount of control over the supply of the good and can manipulate prices. In other words, they search for the optimal price; the price at which they maximize their profits. The reason some firms enjoy the luxury of searching for the optimal price rather than accepting the market price is *entry barriers*. That is, for some reason competitors cannot enter the market, so the existing firms experience limited, if any, competition.

Some examples of entry barriers:

- **Economies of scale.** Sometimes bigger is better. The ability to produce more efficiently (cheaply) based upon volume is known as economy of scale. Large firms are able to spread their fixed costs across a higher volume of products, thus allowing them to sell those products at lower prices. In industries that have high fixed costs, competition will be limited by the fact that any new competitors cannot easily enter the market. New firms would need time to build sales to a level where the fixed costs could be effectively reduced on a per unit basis. The economies of scale are therefore a barrier to entry for new competition. Consider the automobile industry. There are large fixed costs associated with automobile production: research into the engineering and design, plus the production process itself. In order for auto producers to be profitable, they must be able to spread these high fixed costs across a high number of automobiles produced. If a plant only produced one vehicle, the price of that vehicle would have to cover all of the high fixed costs. If the plant produced one thousand vehicles, the
fixed costs could be allocated across all of them, and the vehicles would be more affordable to consumers.

- **Government licensing and legal barriers** create barriers to entry in certain industries such as television broadcasting, where required government licenses restrict new competition.
- **Patents or exclusive rights of production** are granted to producers of new and innovative products. These encourage research and development because firms with new, innovative products know they will be protected from competition for a while, giving them the opportunity to recover the substantial costs associated with research and development.
- **Resource control** relates to the single firm that has sole control over a resource essential for entry into an industry, effectively eliminating potential competitors. For example, you don’t see many new, successful diamond mines!

### Problems With High Entry Barriers

Problems associated with markets having high barriers to entry include:

- **Unsatisfied demand.** Monopolists (discussed below) can suppress supply and charge relatively high prices while not meeting the total demand needs of a population.
- **Limited consumer options.** For example, there is typically only one cable television operator in any region. If service is bad, customers either keep subscribing or not. They don’t have the option of switching operators.
- **Entry and exit are not properly motivated by profit.** Since barriers to entry are high, extremely inefficient producers are able to survive.
- **Legal protection** can allow a monopolist to seek abnormal profits. Spending time and money in search of favors from the government (e.g., market protection) can be a waste of valuable resources.

### Monopolies And Oligopolies

When a single supplier controls the entire supply of a product, that supplier is said to enjoy a **monopoly**. Typically, there are very high barriers to entry in markets that tend to create monopolies. For instance, assume you have control over land that holds a vast supply of gold. Next, assume that searching for gold in other parts of the world is extremely expensive because the world's supply of gold is nearly depleted and any new supplies are extremely deep underground. In a situation such as this, the possibility of new suppliers exploring for gold and being able to compete with you is very low. You are a monopoly because you effectively control the world’s supply of gold.

Now let's make the simplifying assumption that your costs to supply gold are more or less constant, so your profit equals total revenues less some constant cost, where total revenue equals the amount of gold you sell multiplied by its selling price. Your goal, as a monopolist, is to find the combination of price and quantity supplied that maximizes total revenue. Since your costs are more or less constant, your only concern is maximizing the revenues you receive.

This optimal price-quantity combination is at the point where the price increase (resulting from a reduction in the amount of gold you supply) exactly offsets the accompanying reduction in demand (caused by the increase in price). Thus, you have maximized your profit, and you didn’t even consider competition.

We showed previously that the individual firm in a competitive market faces a perfectly elastic (flat) demand curve, meaning the competitive firm must accept the market price. From macroeconomics we also know that the aggregate demand curve for the whole market is downward-sloping, indicating that consumers as a whole demand less (more) as prices rise (fall).

Since the monopolist is the only supplier of the good, the demand curve faced by the monopolist is effectively the demand curve for the whole market. The monopolist, therefore, faces a downward-sloping demand curve. The monopolist can raise or lower prices, but demand will be affected when he does so.
But even if the monopolist can set the price anywhere he wants, does he charge the highest possible price? The answer is no, because the monopolist wants to maximize profits, not price. Monopolists will not make profits if the ATC line is always above the demand curve. For example, if someone held a patent on a machine that could be used just one time to convert a $5 bill into a $10 bill, but the ATC of producing the machine was $6, the monopolist would not make a profit.

Figure 10 shows the revenue-cost structure facing the monopolist. Note that, just as with the pure competitor, production will expand until MR = MC at optimal output Q*. To find the price at which it will sell Q* units, you must go to the demand curve. Note that the demand curve itself does not determine the optimal behavior of the monopolist. Just as with the pure competition model, optimal quantity is where MR = MC. For a profit to be ensured, the demand curve must lie above the ATC curve at the optimal quantity point (i.e., P₁ - C₁ > 0).

Figure 10: Revenue-Cost Structure of the Monopolist

Oligopoly is a market structure characterized by:
- A small number of sellers.
- Interdependence among competitors (decisions made by one firm affect the demand, price, and profit of others in the industry).
- Large economies of scale.
- Significant barriers to entry.
- Products may be similar or differentiated.

An oligopoly is comprised of a small number of suppliers who totally control the supply of a good or service. As with a monopoly, an oligopoly seeks that combination of supply and price that maximizes profits. Unlike a monopoly, however, the success of the oligopoly is dependent upon its members’ ability to reach and maintain supply agreements. In contrast to a monopolist, oligopolists are highly dependent upon the actions of their rivals when making business decisions. Price determination in the auto industry is a good example. Automakers tend to play “follow the leader” and announce price increases in close synchronization. They are not working explicitly together, but the actions of one producer have a large impact on the others. The barriers to entry are large. It would take an enormous capital investment to start a new auto company because the large economies of scale that are achieved by the oligopolist pose a significant barrier.

Oligopolists recognize that they cannot maximize profits when they are in fierce competition with one another. Hence, they will form associations or cartels to set prices and output so as to maximize profits.

Although not technically an oligopoly, OPEC is an appropriate and very familiar example of the concept of oligopoly. OPEC faces an interesting problem, since they do not control the entire supply of crude oil. Member countries only control a very large portion of it, which they maintain carefully to manipulate prices. However, if they limit supplies too much, prices will rise to the point where potential competitors (drillers in
Texas, the Gulf of Mexico, the North Sea, etc.) will be enticed to reopen their drilling and exploration sites. Even though OPEC does not have total control over the supply of crude oil, their hold is very strong.

Another interesting aspect of oligopolies is that each member is better off by secretly increasing its supply (i.e., cheating). Industry profits are maximized when all producers agree to restrict supply (thus mimicking monopoly conditions). This collusive agreement among producers will establish prices at a high level. Once the supply level is agreed to, individual firms will maximize their own profits by increasing their own production and thus increasing their share of the industry profit. For instance, if OPEC agrees on a certain supply from each country, all member countries are bound by that agreement. Once the agreement has been reached, the price of crude oil reacts based on the expected supply. Since each member’s best interests are served by maximizing revenues, each member will want to do so. The way a member nation maximizes revenues is by increasing supply above that specified in the agreement. In other words, what is best for the group is not necessarily best for the individual member, and vice versa.

The increased supply from one member that violates the agreement is probably not enough to affect world prices, as long as it is not publicly announced. If that member can be quiet and not boast too loudly, other members will not be aware of the transgression, and will be no worse off. Of course, this is exactly why cartels and oligopolies must police themselves.

**Obstacles To Collusion**

Collusive behavior is limited for the following reasons:

- **Number of oligopolists.** When the number of oligopolists is large, effective collusion is less likely.
- **Monitoring partners.** Collusion is less attractive when it is difficult to detect and eliminate price cuts. In other words, if cheating is difficult to detect, fewer firms will be willing to enter into collusive agreements.
- **Low entry barriers.** New entrants will see the “premium” pricing that is available and enter the market (outside the oligopoly) with more attractive pricing in an attempt to steal market share.
- **Unstable demand conditions.** Unstable demand can lead to differing opinions between oligopolists as to how to best serve the industry’s clientele.
- **Vigorous antitrust action.** Antitrust actions may increase the cost of collusion.

**Section 5: International Economics**

Although there is sometimes substantial trade among governments, individuals perform the majority of international trade. That is, the majority of international trade is done by businesses.

When we enter the international arena, we open up a set of totally new considerations. First of all, there is the question of which country will produce what. For example, why does the U.S. purchase so much electronic equipment from the Far East? Next, since trade is across borders, paying for international purchases becomes a concern. That is, how does a U.S. business pay for goods purchased from a company in Japan?

First, the question of which country will sell what. We will start with a discussion of comparative and absolute advantages.

**Chapter Objective:** Explain why comparative advantage allows nations to benefit from trade with another.

**Comparative And Absolute Advantages**

**Comparative advantage** is the ability of one country to produce a good at a lower opportunity cost than its trading partners. Opportunity cost refers to the opportunities that must be foregone in order to produce the
good. For example, a college student incurs opportunity cost because he or she is choosing to go to school rather than start a career immediately. The student’s resource (in this case, time) can only be used for one opportunity. The missed opportunities resulting from the choice to attend college are the opportunity costs of going to college.

Comparative advantage is the reason there is a differential impact from international trade among industries. Relative cost is the key to having comparative advantage. When trading partners specialize in producing products for which they have comparative advantage, costs are minimized, output is greater, and both trading partners benefit.

For example, consider the following chart, which indicates the production possibilities of food and drink per worker per day in Country A and Country B.

<table>
<thead>
<tr>
<th>Units of Output Per Day</th>
<th>Country A</th>
<th>Country B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food</td>
<td>2</td>
<td>6</td>
</tr>
<tr>
<td>Drink</td>
<td>4</td>
<td>9</td>
</tr>
</tbody>
</table>

Mutual gains could be realized from trade if A specializes in drink production and B specializes in food production. The reason centers on comparative advantage. The table above indicates that Country A can produce either 2 units of food or 4 units of drink per worker per day. Therefore, Country A must give up 2 units of drink to produce 1 unit of food. Country B can produce 6 units of food or 9 units of drink per worker per day. Country B must give up 1.5 units of drink to produce 1 unit of food. The opportunity cost for producing food is greater for A than B. If B produces 6 units of food and A produces 4 units of drink, and each country can agree on a trading price somewhere between 1.5 to 2.0 units of drink for 1 unit of food, they will both benefit compared to other possible combinations of productions. For example, if the trading rate is 1.75 units of drink for one unit of food, then B could produce 6 units of food and trade 2 units of food to A for 2 \cdot 1.75 = 3.5 units of drink. A ends up with 2 units of food and 0.5 units of drink, although with no trading A would have had only 1.5 units of food if enough resources had been diverted to produce 0.5 unit of drink. B ends up with 4 units of food and 3.5 units of drink. With no trading, B would have had 4 units of food only by diverting resources from drink production that would have limited drink output to 3 units. Thus both countries are better off. This makes intuitive sense—the most efficient producer of a good should produce that good and trade its output for goods that are more efficiently produced elsewhere.

**Absolute advantage** describes the situation in which a nation, as the result of its previous experience or natural endowments, can out-produce another nation using the same resources.

The law of comparative advantage holds that trading partners are better off if they specialize in the production of goods for which they are the low-opportunity cost producer and trade for (purchase) those goods for which they are the high-opportunity cost producer.

A country gains (i.e., realizes expanded consumption possibilities) from international trade when it exports those goods for which it has a comparative advantage and import those goods for which it does not. For example, suppose we can produce wheat at $2 per bushel. If the production cost is $3 in all other nations, it is to our advantage to produce more wheat and sell it on the world market. Hence, our exports increase and the other nations get cheaper wheat.

**Chapter Objective:** Describe tariffs and quotas, and explain how these trade restrictions distort a nation’s comparative advantage.
The Impact Of Trade Restrictions

Although the gains from trade are apparent, countries erect barriers to trade, including tariffs and quotas. A tariff is a tax imposed on imports, while a quota is an import quantity limitation. Both types of trade barriers artificially distort the costs of goods, potentially eliminating the benefits of comparative advantage.

Tariffs

Tariffs benefit domestic producers of products because the level of imports will be reduced due to an effective increase in the price of importing the good. For example, if the world price of semiconductors is $40, and domestic producers can only profitably sell semiconductors at $45, foreign producers have a comparative advantage. Hence, domestic producers will not be able to compete in their own domestic semiconductor market. However, if the government places a $5 tariff on imported semiconductors, local producers will become competitive with foreign producers in the local market, and local semiconductor production will rise. Tariffs will also benefit the government because the government will collect the $5 tax on all foreign semiconductors sold in the domestic market.

Quotas

A quota has the same effect as a tariff. The supply of imported goods is reduced, and a lower supply means a higher price domestically. With a quota, the government does not directly benefit because an explicit tax is not involved. Rather, the foreign producers who are granted import permits benefit because they are allowed to sell their goods in the domestic market at artificially high prices. Clearly, domestic producers also benefit from quotas because competition from foreign producers is limited. The bottom line is quotas can be more harmful than tariffs because (1) the government does not receive any funds from the imposition of quotas and (2) the foreign producers receive the revenue transfer (due to higher prices received for all goods sold under the import license).

Reasons For The Adoption Of Trade Restrictions

Reasons that nations adopt trade restrictions include:

- National defense. Some industries are highly sensitive to national security, and their products should, therefore, remain in the country.
- Infant industries. These industries should be protected with tariffs or import quotas for a time, while they develop and reduce costs.
- Anti-dumping. Dumping occurs when a foreign firm sells products below cost in an attempt to gain market share by driving out domestic suppliers. The practice is sometimes supported by the foreign government.

Do Trade Barriers Protect Jobs?

Trade restrictions are typically supported by local governments and citizens because they protect jobs and help maintain high wage levels. In the long run, however, trade restrictions cannot protect the net number of jobs in a country.

The number of jobs protected by import restrictions will be offset by jobs lost in the import/export industry. Import/export firms will be unable to sell the overpriced domestic product abroad or import and sell the lower-priced, restricted foreign-made product.

Do Trade Restrictions Create Jobs?

Trade restrictions may create jobs in the short run, but not in the long run. First of all, trade restrictions prevent your trading partners from developing the purchasing power needed to buy import goods from you, thus depressing your own export industry. Secondly, the higher price of the protected domestic good
dampens domestic aggregate purchasing power, taking sales away from other domestic products. Finally, the jobs that would have been created in the import industry are typically never created.

Does Trade With Low-Wage Countries Depress Wage Rates in High-Wage Countries?

The belief that trading with low-wage countries depresses wages is based on a misunderstanding of the law of comparative advantage. A high hourly wage does not necessarily mean high per-unit labor costs. Labor productivity must be considered. The worker’s skill level, the amount of invested capital, and production methods may produce labor costs per unit of output below that found in low-wage countries.

Consider the law of comparative advantage (not absolute advantage). When each country produces goods for which it has a comparative advantage, both countries will benefit. High-wage countries will have an advantage in high-tech manufacturing, and low-wage countries will have an advantage in labor-intensive goods. When both produce the goods in which they have an advantage, total output and the availability of goods increase.

Chapter Objective: Describe how currencies are traded in global currency markets.

Foreign Exchange

The second major consideration for international traders is foreign exchange (i.e., exchanging the domestic currency for the foreign currency). To purchase products from a foreign country, the firm must have the currency of that country. Since foreign trade is so prevalent, there must be an equilibrium “price” for each currency in terms of all other currencies.

Exchange Rates

An exchange rate is a ratio that describes how many units of one currency you can buy with one unit of another currency. Note that an exchange rate is quoted relative to another currency.

For example, if the Australian dollar (AUD) is trading at 0.60 U.S. dollars ($0.60), each AUD will buy 60 U.S. cents. Remember the following: AUD = $0.60 = 0.60 dollars per AUD. Also, exchange rates between countries are the inverse of one another. Thus, the U.S. dollar quote in terms of AUD is:

U.S. dollar = 1/0.60 = AUD 1.66 = 1.66 AUD per U.S. dollar

Therefore, if you are given dollars per AUD, you can easily get AUD per dollar by inverting the original quote.

Example:
A U.S. importer has agreed to purchase 200 dozen long-stem roses from a Japanese flower supplier. The latest foreign exchange quote is ¥111.02/$ or $0.009007/¥. Specify the total dollar price for the roses if they are quoted at ¥650, including all shipping costs.

Answer:
First, if the roses cost ¥650 per dozen, their total cost in yen is:

¥650 x 200 = ¥130,000
Next, since the U.S. importer must pay in yen, he must exchange dollars for yen. That means we have to find the number of dollars that are equivalent to ¥130,000:

\[ ¥130,000 \times \frac{0.009007}{¥} = $1,170.91 \]

The importer would go to the foreign exchange markets and exchange $1,170.90 for ¥130,000 to pay the Japanese supplier.

**The Foreign-Exchange Market**

The trading of currencies takes place in foreign-exchange markets, whose primary function is to facilitate international trade and investment. Knowledge of the operation and mechanics of these markets is important for a fundamental understanding of international financial management.

The foreign-exchange market permits the transfer of purchasing power denominated in one currency for that of another currency. This market is not a physical place but rather an electronically linked network of banks, foreign exchange brokers, and dealers whose function it is to bring together buyers and sellers of foreign exchange. Transactions occur over the phone, telex, or SWIFT system (Society for Worldwide Interbank Financial Telecommunications).

Participants in the foreign-exchange (interbank) market are large commercial banks, foreign-exchange brokers, major multinational corporate customers, and central banks. Most of the trading in the U.S. goes through foreign-exchange brokers, who match buyers and sellers for a small commission (1/32 of one percent). If small amounts of foreign currency are needed, individuals typically deal with their local banks.

**Chapter Objective:** Differentiate between the spot and forward markets for foreign currency.

**Spot Market**

The foreign currency *spot* market is where currencies trade for immediate delivery, although in practice, the settlement date (also called the value date) is set at two working days after the date the transaction is concluded. For example, if a spot deal is concluded on Thursday, the settlement date is Monday.

**Forward Market**

The foreign currency *forward* market is where contracts are used to buy or sell currencies for future delivery. The two sides of the transaction agree today to a price (exchange rate) at which they will exchange their currencies in the future. Forward contracts are generally for 30-, 90-, 180-, or 360-day periods.

Forward contracts between a bank and a customer call for delivery of a specified amount of a currency quoted against the dollar on a specific future date. The exchange rate is fixed at the time the contract is signed.

For example, assume a U.S. firm must pay a Swiss firm CHF150,000 (CHF is the symbol for Swiss francs) in 90 days. The U.S. firm has dollars now but needs Swiss francs in the future. In order to offset the risk that the value of the Swiss franc might change (i.e., the exchange rate between Swiss francs and U.S. dollars) the U.S. firm will buy Swiss francs in the forward market. An opposite situation is a U.S. firm that agrees to receive payment of CHF200,000 30 days from now. To offset the risk of changing value, the firm will contract to sell Swiss francs in the forward market.
Example: Foreign Currency Forward Transaction
A U.S. firm has entered into a contract in which it will receive CHF100,000 from a Swiss firm in 60 days. Forward contracts on Swiss francs maturing in 60 days specify a rate of CHF1.7530/$. The current exchange rate is CHF1.7799/$. One way or another, the U.S. firm has to exchange its Swiss francs for U.S. dollars in 60 days.

Part 1: Assume the U.S. firm chooses to take its chances with exchange rates and will simply take the rate of exchange on the date it receives the francs. Compared to the current exchange rate, how much will the U.S. firm gain or lose if, when it receives the francs, the exchange rate is 1.6556 Swiss francs to the dollar?

Answer:
- At the original exchange rate, assuming no change before the payment date, the U.S. firm would receive $56,182.93 for the CHF100,000:
  \[ \text{CHF}100,000 \cdot \frac{0.561829}{\text{CHF}} = \$56,182.93 \]
  \[ \frac{1}{1.7799} = 0.561829 \]
- However, at the payment date the exchange rate has changed, and the firm actually receives $60,401.06:
  \[ \text{CHF}100,000 \cdot \frac{0.604011}{\text{CHF}} = \$60,401.06 \]
  \[ \frac{1}{1.6556} = 0.604011 \]

By waiting, the U.S. firm receives more U.S. dollars for its Swiss francs. This is due to the strengthening of the Swiss franc. The Swiss franc strengthened with respect to the dollar, because on the agreement date it took 1.7799 Swiss francs to purchase one dollar, but it only took 1.6556 Swiss francs to purchase a dollar on the payment date.

Another way of looking at this is that the dollar weakened with respect to the Swiss franc over the period. It took $0.561823 (1/1.7799) to purchase one Swiss franc originally, but at the payment date it took $0.604011 (1/1.6556) to purchase one Swiss franc.

Part 2: Using the same exchange rates, assume the firm entered into the forward contract to sell Swiss francs at CHF1.7530/$.

Answer:
- With the forward contract, the firm has locked in a rate of exchange. It has agreed to receive $57,045.10 for their CHF100,000 (at CHF1.7530/$):
  \[ \text{CHF}100,000 \cdot \frac{0.570451}{\text{CHF}} = \$57,045.10 \]
  \[ \frac{1}{1.7530} = 0.570451 \]

Even though the Swiss franc has appreciated in value (strengthened) with respect to the U.S. dollar, the firm receives the rate specified in the forward contract. Note that, by selling its francs in a forward contract the firm receives fewer U.S. dollars than if it had simply waited.

Part 3: Now assume at the time of payment the exchange rate has risen to CHF1.8250/$.
- Remember that at the original exchange rate (CHF1.7799/$) and assuming no change before the payment date, the U.S. firm would receive $56,182.93 for its CHF100,000:
  \[ \text{CHF}100,000 \cdot \frac{0.561829}{\text{CHF}} = \$56,182.93 \]
  \[ \frac{1}{1.7799} = 0.561829 \]

Answer:
- At the payment date the exchange rate has changed and the firm actually receives $54,794.52:
  \[ \text{CHF}100,000 \cdot \frac{0.547945}{\text{CHF}} = \$54,794.52 \]
1/1.8250 = 0.547945

By waiting, the U.S. firm receives less, due to the weakening of the Swiss franc. The Swiss franc weakened with respect to the dollar because on the agreement date it took 1.7799 Swiss francs to purchase one dollar, and it took 1.8250 Swiss francs to purchase a dollar on the payment date.

Another way of looking at this is that the dollar strengthened with respect to the Swiss franc over the period. It took $0.561829 (1/1.7799) to purchase one Swiss franc originally, but at the payment date it took only $0.547945 (1/1.8250) to purchase one Swiss franc.

The reason we looked at two different exchange rates at the payment date is to point out a crucial characteristic of forward contracts. That is, the purchase price (rate of exchange between the two currencies) is locked in at the agreement date, regardless of whether or not exchange rates change in the future. In Part 1 the U.S. firm received $60,401.06 because it waited to exchange its Swiss francs until it actually received them. In that case the Swiss franc strengthened, so the firm received more money by not entering into a forward contract.

In Part 2, however, the firm agreed to receive $57,045.10 by selling its Swiss francs through a forward contract. If it had not entered into the forward contract but instead just waited, it would have received $60,401.06. It would appear the firm lost money by entering the forward contract.

The question that should be in your mind is, “Why in the world would the firm enter into a forward contract, when if it just waited and exchanged its francs when it received them, it would get more U.S. dollars?” The answer is really fairly straight-forward and demonstrated in Part 3. It DID NOT KNOW at the agreement date whether the Swiss franc would strengthen, weaken, or remain the same. Since it had no way of knowing the direction of exchange rate movements, if any, the firm was willing to lock in at the forward contract rate (a known price) to avoid the uncertainty associated with waiting (i.e., the exchange rate risk).

Chapter Objective: Describe the factors that cause currencies to appreciate or depreciate on foreign exchange markets.

Currency Appreciation Or Depreciation

Exchange rates are largely a function of supply and demand for currencies. If demand for a currency rises relative to the supply, the currency should appreciate in value. If supply increases relative to demand, the currency should depreciate. There are three major factors that cause a country’s currency to appreciate or depreciate.

- Differential income growth among nations will cause nations with the highest income growth to demand more imported goods. Countries experiencing faster growth than its trading partners will have an increase in demand for foreign currencies to pay for the imported goods. There will be an increase in the supply of the fast growth country’s currency together with more demand for foreign currencies. The result will be that the currency of the faster growth nation will depreciate relative to the currencies of the trading partners.

- Differential inflation rates will reduce demand for the currencies with higher inflation rates. If a country’s inflation rate is higher than their trading partner’s, the demand for the country’s currency will be low, and the currency will depreciate.

- Differential interest rates will cause a flow of capital into those countries with the highest available real rates of interest. Therefore, there will be an increased demand for those currencies, and they will appreciate relative to countries whose available real rate of return is low.

Chapter Objective: Describe the components of the balance of payments.
Balance Of Payments Components

Balance of payments (BOP) accounting is a method used to keep track of transactions between a country and its international trading partners. The BOP accounts reflect all payments and liabilities to foreigners and all payments and obligations received from foreigners. The BOP equation is:

\[
\text{current account} + \text{capital account} + \text{official reserve account} = 0
\]

The current account measures the exchange of merchandise goods, the exchange of services, the exchange of investment income, and unilateral transfers (gifts to and from other nations). Basically, the current account includes all international transactions for goods and services. If an American buys a pair of shoes made in Italy, the transaction shows up in the current account. If a Japanese citizen hires an American lawyer, that transaction shows up in the current account. When the media reports on the “trade deficit,” it is usually referring to the balance of merchandise trade, which is the goods component (and the largest piece) of the current account. The balance on current account summarizes the balance on goods and services, the exchange of investment income, and unilateral transfers.

The capital account measures the flow of funds for debt and equity investment into and out of the country. Instead of goods and services, the capital account includes transactions involving the assets of another country. If an American buys land in Italy, that transaction would be in the capital account. Similarly, if a Japanese investor bought US Treasury securities (or stock in a U.S. based company), that transaction would be in the capital account.

The official reserve account represents funds held on deposit at the International Monetary Fund (IMF) in the form of gold, other foreign currencies, and SDRs (special drawing rights at the IMF). The easiest way to think of the official reserve account is as a cushion. Note that the Balance of Payments sums to zero. A negative balance in the current account must be offset by a positive balance in the capital account, and vice-versa. The official reserve account acts as a cushion to absorb a small imbalance between the current and capital accounts.

In order for the balance of payments to sum to zero, changes in the current account must be offset by changes in the capital account. This makes sense when you think about it. Assume that an American buys a bottle of French wine using dollars. The French wine seller now has dollars. Those dollars are no good in France, but they can be used either to buy American goods or to buy American assets. Either way, the dollars have to come back to the U.S. because they represent U.S. assets. In recent years, the U.S. has had large merchandise trade deficits, and large current account deficits, meaning that U.S. citizens have bought a lot of foreign goods. If foreigners bought lots of US goods, the current account deficit could be reduced. Otherwise, those dollars will come back to the U.S. through the purchase of U.S. assets, which will create a surplus in the U.S. capital account. In fact, this is just what has happened, and the large proportion of foreign ownership of U.S. stocks and bonds reflects the capital account surplus of recent years.

Summary

Section 1: Three Great Economists

A. Adam Smith (1723–1790) is considered the father of the free enterprise system and the first “true” classical economist. Classical economists believe in laissez-faire (i.e., the government should only provide and protect peace and property rights, and should not interfere in the economy).

B. Karl Marx (1818–1883) believed that the proletariat should control all means of production. Marxist philosophy holds that capitalism is doomed to evolve into socialism, then into communism. In the Marxist system, there would be no private property. All property is owned collectively and is available to each according to need.
C. John Maynard Keynes (1883–1946) was a devoted capitalist whose views differed greatly from the classical economists. He believed that during a recession wages and prices will not automatically go lower and that the only way to recover from a recession is to increase government expenditures in an effort to stimulate demand and bring the economy back to full employment.

Section 2: Supply And Demand

A. Supply is defined as the amount of an item available for purchase. An item is supplied only if the price received from selling it is sufficiently greater than the total cost to provide it. An increase (decrease) in supply usually decreases (increases) price.

B. Demand is defined as the total amount of an item society wants to purchase, which depends upon several factors (the number of potential consumers, price, the availability of substitutes, whether a necessity or a luxury, and the amount of money in the economy). An increase (decrease) in demand usually increases (decreases) price. The combination of supply and demand sets prices.

Section 3: Macroeconomics

A. Gross domestic product (GDP) is the total market value of all final goods produced within a country, regardless of the nationality of the producer. GDP measures both output and income, which are equal. Two approaches to measuring GDP include the Expenditure Approach (a demand-based concept) and the resource cost-income approach [a supply- (i.e., production) oriented approach]. Gross National Product is the total market value of all final goods and services produced by the citizens of a country, no matter where they are residing. GDP Deflator is a general price index that corresponds to the price change in all final goods and services produced. The consumer price index (CPI) differs from the GDP deflator in several ways. CPI is useful for measuring inflation in the consumer goods sector.

B. Inflation is an artificial increase in prices due to excess demand. Inflation is usually caused by too much money in the economy.

C. Unemployment

1. Frictional unemployment is due to the inability to convey information that qualified workers for particular jobs are available.
2. Structural unemployment is due to changes in the structure of the economy.
3. Cyclical unemployment is caused by a decrease in aggregate demand.

D. Fiscal Policy—Governments use taxation and spending to achieve macroeconomic goals by either slowing or stimulating an economy.

E. Monetary Policy—The money supply in most countries is controlled by the central bank (the Fed in the U.S.). Increasing the money supply reduces interest rates, which stimulates borrowing, stimulates the economy, and increases expenditures.

F. Marginal Propensity to Consume—The proportion of each additional dollar of income spent on personal consumption is the marginal propensity to consume (MPC).

G. Classical Economics—Economists before John Maynard Keynes (1883–1946) believed in a laissez-faire approach and thought that it was impossible to overproduce relative to total demand because supply (production) creates its own demand. During a recession, prices and wages will drop quickly enough to bring the economy back to full employment.

H. Keynesian Economics—Instability in a Keynesian world is driven from the demand-side of the economy. The main sources of economic instability are consumer spending, private investment, and government expenditures.

Section 4: Microeconomics

A. Shifts in Demand vs. Movements Along Demand Curves A movement along a specific demand curve represents the change in quantity demanded resulting from a change in price. Demand curve shifts are called changes in demand.

B. Elasticity refers to the amount of the decrease or increase in demand, when prices and/or income change.

C. There are several different types of costs:

1. Fixed costs remain unchanged in the short run.
2. Variable costs are related to the level of production, not the passage of time.
3. Average total cost equals the total costs (fixed and variable) divided by the number of units produced.
4. Marginal cost is the cost of producing one additional unit of output.
D. The law of diminishing returns states that as more and more resources (e.g., labor) are devoted to the production process, they increase output, but at an ever decreasing rate.
E. Shifts in Supply vs. Movements Along Supply Curves The change in the quantity supplied as price changes represents movements along the supply curve. Shifts in the supply curve represent changes in the quantity suppliers are willing to supply at all price levels.
F. In a purely competitive market:
   1. All the firms in the market produce a homogeneous product.
   2. There are a large number of independent firms.
   3. Each seller is small relative to the total market.
   4. There are no barriers to entry or exit.
   5. Competitors in a purely competitive market are price-takers.
G. In a price-searcher market (noncompetitive market), firms enjoy a certain amount of control over the supply of the good and can manipulate prices. They search for the price at which they maximize profits.
H. The monopoly market structure has the following characteristics:
   1. One seller of a specific, well-defined product that has no good substitutes.
   2. Barriers to entry are high.
I. Oligopoly is a market structure characterized by:
   1. A small number of sellers.
   2. Interdependence among competitors.
   3. Significant barriers to entry.
J. Regardless of the industry market structure, an individual firm will continue to expand production (output) until marginal revenue (MR) equals marginal cost (MC).

Section 5: International Economics
A. Comparative advantage is the ability of one trading partner to produce a good at a lower opportunity cost than others can produce it. Trading partners are better off if they specialize in the production of goods for which they are the low-opportunity cost producer and trade for (purchase) those goods for which they are the high-opportunity cost producer.
B. Tariffs benefit domestic producers of products because the level of imports will be reduced due to an effective increase in the price of importing the good. Quotas limit the quantity of an imported good. Quotas can be more harmful than tariffs.
C. Trade restrictions create jobs only in the short run. Trade restrictions prevent your trading partners from developing the purchasing power needed to buy imported goods from you, thus depressing your own export industry.
D. The trading (exchanging) of currencies takes place in foreign-exchange markets. Participants in the foreign-exchange (interbank) market are large commercial banks, foreign-exchange brokers, major multinational corporate customers, and central banks.
E. The foreign currency spot market is where currencies trade for immediate delivery. The foreign currency forward market is where contracts are used to buy or sell currencies for future delivery.
F. Exchange rates are determined by the relative supply of and demand for currencies, which are driven by interest rates, inflation rates, and relative growth rates.
G. The Balance of Payments captures all of a country’s transactions in international markets, and includes the current account, capital account, and official reserve account.

Practice Questions: Economics

1. The economic concept most commonly associated with John Maynard Keynes is that:
   A. market prices will penalize or reward individual economic decisions.
   B. government should increase expenditures during a recession.
   C. labor will inevitably become a commodity, just another input in the production process.
D. markets will always adjust quickly to direct the economy to full employment.

2. Classical economists would agree with all of the following statements EXCEPT:
   A. supply creates demand by providing jobs and wages.
   B. wages and prices will decline fast enough during a recession to foster an economic recovery.
   C. economic recessions are not a result of insufficient demand.
   D. deficit spending by the government will speed economic recovery from a recession.

3. Lekross Dairy can produce and package cheese for $1.20 per pound. Lekross can ship this cheese locally for $0.15 per pound, but the cost to ship over distances greater than 50 miles is $0.55 per pound. A local Grocer (Localmart) has offered to buy Lekross cheese for $1.30 per pound, while a Grocer 80 miles away (Far Stores) has offered $1.80 per pound. Given this situation, you should:
   A. accept Localmart’s offer, but decline the offer of Far Stores.
   B. accept Far Stores’ offer, but decline the offer of Localmart.
   C. accept both offers.
   D. accept neither offer.

4. Lionel Mandrake has been tracking sales of various products at a local grocery store. He has noticed that when prices of orange juice increase, sales of fruit punch increase. He has also noticed that when prices of cookies increase, sales of milk decrease. Based on this information, Mandrake should conclude that:
   A. orange juice and fruit punch are substitutes, and milk and cookies are substitutes.
   B. orange juice and fruit punch are substitutes, and milk and cookies are complements.
   C. orange juice and fruit punch are complements, and milk and cookies are substitutes.
   D. orange juice and fruit punch are complements, and milk and cookies are complements.

5. Which of the following statements most accurately reflects the law of supply?
   A. Businesses will produce only the quantity of goods they believe consumers will buy.
   B. Consumers will buy more of a good as the price of that good declines.
   C. As the price of a good increases, more of that good will be supplied.
   D. As more inputs are devoted to production, output increases at an ever decreasing rate.

6. Gasoline is a product for which demand is inelastic relative to supply in the short run. If the government imposes a new tax on gasoline producers:
   A. the statutory incidence of the tax will fall more heavily on gasoline consumers than gasoline producers.
   B. the tax incidence will fall more heavily on gasoline consumers than gasoline producers.
   C. the tax incidence will fall more heavily on gasoline producers than gasoline consumers.
   D. the tax incidence will most likely be split evenly between producers and consumers.

7. If full employment in the U.S. is 95 percent and the current rate of unemployment is 6 percent, which of the following statements is FALSE?
   A. The natural rate of unemployment is 5%.
   B. Structural unemployment is less than 5%.
   C. Frictional unemployment is less than 5%.
   D. Cyclical unemployment is greater than 5%.

8. Assume that nominal GDP for 2004 was $11,466 billion. If the GDP deflator for 2000 (base year) was 100, and the deflator for 2004 is 107.24, what is real GDP for 2004?
   A. $12,296 billion.
   B. $11,668 billion.
   C. $11,267 billion.
   D. $10,692 billion.
9. The President of the U.S. has recently proposed a broad-based tax cut. This is an example of all of the following EXCEPT:
   A. restrictive monetary policy.
   B. Keynesian fiscal policy.
   C. an attempt to stimulate economic growth.
   D. macroeconomic policy.

10. If the Consumer Price Index (CPI) was 184.3 at the end of 2003 and 190.3 at the end of 2004, then inflation in 2004 was closest to:
   A. 1.033%.
   B. 3.15%.
   C. 3.26%.
   D. 6.00%.

11. Which of the following is an example of how the Federal Reserve (Fed) could implement an expansionary monetary policy?
   A. Sell U.S. Treasury securities in the open market.
   B. Lower the marginal tax rate for wealthy taxpayers.
   C. Lower the discount rate on short-term funds.
   D. Raise the marginal tax rate for wealthy taxpayers.

12. The law of diminishing returns suggests that:
   A. firms producing near their maximum capacity will experience decreasing marginal revenue.
   B. variable costs will increase as output increases.
   C. average variable costs will increase at high levels of output.
   D. average fixed costs will increase at high levels of output.

13. Alchemy Inc. has just received government patent protection on an expensive process that converts copper into silver. This patent protection:
   A. is a high entry barrier.
   B. will allow Alchemy to recover its costs of research and development.
   C. will grant Alchemy a monopoly position.
   D. all of the above.

14. Joe’s Cafe has found that the price elasticity of demand for desserts is –1.5. Based on this fact, Joe’s cafe should expect that:
   A. lowering the price of desserts would reduce demand by more than the percentage price reduction.
   B. raising the price of desserts would reduce demand, but by less than the percentage change in price.
   C. lowering the price of desserts would increase demand by more than the percentage price reduction.
   D. raising the price of desserts would increase demand by more than the percentage change in price.

15. Protext is a liquid sealant used to protect metal surfaces from harsh weather environments. Protext is made from several chemicals, including oil and other petroleum derivatives. All of the following would be likely to cause a shift in the supply curve for Protext EXCEPT:
   A. an increase in oil prices.
   B. development of a less expensive production process for Protext.
   C. an increase in the retail price of Protext.
   D. a decrease in oil prices.
16. A purely competitive firm will maximize profits by setting output at the point where:
   A. unit price equals marginal cost.
   B. average cost equals marginal revenue.
   C. average total revenue equals average fixed cost.
   D. marginal revenue equals average variable cost.

17. According to the law of comparative advantage, trading partners should:
   A. specialize in the production of goods where they have an absolute advantage.
   B. impose tariffs on goods where they have low opportunity costs of production.
   C. import goods for which they have high opportunity costs of production.
   D. seek to import goods from nations with low wage rates.

18. Quotas are often considered to be more harmful forms of trade restrictions than tariffs because:
   A. quotas provide no cash flow benefits to the domestic government.
   B. tariffs provide greater cash flow benefits to the foreign producers.
   C. quotas benefit domestic producers at the expense of domestic consumers.
   D. tariffs benefit domestic consumers at the expense of foreign producers.

19. Wakeup, Inc. is a U.S.-based firm that imports coffee from Brazil and packages it with muffins
    and sweet rolls in gift baskets sold as holiday gifts. Wakeup will need 1 million Brazilian Reals
    (BRL) in 30 days to pay for its latest shipment of coffee. The current exchange rate is 2.725
    BRL/$. The 30-day forward rate of exchange is 2.780 BRL/$. If the spot rate of exchange 30
    days from now is 2.745 BRL/$, how much will Wakeup need to pay in dollars?
    A. $359,712.
    B. $2,780,000.
    C. $364,299.
    D. $2,745,000.

20. All of the following transactions would affect the U.S. current account EXCEPT:
    A. U.S. oil refinery’s purchase of oil from Saudi Arabia.
    C. French consumer’s purchase of U.S. manufactured DVD.
    D. foreign aid payments made for disaster relief.

Answers

1. B
   Keynes believed that government spending during a recession could offset reductions in aggregate
   demand resulting from reduced private sector activity. Choice “A” is more closely associated with Adam
   Smith’s “invisible hand.” Choice “C” is Marxist philosophy, and choice “D” is most likely a classical
   economist belief.

2. D
   This is Keynesian economics. Classical economists favor a “hands-off” approach where the
government does not interfere with the operation of the private sector economy.

3. B
Lekross’ cost for cheese delivered to Localmart is \(1.20 + 0.15 = 1.35\) per pound. For Far Stores, the cost delivered is \(1.20 + 0.55 = 1.75\) per pound. Far Stores’ offer will cover Lekross’ costs, while any cheese sold to Localmart would generate a loss.

4. B

Complements are products where demand for one is directly related to demand for the other (i.e., an increase in demand for one leads to an increase in demand for the other), while substitutes are products where demand for one is inversely related to demand for the other. In this case, higher orange juice prices (which would lower demand) cause buyers to increase demand for fruit punch (substitute). Higher cookie prices (which would lower demand), cause lower milk demand (complement).

5. C

The law of supply says higher prices for a good will lead to an increase in supply. Choice “B” is the law of demand, and choice “D” is the law of diminishing returns.

6. B

If demand is inelastic relative to supply, quantity demanded will be less sensitive to price changes than quantity supplied. Consumers are willing to bear more of the price increase (or have less flexibility to alter their demand), so they will pay more of the tax. The statutory tax incidence refers only to who is responsible for actually paying the tax, and does not address who bears the economic burden of the tax.

7. D

The natural rate of unemployment would include both frictional and structural unemployment and would be calculated as \(1 - 0.95 = 0.05\), or 5%. Any excess would be cyclical in nature.

8. D

\[
\text{Real GDP}_{2004} = \frac{\text{nominal GDP}_{2004}}{\text{GDP deflator}_{2004}} \\
= 11,466 \times \frac{100.00}{107.24} = \$10,692 \text{ billion}
\]

9. A

Government taxing and spending is fiscal policy, which is macroeconomic policy. Tax cuts are believed to stimulate the economy, although research does not entirely support this belief.

10. B

The formula for calculating inflation from the CPI is:

\[
\text{inflation} = \frac{\text{CPI}_T}{\text{CPI}_{T-1}} - 1 = \frac{190.3}{184.5} - 1 = 0.326 = 3.26\%
\]

11. C

Lowering the discount rate would lower the cost of borrowing and hopefully stimulate the economy. This would be expansionary monetary policy. Selling Treasury securities in the open market would be a restrictive policy, as this would remove money from circulation. Adjusting tax rates would be fiscal policy carried out by the Treasury, not the Fed.
12. C

The law of diminishing returns holds that as more and more resources are devoted to production, the manufacturer increases output at a decreasing rate. Stated differently, more and more variable inputs will be required to produce another unit of output, which will raise average variable costs.

13. A

The patent is a barrier to entry, but there are still other ways to produce silver (i.e., mining). Alchemy’s ability to recover its expenses will depend on how expensive the process is; it may be cheaper to mine silver than to convert copper.

14. C

The price elasticity of demand for desserts of –1.5 indicates that changing price would lead to a more than commensurate change in demand (in the opposite direction). Therefore, lowering dessert prices would increase demand by more than the change in price.

15. C

A change in the price of Protext would simply lead to a move along the supply curve. A change in the cost of the production process or a change in the price of raw materials would cause the entire curve to shift. Note that the question does not ask which way the curve is shifting.

16. A.

Remember that for the purely competitive firm, unit price equals marginal revenue - the firm faces a flat demand curve. Therefore profit will be maximized at the level where marginal revenue (or unit price) equals marginal cost.

17. C

Comparative advantage holds that nations should produce and export goods where they have low opportunity costs of production and import goods where they have high opportunity costs of production.

18. A

Tariffs provide some cash flow benefit to the domestic government, but quotas do not. Foreign producers get more income under quotas because there is no amount paid to the domestic government. Both types of restrictions allow domestic producers to charge higher prices at the expense of domestic consumers. Tariffs do not benefit domestic consumers.

19. C

To buy 1 million BRL in 30 days, Wakeup will need $364,299. The current spot and forward rates do not matter unless Wakeup is interested in setting up a hedge or evaluating its exchange risk.

20. B

Purchasing the Treasury bond would affect the capital account, not the current account. The other transactions would all be included in the current account.
Chapter three: **Fundamentals of Financial Statements**

**Overview**

Financial statements are useful in helping investors and creditors evaluate firms. They give a snapshot of the firm’s assets, liabilities, and equity at a point in time (the balance sheet) as well as a summary of the firm’s operating performance over a specified time period (the income statement). They show the firm’s operating, investing, and financing cash flows over a specified period (the statement of cash flows) and the amounts of and changes in ownership (the statement of owners’ equity).

Before evaluating financial statements, you need a reasonable understanding of the major accounts contained in the statements and the accounting methods used to generate them. Section 1 gives you a discussion of accounting principles, methods, and procedures. Section 2 follows with an overview of the four principal financial statements. Section 3 then provides a more thorough discussion of accounting issues related to several balance sheet accounts. Section 4 illustrates the procedures with a comprehensive example.

**Section 1: Principles And Procedures**

Financial statements in the U.S. are prepared using guidelines that are determined by the Financial Accounting Standards Board (FASB). The FASB is an independent, non-governmental body that sets accounting standards for all companies issuing audited financial statements. Both the SEC (Securities and Exchange Commission) and the AICPA (American Institute of Certified Public Accountants) recognize FASB Statements as authoritative, so there is only one set of generally accepted accounting principles (GAAP) in the U.S. The FASB has sought to establish a conceptual framework with the hope of creating a system of consistent financial reporting objectives and concepts. The conceptual framework is described by a set of Statement of Financial Accounting Concepts.

These guidelines establish the form and content of financial statements to help keep them standardized across companies and industries. The intent is to generate standardized, comprehensible information “for those with a reasonable understanding of business and economic activities (who) are willing to study the information with reasonable diligence.”[^1] In Section 2, we’ll look closely at the four principal financial statements and how they relate to one another. But first we will take a closer look the basic underlying tenets of financial accounting. These basic principles help to ensure the accuracy, consistency, comparability, reliability, and overall integrity of financial information.

**Statement of Financial Accounting Concepts 1 (SFAC 1)** states that financial statements should provide useful information to investors and creditors for evaluating the amount, timing, and uncertainty of future cash flows. Said differently, the objective of financial analysis is the comparative measurement of risk and return as it relates to investment choices or credit decisions.

**Chapter Objective:** Describe the important characteristics of accounting information.

**Statement of Financial Accounting Concepts (SFAC) 2** mandates the qualitative characteristics of accounting information. Financial statement information should facilitate comparisons of firms using alternative reporting methods and be useful for decision making. For accounting information to be useful for an analyst, it should have the following characteristics:

- **Relevance.** Relevance pertains to information that could potentially affect a decision. The relevance of accounting information to an analyst is going to depend to a large extent on the analyst. For example, an equity analyst is going to be most concerned with earnings and growth rates.
Timeliness. One important component of relevance is timeliness. Timeliness reflects the fact that information loses value rapidly in the financial world. Timely data is helpful in making projections into the future on which market prices are based.

The qualities of relevance and reliability can often be at odds with one another. For example, market value data is relevant but may not be reliable; on the other hand, historical cost data is highly reliable but may have little relevance.

Reliability. Reliability refers to information that can be verified (measured accurately) and has representational faithfulness (they are what they report to be). Without these two characteristics, data cannot be relied upon to make investment decisions. Reliable information should also reflect neutrality (does not consider the economic impact of the reported information).

Consistency. Accounting information should be consistent to the extent that the same accounting principles are used over time.

Comparability. Information should allow comparisons among companies. Comparability is often a problem in financial analysis due to the fact that companies use different accounting methods and estimates.

Materiality. Materiality answers the question of which data are important enough (or of sufficient amount) for inclusion in the financial statements. Many analysts define materiality in quantitative terms (e.g., 5% of assets); however, most analysts agree that an item is material if it affects the value of the firm.

Chapter Objective: Describe the application of accounting principles, both in the U.S. (through GAAP) and internationally (through IASB).

GAAP

In the U.S., financial statements are prepared according to U.S. Generally Accepted Accounting Principles (GAAP). In developing countries, financial statements are often prepared according to the standards of the International Accounting Standards Board (IASB), U.S. GAAP, or U.K. GAAP. It is noteworthy that these standards boards assume the primary users of financial statements are investors and creditors and tailor their standards to satisfy the needs of these groups generally. However, other outside users depend upon these statements to provide them with useful financial information.

U.S. GAAP comprises a set of principles that are patterned after a number of sources, including the FASB, the Accounting Principles Board (APB), and the American Institute of Certified Public Accountants Research Bulletins (among others). Organizations outside of FASB may provide guidance for proper accounting where standards are non-existent, unclear, or specific to a certain industry.

The Securities and Exchange Commission (SEC) governs the form and content of the financial statements of publicly traded companies. However, the SEC has allowed the Financial Accounting Standards Board (FASB) much of the responsibility for the content of financial statements (the balance sheet, the income statement, the statement of cash flows, and the statement of stockholders’ equity). While recognizing FASB Statements of Financial Accounting Standards (SFAS) as authoritative, the SEC also issues accounting rules, often dealing with supplementary disclosures. For example, the SEC mandates the MD&A, which provides additional information on the management’s perspective of current and past performance.

Filings with the SEC often contain valuable information not presented in stockholder reports. SEC filings include 10-K Annual Reports (financial statements and schedules and management discussion and analysis), 10-Q Quarterly Reports (financial statements and management discussion and analysis), and 8-K
Current Reports (changes in control, acquisitions and divestitures, bankruptcy, changes in auditors, and resignations of directors).

Accounting principles under GAAP follow a certain hierarchy according to level of authority:

Level A (highest level of authority)
- FASB statements and interpretations
- APB opinions
- AICPA accounting research bulletins

Level B
- FASB technical bulletins
- AICPA industry audit guides “cleared” (meaning no objections) by FASB
- AICPA statements of position at level B

Level C
- Positions of the FASB Emerging Issues Task Force
- Cleared AcSec (AICPA’s Accounting Standards Committee) practice bulletins

Level D
- AICPA accounting interpretations
- Question and answer guides published by FASB
- uncleared AICPA statements of position
- uncleared AICPA industry audit and accounting guides

Level E (lowest level)
- FASB concepts statements
- APB statements
- AICPA issues papers
- IASB statements

International Accounting Standards

There is no internationally accepted set of accounting standards. Differences in accounting and reporting standards make it difficult to compare investments in U.S. firms with those in other countries.

The International Organization of Securities Commissions (IOSCO) is an organization of more than 65 countries’ security regulators (including the U.S. SEC) that investigates and sets standards on multinational disclosure and accounting statements. Implementation and regulation of accounting standards is left to the governing authority in each individual member country.

The International Accounting Standards Board (IASB) is attempting to provide uniformity to accounting standards across different nations and has issued more than 40 new accounting proclamations. Although the IASB can issue standards, it lacks any enforcement mechanism. However, many national governments have adopted the IASB structure and require financial reporting to conform to IAS. International Accounting Standards (IAS GAAP) and U.S. GAAP are moving closer together through time.

Classes Of Users

The concepts and techniques of financial statement analysis described in this chapter are aimed at external users, such as:
- Investors: both creditors and equity investors.
  - Equity investors are interested in identifying firms with long-term earning power, growth opportunities, and ability to pay dividends.
  - Short-term creditors are more concerned with the liquidity of the business.
Long-term creditors (investors in bonds) focus on the long-term asset position and earning power.
- Government: regulators and taxing authorities.
- Others: general public, special interest groups, labor, etc.

**Periodicity Concept**

Reporting of financial accounting data is done in periods of time—based on the time-period principle—and these periods may be of any length of time. Companies tend to use the year as the primary length of the period but also report for periods less than a year (e.g., quarterly) on an interim basis.

The statements are prepared at the end of a uniform period of time to allow comparisons across time. Financial statements are prepared at the conclusion of each of these accounting periods, summarizing the activities that occurred during the period. It is important to note that the 12-month reporting period (i.e., the fiscal year) chosen by management does not have to coincide with the calendar year ending December 31.

**Chapter Objective:** Describe the double entry system of accounting and how this system relates to the basic accounting equation.

**Double Entry Accounting: Debits And Credits**

All accounting is based on a double entry system, where there are at least two sides to every transaction. When any transaction is entered into an accounting system, there must be at least two accounts affected (there can be more), one for each side of the transaction. This is a result of the basic accounting equation, which is the underlying basis of the statement of financial position or balance sheet. The equation is as follows:

assets = liabilities + owner’s equity

As with any equation, a change to one side must be offset by either an equal change in the same direction on the other side, or an opposite and offsetting change on the same side. Otherwise, the “equals” sign is violated and the equation fails. The accounting equation tells us what assets are owned or used by the firm, as well as where they came from. All of a firm’s assets must be financed either with some form of debt or equity. This should make sense. If you start a business, you must have capital in order to acquire assets. You might use your own money (equity), or you might borrow money (liabilities).

We use the terms **debit** and **credit** in double entry accounting, which are simply Latin for left side and right side. And because we are referring to the left and right sides of an equation, the left side must equal the right side, or the debits must equal the credits. Debits and credits should not be viewed in terms of positives, negatives, good, bad, indifferent, or otherwise. How each of the different types of accounts is increased, whether on the left or right, is outlined in Figure 1.

<table>
<thead>
<tr>
<th>Accounts</th>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>Increase</td>
<td></td>
</tr>
<tr>
<td>Liabilities</td>
<td></td>
<td>Increase</td>
</tr>
<tr>
<td>Owner’s Equity</td>
<td></td>
<td>Increase</td>
</tr>
<tr>
<td>Revenues</td>
<td></td>
<td>Increase</td>
</tr>
</tbody>
</table>
For the sake of simplicity, the decreases to each account were left blank. Obviously, if you know how an account increases, its decrease will be just the opposite.

The basic accounting procedure begins by recording a business’s economic events or financial transactions. This record keeping begins in the general journal, which is also called the book of original entry. Initially, raw data is captured in chronological order and entered in the journal in a format called the journal entry. Like the accounting equation, journal entries also have a left and right side. How raw data is captured on the books, whether on the debit (left) or credit (right) side of a journal entry is how it will remain not only on the books, but also in the final accounting output or financial statements. We will look at some basic examples of journal entries shortly.

The second step in the process is to take the raw data that was captured in the general journal and classify or sort the information into a useable format. This is done through a process called posting. In this process, each journal entry is literally taken apart and sorted to its respective account in the general ledger. The general ledger is a book of accounts with debit and credit columns. However a transaction was recorded in the general journal, whether as a debit or credit, it should be transferred in exactly the same way to the general ledger. Once this is done, specific account totals can be determined at any time by totaling the debit and credit columns within specific accounts in the general ledger and taking the difference. Depending on the type of account, one column will represent increases, while the other will show decreases.

Let’s look at an example. Assume that a hardware store buys a case of hammers from a supplier for $100. This transaction is a purchase of inventory (goods for resale) and is considered an asset exchange since inventory went up while cash went down by the same amount. The accounting entry for this sale would be to debit one account, Inventory, and credit another account, Cash.

<table>
<thead>
<tr>
<th>Date</th>
<th>Inventory</th>
<th>Cash</th>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>100</td>
<td>100</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: The words debit and credit are for demonstration purposes only. They typically are not included in a journal or T-account entry.

The debit or left-hand recording to an asset account produces an increase to the left side (asset side) of the accounting equation. In this case, we are showing an increase in inventory. At the same time, the balance of cash decreased. In order to show this equal and offsetting change to assets, the change is recorded on the right or credit side, specifically within the cash account. Any transaction that increases an asset is recorded on the left or debit side of the transaction, while decreases to assets are recorded on the right.

What if the hardware store did not want to spend cash to buy the hammers and instead asked the hammer supplier to finance the purchase? In this situation, the hardware store would owe the supplier $100. The account that results is called accounts payable, which represents a liability that must be satisfied at some point in the near future. In this case, instead of cash decreasing to offset the increase in inventory, liabilities (on the other side of the equation) would increase in the credit side of the entry to complete the balancing offset. Consistent with the accounting equation, an increase in an asset is recorded with a debit, while an increase in an equity or liability account will be recorded with a credit.
Accrual Basis Accounting

The financial reporting system depends on data stemming from accounting events or transactions and selected economic events. The following principles are the foundation of accrual accounting:

- **Recognition principle**: revenue is recognized when goods are delivered or services are performed and the associated expenses are recorded, not necessarily when cash is received for the goods or services.
- **Matching principle**: revenues and expenses are matched to the period in which the goods are sold or services are performed.
- **Historical cost**: represents a transaction’s original value. For example, the historical cost of a fixed asset is its original purchase price plus any installation and shipping fees. One advantage to historical cost is that it is objective and verifiable.

The general definition of **accrual basis accounting** says that revenues are recorded when earned, regardless of when cash is collected. Likewise, expenses are recorded when incurred regardless of when they are paid. As a result, the cash flow that results from a transaction may occur before, during, or after the transaction takes place. For example, when sales are made on credit a company delivers goods or services but allows the customer to pay later. The fact that goods or services have been rendered fixes the company’s right to collect, and revenue has been created. It also follows that net income, the difference between all revenues and expenses, is not a cash-equivalent figure.

An extremely important characteristic of accrual based financial statements is the **matching principle**, requiring related revenues and expenses to be matched or recorded within the same accounting period. Expenses that cannot be specifically identified to particular revenues should simply be recorded in the period they are incurred. A good example might be the utility bill for heating and cooling office space. It is desirable to match expenses to revenues to determine whether you actually earned a profit. If revenues and expenses are not properly matched, it is difficult to identify which products or services are profitable and which ones are not.

A good example of how accrual-based accounting works can be seen with credit sales. When a firm allows its customers to pay later rather than collecting cash at the time of sale, accounts receivable are created. Sales are reported on the income statement even though they have not actually been collected, and the amount owed by the customer is included in accounts receivable on the balance sheet. To illustrate the concept of accounts receivable, assume that a firm has an accounts receivable balance of $1,000. This means that the firm has sold $1,000 in products without collecting the cash. Credit sales of $1,000 would be recorded as follows:

<table>
<thead>
<tr>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounts receivable</td>
<td>1,000</td>
</tr>
<tr>
<td>Sales revenue</td>
<td>1,000</td>
</tr>
</tbody>
</table>

As the firm collects cash from their previous credit sales, the collections will be recorded as a debit (increase) to cash and a credit (decrease) to accounts receivable. Once the firm has received $1,000 in payments for credit sales, the balance of accounts receivable will be zero (Unless the firm has sold additional goods on credit).[^1]
The accrual basis of accounting is more useful for financial analysis because it relates reported financial information to the economic events that generated the results.

- Generally, accrual basis accounting results in a more accurate measurement of net income for the period than cash basis accounting.
- The accrual basis accounting reflects an understanding that the economic effect of revenue generally occurs when it is earned and not when cash is received.
- The economic effect of an expense is incurred when the benefit expires or is used up, not when cash is paid.
- Accrual accounting enhances the comparability of income statements and balance sheets from one period to the next.

**Cash Basis Accounting**

Contrary to accrual basis accounting, cash basis recognizes revenues when cash is received and expenses when cash is paid. Net income, under cash basis accounting, is the difference of all cash collections and payments made during the period.

The recognition of revenues and expenses on a cash basis can cause confusing and misleading financial statements. For example, assume that a firm purchases goods during December of 2004 paying $1,000. If the goods are sold for $3,000 during January of 2005, the revenue and its related expense will be recorded in two separate accounting periods. Assuming this was the only transaction, and without accrual accounting, 2004 would report a $1,000 loss while 2005 would show a $3,000 profit. Realistically, this transaction should show a $2,000 profit in 2005, the year in which the goods were sold.


2. Goods are continually sold on account while payments for prior purchases are received. In this way accounts receivable usually never gets to zero.

**Section 2: Four Primary Financial Statements**

**Chapter Objective:** List and describe the accounts found in a typical balance sheet, and demonstrate how these accounts are arranged in a classified balance sheet.

**The Balance Sheet**

The balance sheet is built upon the underlying accounting equation. As previously stated, it shows the company’s resources at a give point in time, as well as those who have claim to those resources. Claims can be categorized as debt (lender’s and creditor’s claims) and equity (owners’ claims).
is also commonly referred to as the **statement of financial position**. The following sample balance sheet illustrates the format along with a small variety of account types.

<table>
<thead>
<tr>
<th>AAA Company, Inc.</th>
<th>Current Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Balance Sheet</strong></td>
<td></td>
</tr>
<tr>
<td><strong>December 31, 2004</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Current Assets</th>
<th>Current Liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>Accounts Payable</td>
</tr>
<tr>
<td></td>
<td>$175</td>
</tr>
<tr>
<td>Marketable Securities</td>
<td>Notes Payable</td>
</tr>
<tr>
<td></td>
<td>$300</td>
</tr>
<tr>
<td>Accounts Receivable</td>
<td>Taxes Payable</td>
</tr>
<tr>
<td></td>
<td>$75</td>
</tr>
<tr>
<td>Inventory</td>
<td>Current Portion Long-Term Debt</td>
</tr>
<tr>
<td>1,200</td>
<td></td>
</tr>
<tr>
<td>Supplies</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td></td>
</tr>
<tr>
<td>Prepaid Expenses</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td></td>
</tr>
<tr>
<td><strong>Total Current Assets</strong></td>
<td><strong>Total Current Liabilities</strong></td>
</tr>
<tr>
<td>$2,750</td>
<td>$675</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Net Property, Plant &amp; Equipment</td>
<td>Long-Term Debt</td>
</tr>
<tr>
<td>5,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>Other Assets</td>
<td>Total Liabilities</td>
</tr>
<tr>
<td>1,000</td>
<td>$1,675</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Common Stock</td>
</tr>
<tr>
<td></td>
<td>$2,000</td>
</tr>
<tr>
<td></td>
<td>Additional Capital</td>
</tr>
<tr>
<td></td>
<td>1,000</td>
</tr>
<tr>
<td></td>
<td>Retained Earnings</td>
</tr>
<tr>
<td></td>
<td>$4,075</td>
</tr>
<tr>
<td></td>
<td><strong>Total Equity</strong></td>
</tr>
<tr>
<td></td>
<td>$7,075</td>
</tr>
<tr>
<td></td>
<td><strong>Total Assets</strong></td>
</tr>
<tr>
<td><strong>$8,750</strong></td>
<td><strong>Total Liabilities &amp; Equity</strong></td>
</tr>
<tr>
<td></td>
<td><strong>$8,750</strong></td>
</tr>
</tbody>
</table>

Just as shown in our simple accounting equation, assets are on the left side of the balance sheet, while liabilities and owners’ equity (claims against the assets) are on the right. And, as must be the case, total assets equal total liabilities plus owners’ equity.

The sample balance sheet for AAA Company, Inc. is also commonly referred to as a **classified balance sheet**. As we have already seen, the word classified in this context means organized or sorted. For example, the assets and liabilities are divided into categories that are current and long term. Current assets and liabilities are those that will be converted to cash, used up, or satisfied (in the case of liabilities) within one year or within the operating cycle, whichever is longer. They are also listed in a decreasing order of liquidity. Those that are most liquid, at the top, will be converted to cash or used up sooner than those below them.

Classifying the balance sheet in such a way allows users of financial information to quickly determine the firm’s overall level of liquidity, or short-term debt-paying ability. While current assets are generally used to pay current liabilities, the difference between current assets and current liabilities is called working capital. And since current assets are required to operate the business on a day-to-day basis, businesses should generally have positive working capital. If working capital is consistently negative, the business must cover the shortfall with long-term debt or additional equity financing.

Before going any further, we will provide a basic overview of the different types of accounts as well as specific accounts within each category.
Assets

Assets are resources that are owned or used by a business to produce a current or future benefit. The overall goal of most any business is to use assets to create more assets or revenues. Understanding the definition of an asset is important, as certain account titles have the potential to be somewhat misleading. Beware, however, not to confuse assets with revenues. When you look at the balance sheet in the asset section what you see are those assets owned or used by the business as of a given point in time (usually December 31st.). Revenues, on the other hand, are found in the income statement and represent the sum total of all assets created during the year. We will discuss revenues in greater detail shortly.

- **Cash.** This account not only includes cash available for immediate use, but cash equivalents such as certificates of deposit (CDs) and short-term government bonds (T-bills). Investments that are expected to be held for fewer than 90 days are considered cash equivalents.

- **Marketable securities.** Short-term investments that will be held for more than 90 days but less that a year would fall into this category. These securities can further be classified as trading securities, available for sale, or held to maturity. Their classification will determine whether they are shown on the balance sheet at current market value or historical cost.

- **Accounts receivable.** This account is created when credit sales are made to customers who agree to pay later.

- **Inventory.** Goods purchased or produced for resale. Inventory is carried on the balance sheet at the lower of cost or current market value.

- **Supplies.** Supplies differ from inventory in that they are not for resale, but instead consumed by the business internally. Examples would include pens, pencils, paper, toner for the copy machine, etc.

- **Prepaid expenses.** This particular account can be misleading in its title. Prepaid expenses are assets, not expenses. They result from advance payment for items such as rent, insurance premiums, subscriptions, fees, etc. They are an asset since they will bring a future benefit, even if not in the form of other assets or revenues. Once prepaid items are either used up or expire, they are then written off to expense.

- **Long-term fixed assets.** This category includes those assets that will be used by the business in its day-to-day operations for more than one year. It is also commonly referred to as **Property, Plant, & Equipment,** and is carried on the balance sheet at a net (generally declining) book value.
  - Land is the real estate upon which the firm’s buildings sit. Land is valued at its historical cost.
  - Plant (a.k.a. building) represents the buildings that house the firm’s production or selling activities. Plant is valued at historical cost less accumulated depreciation. Accumulated depreciation is the total previously recorded depreciation expense.
  - Equipment is the machinery or fixtures used to produce or sell inventory. Equipment is valued at historical cost less accumulated depreciation.

- **Long-term term investments.** Purchases of the debt and equity (bond and stock issues) of other companies that will be held for more than one year.

- **Intangibles.** Long-term assets that bring current and/or future benefits, but that are lacking in physical substance. Examples include patents, copyrights, franchise agreements, logos, trademarks, and goodwill.

Liabilities

Liabilities represent the current and future obligations (debts) of the firm. These obligations can be satisfied by payment in cash, but also by providing goods and services in some cases. Following are some common types of liabilities.

- **Accounts payable.** Current debts that represent balances due to suppliers. When firms make purchases of goods for either use in the business or the manufacture of inventory, they are typically offered trade credit and allowed a period of thirty to forty-five days to make payment without incurring penalties or interest.

- **Notes payable.** These debts differ from accounts payable in that they represent outright borrowing from lenders, typically requiring repayment of principle plus interest. Whereas accounts payable are
always classified as current liabilities (they are generally due within a month or so), notes payable can be classified as either short or long term, depending upon how soon they must be repaid.

- **Unearned revenues.** Again, this particular account title can be misleading in that it does not represent a revenue. By definition, revenues must be *earned*, which this is clearly not. Unearned revenues represent advance payments made by customers for whom the company has not yet provided goods or services. Once the company fulfills its part of the bargain and the earning process is complete, unearned revenues (liabilities) will be reclassified as revenues.

- **Long-term debt.** Obligations that will not be fulfilled within the current year, that arise from leasing, mortgaging, and issuing bonds. Long-term debt is most often used to procure long-term assets and requires repayment of principle plus interest.

**Shareholders’ Equity**

Shareholders’ equity is the owners’ investment and the total earnings retained from the beginning of the business.

The terms “stockholder” and “shareholder” are used interchangeably.

- *Contributed capital (paid-in-capital)* is the amount of the stockholders’ investment in the firm’s equity securities.
- *Common stock* is the portion of stockholders’ investment valued at par or stated value.
- *Other paid-in-capital* is the excess of the shareholders’ investment over the stock’s par value.
- *Retained earnings* is the total net income less the amount distributed to the owners as dividends from the beginning of business. Retained earnings is just an amount; it does not represent ready cash.

**Chapter Objective:** List and describe the accounts found in a typical income statement, and demonstrate how these accounts are arranged in a typical income statement.

**The Income Statement**

The income statement allows the user of financial information to see the results of a company’s day-to-day operations for the entire year. It is comprised of two basic components: 1) revenues and gains and 2) expenses and losses. A condensed version in the most common format is as follows.

**AAA Company, Inc.**

**Income Statement**

**Year ended December 31, 2004**

Sales

Less: Cost of goods sold

Gross margin

Less: Selling, general & administrative expenses

Income from operations

Less: Interest expense

Income before taxes

Less: Income taxes

Net income
Earnings per share

Revenues

Revenues represent a sum of all assets created during the current period. Beware, once again, not to confuse revenues with assets. If you want to know the amount and type of assets a company has at its disposal on December 31\textsuperscript{st}, you’ll have to look back at the balance sheet. Revenues, also called income, are created with the sale of goods and services. Intuitively, this is how businesses profit, by selling goods and services for greater than their cost.

Other types of revenues can result from activities outside of the day-to-day operations of the business. Such activities may include lending or investing which will produce interest and dividend income, as well as rental activities resulting in rental income. Gains are also slightly different, in that they do not result from everyday operations, but instead are created when companies sell assets (buildings, equipment, investments, etc.) for greater than their book value.

Expenses

Contrary to revenues, expenses represent an overall annual use of resources. One of the greatest uses stems from the purchase or production of goods for resale. As the costs of producing inventory are incurred, they are recorded in the balance sheet as inventory for as long as the company owns the asset. Once the asset is sold, however, its cost is removed from the balance sheet and sent to the income statement as an expense. Subtracting cost of goods sold from revenue at the point of sale results in a figure called gross profit. This provides information about the profitability of the company’s primary source of profit—selling goods. Companies that sell services will not have an account called cost of goods sold, so all costs incurred for selling services will be expensed as incurred.

Almost all assets are written off to expense at some point, some more quickly than others. For example, when supplies are used up they are written off to supplies expense. When wages are paid, wages expense is recorded along with the decrease in assets. In short, when an asset declines it is generally written off. While some assets are used up rather quickly, others may take years. The following terms represent the expense of certain categories of long-term assets:

- **Depreciation expense.** The systematic allocation of cost to expense for long-term fixed assets in the category of property, plant, and equipment.
- **Depletion expense.** The systematic allocation of the cost of natural resources to expense as they are depleted or wasted away.
- **Amortization.** The systematic allocation of cost to expense for intangible assets.

Since long-term assets provide benefits to a company for many years, their costs are written off against their benefits over the same period of time—hence the term systematic allocation.

Cost vs. expense. You should understand that the terms cost and expense are not necessarily synonymous. That is, when a company incurs a cost it may be recorded as either an asset or an expense. The decision is fairly simple, in that costs that result in assets are recorded as assets. When costs are recorded as assets they are said to have been capitalized. Not until the asset has been used up, expired, or sold will it be written off. Costs that do not ordinarily result in assets are those such as for the payment of wages, utilities, taxes, selling, and general administrative overhead.

After deducting operating expenses from gross margin, the amount remaining is income from operations, also frequently called earnings before interest and taxes, or EBIT. Interest expense is shown separately since it represents management’s choice of how to finance the firm and is a cost of borrowing rather than a day-to-day operating expense. Taxes are the last expense to be deducted, since they are computed on the net profit that precedes them. The difference between all revenues, gains, expenses, and losses results in a
final net income figure. Finally, an earnings per share (EPS) figure is provided below net income. Earnings per share is simply the current year’s net income divided by the number of common shares outstanding.

“Below The Line” Items

Discontinued Operations

When a firm decides to discontinue a portion of its diversified operations, the net income associated with the discontinued operations and any gain or loss from its disposal is separated from income from continuing operations.

The income (gain or loss net of income tax) of discontinued operations is put below the line and separated from income from continuing operations on the income statement.

Reporting Extraordinary Items

Extraordinary gains and losses are unusual and infrequent. They include gains/losses from the retirement of debt prior to maturity, foreign government confiscation, earthquake damages, losses from volcanic eruptions, etc. Most gains or losses do not qualify as extraordinary.

“Below the line” means the item is reported in the income statement after income from continuing operations. “Above the line” means that the item is reported in the income statement before (and is, therefore, a part of) income from continuing operations.

Extraordinary gains or losses net of income tax effects are reported below the line and separated from income from continuing operations on the income statement.

Changes in Accounting Methods

A change in accounting methods involves events such as changing from FIFO to LIFO, changing depreciation methods from the double declining balance method to the straight-line method, or changing from accounting for post-retirement benefits only when they are paid, to using accrual accounting procedures.

A change in accounting method must be justified based on improvements in the information provided by the financial statements and must be disclosed in the financial statements. The effect that the change in accounting method would have had on net income in prior periods must be disclosed. The sum of these effects is referred to as the cumulative effect of the accounting change. The cumulative effect of the accounting change is reported below the line, net of tax, just after extraordinary items. Do not confuse a change in accounting method (or accounting principle) with a change in an accounting estimate, such as the salvage value of an asset or its useful life. Changes in accounting estimates require no disclosure of the effect of the change on prior period income and no entry for their cumulative effect.

Consider a company that is changing from straight-line depreciation to an accelerated depreciation method. Assume that depreciation over the last five years was $10,000, but under the accelerated depreciation method it would have been $18,000. If the accelerated method had been used, pretax income would have been $8,000 less. A tax rate of 40 percent would have made the decrease in prior period net income 8,000 \( (1 - 0.4) = 4,800 \). The additional depreciation of $8,000 will be recognized in the current period, and the cumulative effect of the change, net of tax, $(4,800)$ reduces current period net income.

Chapter Objective: List and describe the components of the Statement of Changes in Equity.
The Statement Of Changes In Equity

The balance sheet and income statement are connected or *articulated* by the statement of changes in equity. Without this connection, the balance sheet would be forever out of balance. In the balance sheet we saw that owners’ equity is comprised of two parts: contributed capital and retained earnings. The statement of changes in equity will therefore show how these two components have changed throughout the year.

Contributed capital will show changes if additional stock is issued or if existing stock is repurchased and removed from the market. The more likely change to equity, however, is the annual flow of net income into (and dividends out of) retained earnings. Remember, retained earnings represents all current and prior year profits that were kept by the business. Profits that were not kept were returned to shareholders in the form of dividends. Although they usually reduce assets when paid, dividends are not an expense because they are not a required cost of doing business. Instead, dividends represent a return of capital to the owners of the business. The basic format of the statement of changes in equity is as follows.

```
AAA Company, Inc.
Statement of Changes in Equity
For the Year Ended December 31, 2004

Equity Balance at January 1, 2004
+ Additional Capital Contributions
+ Net Income for 2004
– Dividends Paid
= Equity Balance at December 31, 2004
```

Later, we will work our way through a comprehensive example. Notice as we go that assets in the balance sheet change everyday. Equity, on the other side of the balance sheet, will only be updated periodically, usually at the end of the year. Since net income represents the *change in assets* (key words “change in”) that occurs during the year, we need that change to flow into equity and keep the balance sheet in balance. In the statement of changes in equity above, you can see how the beginning balance of equity was increased with the addition of net income and decreased by dividends. Once the changes are made to equity, the year-end balance will flow to the balance sheet and maintain its balance.

**Chapter Objective:** List and describe the components of the statement of cash flows.

The Statement Of Cash Flows

The *statement of cash flows* provides information beyond that available from earnings and other financial data. This is because cash flow is essential to the continued operation of a business. The primary purpose of the statement of cash flows is to provide:

- Information about a company’s cash receipts and cash payments during an accounting period.
- Information about a company’s operating, investing, and financing activities.

Important information for investment decision making presented in the statement of cash flows includes whether:

- Regular operations generate enough cash to sustain the business.
- Enough cash is generated to pay off existing debts as they mature.
- The firm is likely to need additional financing.
Unexpected obligations can be met. The firm can take advantage of new business opportunities as they arise.

The statement of cash flows provides information on cash flows from operations, investing activities, and financing activities. Information on noncash activities must also be reported along with the statement.

The statement of cash flows relates the firm’s income statement to changes between the firm’s beginning-of-period and end-of-period balance sheets. The objective of the statement of cash flows is to show the sources of cash and all the uses of cash during the accounting period.

**Cash flow from operations** represents changes in the working capital accounts (e.g., accounts receivable, inventory, and accounts payable) and all items that flow through the income statement (e.g., cash receipts from customers, payments for goods sold, wages):

- Net cash flow from operations focuses on the *liquidity* of the company rather than on profitability.
- Under Statement of Financial Accounting Standards (SFAS) 95, interest and dividend revenue and interest expense are considered operating activities, but dividends paid are considered financing activities.
- All income taxes are considered operating activities, even if some arise from financing or investing.

**Cash flow from investing** represents the purchase or sale of productive assets (physical assets and investments) for cash:

- Investing cash flow essentially deals with the items appearing on the lower left-hand portion of the balance sheet (fixed assets).
- Investing cash flow includes:
  - Capital expenditures for long-term assets.
  - Proceeds from the sales of assets.
  - Cash flow from investments in joint ventures and affiliates and long-term investment in securities.

**Cash flow from financing** represents acquiring and dispensing ownership funds and borrowings.

Financing cash flow deals with the lower right-hand portion of the balance sheet (long-term debt and equity).

Examples include cash flows from additional debt and equity financing:

- Debt financing includes both short- and long-term financing.
- Dividends paid are a financing cash flow because dividends flow through the retained earnings statement.

**Noncash investing and financing activities** do not flow through the statement of cash flows because they do not require the use of cash. Examples are:

- Retiring debt securities by issuing equity securities to the lender.
- Converting preferred stock to common stock.
- Acquiring assets through a capital lease (only the initial purchase entries).
- Obtaining long-term assets by issuing notes payable to the seller.
- Exchanging one noncash asset for another noncash asset.
- The purchase of noncash assets by issuing equity or debt securities.

While these activities do not flow through the statement of cash flows, they should be disclosed in either the footnotes or on a separate schedule as investing or financing events that did not affect cash.

**Chapter Objective:** Construct a statement of cash flows using the indirect method.
The calculation of cash flow from operations using the indirect method starts with income after taxes (the bottom of the income statement) and adjusts backwards for noncash and other items. Changes in balance sheet items are used to adjust net income under the indirect method. Figure 2 identifies changes in balance sheet accounts as either sources of cash (added to net income) or uses of cash (subtracted from net income).

<table>
<thead>
<tr>
<th>Increase</th>
<th>Decrease</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current Assets</td>
<td>use</td>
</tr>
<tr>
<td>Current Liabilities</td>
<td>source</td>
</tr>
</tbody>
</table>

**Figure 2: Balance Sheet Items in the Cash Flow Statement**

Net income
Adjust for:
+ Noncash expenses or losses
– Noncash revenues or gains
Adjust for changes in working capital:
+ / – Changes in operating asset accounts (e.g., accounts receivable)
+ / – Changes in operating liability accounts (e.g., accounts payable)
= Cash flow from operations

**Figure 3: Cash Flow Statement Construction**

**Example: Statement of Cash Flows Using the Indirect Method**

Given the following income statement and balance sheet information, calculate the statement of cash flows using the indirect method.

**Income statement**

- Sales: $1,600
- Cost of goods sold: (1,350)
- Gross profit: 250
- Depreciation expense: 100
Interest expense 47
Equity in earnings of investment 2
Gain on the sale of old machine 10

Income before taxes $115

Income taxes
Current 35
Deferred 10

Net income after taxes $70

Balance Sheet

<table>
<thead>
<tr>
<th>1/1/end</th>
<th>1/1/beg</th>
<th>Net Change</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Assets</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cash</td>
<td>$292</td>
<td>$100</td>
</tr>
<tr>
<td>Accounts receivable</td>
<td>280</td>
<td>200</td>
</tr>
<tr>
<td>Inventory</td>
<td>700</td>
<td>800</td>
</tr>
<tr>
<td>Property, plant, and equipment</td>
<td>1,020</td>
<td>1,000</td>
</tr>
<tr>
<td>Accumulated depreciation</td>
<td>(340)</td>
<td>(300)</td>
</tr>
<tr>
<td>Investments</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td>$1,964</td>
<td>$1,810</td>
</tr>
<tr>
<td><strong>Liabilities</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accounts payable</td>
<td>$470</td>
<td>$450</td>
</tr>
<tr>
<td>Mortgage</td>
<td>550</td>
<td>600</td>
</tr>
<tr>
<td>Bank note</td>
<td>100</td>
<td>0</td>
</tr>
<tr>
<td>Deferred taxes</td>
<td>90</td>
<td>80</td>
</tr>
<tr>
<td>Common stock</td>
<td>410</td>
<td>400</td>
</tr>
<tr>
<td>Retained earnings</td>
<td>344</td>
<td>280</td>
</tr>
<tr>
<td><strong>Total liabilities and equity</strong></td>
<td>$1,964</td>
<td>$1,810</td>
</tr>
</tbody>
</table>

Additional information:
1. Dividends of $6 were paid to shareholders.
2. One new common share was sold at par value. Par is $10 per share.
3. Fixed assets were sold for $30. Original cost of these assets was $80, and $60 of accumulated depreciation has been charged to the original cost.
4. New fixed assets were purchased for $100. To pay for this acquisition, a 10-year, $100 note was issued to a bank.
5. The firm recognized a $2 gain from a subsidiary using the equity method. No cash was received.

Cash flow from operations (indirect method):

Net income $70
Add (subtract) adjustments $100
Depreciation 10
Deferred taxes (10)
Gain on the sale of machinery (2)
Equity in long-term investment (80)
Accounts receivable (use) 100
Inventory (source) 20
Accounts payable (source) 138

Net cash flow from operations 208

It is important to remember that only the current period’s depreciation is considered on the statement of cash flows under the indirect method.

You might be wondering what happened to the $60 in accumulated depreciation written off when the old machine was sold. The answer is that the depreciation was entered into the cash flow computations in earlier periods.

- Let’s scrutinize the SCF and talk a bit about its construction:
  - Depreciation and deferred taxes are noncash expenses which reduce net income. Adding them back to net income eliminates any effect on cash flows.
  - The gain on the sale of machinery is equal to the market value of the machine ($30) minus the book value of the machine at the time of the sale ($80 historical cost—$60 accumulated depreciation). Observe that the full $30 is listed as a cash flow from investing, so the $10 gain is double counting and must be removed from net income when deriving CFO.
  - The gain from the subsidiary is equity investment income that does not result in receipt of cash. Thus, it is eliminated from net income in deriving CFO.
  - Accounts receivable and accounts payable are operating (working capital) accounts whose change is classified via sources/uses. That is, changes in accounts receivable, inventory, and accounts payable are adjustments to reflect funding from customers and suppliers.

Determining cash flow from investing activities tends to be easier than calculating cash from operations. Each investing activity is classified as a cash inflow or a cash outflow. The individual items are then added together to compute cash from investing. Continuing with our example:

<table>
<thead>
<tr>
<th>Investing cash flows</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase fixed assets (use)</td>
</tr>
<tr>
<td>Sale of old machine (source)</td>
</tr>
<tr>
<td>Net cash flow from investing</td>
</tr>
</tbody>
</table>

The purchase of fixed assets is a cash expenditure and is reflected as a cash outflow.

The entire amount received from the sale of the old machine (fixed assets) is reflected as a cash inflow.

Cash receipts and payments from each financing activity are analyzed individually and then totaled to compute cash flow from financing.
The issuance of the 10-year, $100 note and the sale of common stock represent cash inflows to the firm. Dividends paid flow through retained earnings and are classified as a financing cash outflow. The repayment of the mortgage note principal constitutes a use of cash.

### Completed Statement of Cash Flows

#### Cash flow from operations (indirect method):

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net income</td>
<td>$70</td>
</tr>
<tr>
<td>Add (subtract) adjustments</td>
<td></td>
</tr>
<tr>
<td>Depreciation</td>
<td>$100</td>
</tr>
<tr>
<td>Deferred taxes</td>
<td>10</td>
</tr>
<tr>
<td>Gain on the sale of machinery</td>
<td>($10)</td>
</tr>
<tr>
<td>Equity in long-term investment</td>
<td>(2)</td>
</tr>
<tr>
<td>Accounts receivable (use)</td>
<td>(80)</td>
</tr>
<tr>
<td>Inventory (source)</td>
<td>100</td>
</tr>
<tr>
<td>Accounts payable (source)</td>
<td>20</td>
</tr>
<tr>
<td><strong>Net cash flow from operations</strong></td>
<td><strong>$208</strong></td>
</tr>
</tbody>
</table>

#### Investing cash flows

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase fixed assets (use)</td>
<td>($100)</td>
</tr>
<tr>
<td>Sale of old machine (source)</td>
<td>30</td>
</tr>
<tr>
<td><strong>Net cash flow from investing</strong></td>
<td><strong>(70)</strong></td>
</tr>
</tbody>
</table>

#### Financing cash flows

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-year note (source)</td>
<td>$100</td>
</tr>
<tr>
<td>Sale of common stock (source)</td>
<td>10</td>
</tr>
<tr>
<td>Dividends paid (use)</td>
<td>(6)</td>
</tr>
<tr>
<td>Repayment of mortgage note (use)</td>
<td>(50)</td>
</tr>
<tr>
<td><strong>Net cash flow from financing</strong></td>
<td><strong>$54</strong></td>
</tr>
</tbody>
</table>

**Net cash flow**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net increase in cash</td>
<td>$192</td>
</tr>
</tbody>
</table>
The net increase in cash is $192. Note that this is equal to the net increase in cash shown on the balance sheet ($292 – $100 = $192).

Chapter Objective: Describe the relationship between the four primary financial statements.

Connecting The Balance Sheet, Income Statement, And Statement Of Cash Flows

The **balance sheet** reports financial position:
- **Assets** are probable current and future economic benefits obtained or controlled by a particular entity as a result of past transactions or events.
- **Liabilities** are probable future sacrifices of economic benefits. They arise from present obligations of a particular entity to transfer assets or provide services to other entities in the future as a result of past transactions or events.
- **Equity** is the residual interest in the net assets of an entity that remains after deducting its liabilities.

Transactions are measured so that the following fundamental balance sheet equation holds:

\[ \text{assets} = \text{liabilities} + \text{stockholders' equity}, \text{ or } A = L + E \]

The **income statement** reports on the performance of the firm and explains some, but not all, of the changes in the assets, liabilities, and equity of the firm between two balance sheet dates. The income statement is governed by accrual concepts and the matching principle. The **elements of the income statement** include:
- **Revenues** that are inflows from delivering or producing goods, rendering services, or other activities that constitute the entity’s ongoing major or central operations.
- **Expenses** that are outflows from delivering or producing goods or services that constitute the entity’s ongoing major or central operations.
- **Gains and losses** that are increases (decreases) in equity or net assets from peripheral or incidental transactions.

**Comprehensive income** is the change in equity from transactions and from non-owner sources. It includes all changes in equity during a period except those resulting from investments by owners and distributions to owners. The purpose of the comprehensive income concept is to help distinguish income from continuing operations from other changes in carrying amounts of assets and liabilities.

The results of continuing operations, unusual or infrequent operations, taxes, discontinued operations, extraordinary items, and the effects of accounting changes are reported separately on the typical income statement. In many cases, however, the classification of items is subject to management discretion.

The **statement of cash flows** reports the cash receipts and outflows classified as operating, investing, and financing activities. **SFAS 95** defines these cash flows as follows:
- **Investing cash flows** are those resulting from acquisition or sale of property, plant, and equipment, of a subsidiary or segment, and purchase or sale of investments in other firms. Note that these must be reported on a gross basis (e.g., acquisitions separate from sale of property).
- **Financing cash flows** are those resulting from issuance or retirement of debt and equity securities and dividends paid to stockholders.
- **Cash from operations** includes the cash effects of all transactions that are neither investing nor financing as defined above.

The **statement of stockholders’ equity** reports the amounts and sources of changes in equity from transactions with owners and may include the following components: preferred shares, common shares at par, additional paid-in-capital, retained earnings, Treasury shares, employee stock ownership plan
adjustments, minimum pension liability, valuation allowance for marketable securities, and cumulative foreign currency translation adjustment.

Chapter Objective: Identify and discuss additional sources of accounting information on publicly traded companies.

Other Sources of Financial Information

Financial statement footnotes include disclosures that help explain the information summarized in the financial statements. Footnotes are required by GAAP or the SEC to allow users to improve assessments of the amount, timing, and uncertainty of the estimates reported in the financial statements. Footnotes:

- Provide information about accounting methods and the assumptions and estimates used by management.
- Are audited, whereas other disclosures, such as supplementary schedules, are not audited.
- Provide additional information on such items as fixed assets, inventory, income taxes, pensions, debt, contingencies and commitments, marketable securities, significant customers, sales to related parties, and export sales.
- Often contain disclosures relating to contingent losses. Firms are required to accrue a loss when (1) it is probable that assets have been impaired or a liability has been incurred and (2) when the amount of the loss can be reasonably estimated. A range of possible losses from a minimum to a maximum range is estimated. If it is only reasonably possible that a loss has been incurred, then footnote disclosure of that loss contingency is required. Examples include litigation, expropriation, and repurchase agreements.

A firm may use supplementary schedules to report additional information outside the financial statements.

The management discussion and analysis (MD&A) portion of a financial disclosure provides an assessment of the financial performance and condition of a company from the perspective of the company. The MD&A is required by the SEC.

The MD&A is required to discuss:

- Results from operations, with a discussion of trends in sales and expenses.
- Capital resources and liquidity, with a discussion of trends in cash flows.
- A general business overview based on known trends.

Additional areas include:

- Discussion of significant effects of currently known trends, events, and uncertainties (may voluntarily disclose forward-looking data).
- Liquidity and capital resources and transactions or events with liquidity implications.
- Discontinued operations, extraordinary items, and other unusual or infrequent events.
- Extensive disclosures in interim financial statements.
- Disclosures of a segment’s need for cash flows or contribution to revenues or profit.

Other data sources are available. Remembering that corporate reports and other publications are written by management and are often viewed as public relations or sales materials is important. Not all of the material is independently reviewed by outside auditors. Internet sources of such unaudited information include the company’s home page, EDGAR (Electronic Data Gathering Analysis, Retrieval System, www.sec.gov), that contains SEC filings, market data from exchanges, tax, and economic information.

An audit is an independent review of an entity’s financial statements. Public accountants conduct the audit, examining the financial reports and supporting records. The auditor provides an opinion on the fairness and reliability of the financial reports. The independent certified public accountant employed by the board of directors is responsible for seeing that the financial statements conform to GAAP. The auditor examines the
company’s accounting and internal control systems, confirms assets and liabilities, and generally tries to be confident that there are no material errors in the financial statements. Reading the auditor’s report is important.

The **standard auditor’s opinion** contains three parts stating that:

- Whereas the financial statements are prepared by management and are its responsibility, the auditor has performed an independent review.
- Generally accepted auditing standards were followed, thus providing reasonable assurance that the financial statements contain no material errors.
- The auditor is satisfied that the statements were prepared in accordance with GAAP and that the accounting principles chosen and estimates made are reasonable. The auditor’s report must also contain an additional explanation when accounting methods have not been used consistently between periods.

An **unqualified opinion** indicates that the auditor believes the statements are free from material omissions and errors. A **qualified opinion** may be issued if the auditor has concerns about omissions and errors.

The auditor’s opinion will also contain an explanatory paragraph when a material loss is probable but the amount cannot be reasonably estimated. These “uncertainties” may relate to the going concern assumption, the valuation or realization of assets, or to litigation. This type of disclosure may be a signal of serious problems and call for closer examination by the analyst.

**Section 3: A Closer Look At The Balance Sheet**

In this section we will address several balance sheet accounts in more detail. The specific accounts covered are marketable securities, accounts receivable, inventory, long-term assets, current liabilities, long-term liabilities, and equity.

**Chapter Objective:** Describe the different types of marketable securities and the accounting procedures for each type.

**Marketable Securities**

Short-term investments (a.k.a., marketable securities) are investments intended to be held only until cash is needed for the operations of the business. It is intended that these investments are to be held for less than one year.

Short-term investments are initially recorded at cost (cash price plus any acquisition costs, such as brokerage fees).

For this discussion, assume a company holds a short-term investment with historical cost of $10,000 and current market value of $12,000.

- If management intends to hold short-term investments in debt securities to maturity, then they are reported at their original cost. These are called **investments in securities held to maturity**. Here, the security’s book value is $10,000.
- If management classifies a short-term investment as a **trading** investment (trading investments are always considered to be current assets), then the investment is reported on the balance sheet at its **fair market value**. Any unrealized holding gains or losses due to the appreciation or depreciation of the investment must be listed as a **gain or loss on the income statement**. Here, the unrealized holding gain is $2,000 ($12,000 – $10,000).
- If management classifies a short-term investment as an **available-for-sale** (AFS) investment, then the investment is reported on the balance sheet at its **fair market value**. Any unrealized holding gains
or losses due to the appreciation or depreciation of the investment must be listed as an adjustment to stockholders’ equity, not as a gain or loss on the income statement.

- Interest or dividends received from these investments are recorded as interest or dividends earned (income). Consider short-term investments to be similar to cash equivalents.

**Chapter Objective:** Describe accounting procedures for accounts receivable, including the accounting for doubtful or uncollectible accounts.

### Accounts Receivable

Businesses often sell goods to customers on credit. Accounting for credit transactions depends on when the cash from the sale is received.

Sales to customers on credit is recorded either directly as a sale in the case when cash is received immediately from a credit card company (i.e., credit sales and debit cash) or as a current asset when cash is to be received at a later time (i.e., debit accounts receivable and credit sales).

**Example: Treatment of Accounts Receivable**

The SSS Corporation has $10,000 of credit sales and $2,000 of cash collections in its accounts receivable during the year:

The creation of accounts receivable is accounted for as:

<table>
<thead>
<tr>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accounts receivable</td>
<td>10,000</td>
</tr>
<tr>
<td>Sales revenue</td>
<td>10,000</td>
</tr>
</tbody>
</table>

The payment by customers is recorded as:

<table>
<thead>
<tr>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>$2,000</td>
</tr>
<tr>
<td>Accounts receivable</td>
<td>$2,000</td>
</tr>
</tbody>
</table>

The accounts receivable balance is now $8,000.

**Uncollectible accounts** are accounts that customers cannot or will not pay. There are two approaches to accounting for uncollectible accounts: the direct write-off method and the allowance method.

- In the case of the **direct write-off method of accounting for bad debts**, bad debt expense is recorded as the accounts are written off as uncollectible.
- The **allowance method for bad debts** requires an estimate of the bad debts, generally made on the basis of the typical relation between either bad debt expense and credit sales or between accounts receivable and the allowance for doubtful accounts.
- The allowance for doubtful accounts method is more consistent with the matching principle and is preferred.

Estimating uncollectible accounts can be done using the percentage of net sales method (i.e., estimate percent of sales that will be uncollectible) or through the aging of accounts receivable (i.e., classifying accounts based on period outstanding and using a different percent from each aged category).

If a customer pays on an account that has been written off as uncollectible, the write-off is reversed, and the allowance account is credited for the amount (and cash is debited).
The direct write-off method is used for income tax calculations and by firms with immaterial bad debts. Here the firm does not use an allowance account (accounts receivable on the balance sheet is the amount owed by customers). It recognizes bad debt expense only when a particular account is written off as uncollectible.

Chapter Objective: Discuss inventory valuation and inventory costing methods.

Inventory

The objective of inventory accounting is to determine the value of inventory that best achieves the matching of costs with revenues for the accounting period. The value of inventory determines the cost of goods sold, or COGS (hence, the income statement), and the carryover of inventory to the next period (hence, the balance sheet).

Management has choices regarding the systems and methods used for inventory accounting. Because inventory directly impacts the income statement, management’s decisions about how to account for inventory will affect net income.

Management’s choices in accounting for inventories can be separated into three main categories:

Inventory Processing Systems:
- **Periodic.** Inventory is accounted for at the end of certain periods (e.g., quarterly). Only ending inventory is counted and priced, and COGS is determined by subtracting the cost of ending inventory from the cost of goods available for sale.
- **Perpetual.** A continuous record of the quantity and cost of merchandise is maintained as purchases and sales are made. COGS is accumulated as costs are transferred from inventory to COGS as sales are made.

Inventory Costing Methods:
- **Specific identification.** The units are priced according to the specific cost of each item in ending inventory.
- **Average cost.** Inventory is priced according to the average cost of the goods available for sale during the period (goods available for sale/ number of units).
- **First-in, first-out (FIFO).** The costs of the first items acquired by the firm are assigned to the first items sold. In other words, the oldest items are assumed to be sold first, and ending inventory reflects the cost of the most recent items acquired.
- **Last-in, first-out (LIFO).** The costs of the last items acquired by the firm are assigned to the first items sold. In other words, the most recent items are assumed to be sold first, and ending inventory reflects the cost of the oldest items.

Valuation Methods:
- **Cost.** Inventory is valued at the actual cost required to purchase or produce it.
- **Lower of cost or market.** Under this approach, if the replacement cost (the cost to produce or the cost to purchase) falls, inventory is valued at the new (lower) replacement cost. In some circumstances, the sales price expected for goods in inventory may fall enough that inventory values are reduced. Because management’s various inventory accounting choices affect reported net income, they have a significant impact on the company.
- **External evaluations** of the company by investors and creditors may be affected due to the levels of reported net income. Typically, higher net income is viewed more favorably than lower net income.
- **Internal evaluations** such as performance reviews that determine management compensations and bonuses may also be impacted. In general, higher net income is viewed more favorably.
- A company’s **cash flow** is influenced by inventory accounting choices through the amount of income taxes paid. Higher COGS will result in lower net income, which in turn will result in lower taxes paid.
Because the firm is paying less cash in taxes, it will have a higher amount of cash flow than a firm paying more in taxes.

Higher net income results in more favorable external and internal evaluations but also results in higher taxes. This means management is forced to balance the goal of determining the proper level of reported income with that of tax minimization.

**Inventory cost** includes invoice price (less discounts), transportation costs, and taxes. Inventory includes not only the inventory on hand, but may include inventory items in transit.

Inventory is valued according to the chosen inventory valuation method. Thus, the cost flow may not be the same as the goods flow, the actual physical flow of goods through the company.

Inventory values and, hence, cost of goods sold are determined by choosing one of four methods of inventory costing.

Let the following be beginning inventory and purchases for the month of January for a firm that sells toasters:

<table>
<thead>
<tr>
<th>Date</th>
<th>Description</th>
<th>Unit Price</th>
<th>Units</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>01/01/2005</td>
<td>Beginning inventory</td>
<td>$12</td>
<td>1</td>
<td>$12</td>
</tr>
<tr>
<td>01/06/2005</td>
<td>Purchase of toaster #102</td>
<td>$16</td>
<td>1</td>
<td>$16</td>
</tr>
<tr>
<td>01/20/2005</td>
<td>Purchase of toasters #103 and #104</td>
<td>$20</td>
<td>2</td>
<td>$40</td>
</tr>
</tbody>
</table>

Ending inventory: 2 units (toasters #102 and #103)

Therefore, two units were sold [number of units available (4) less number of units in ending inventory (2)]. The units sold were toasters #101 and #104.

**Specific Identification**: The units in ending inventory are valued at the specific invoice price of those units sold:

Ending inventory: 2 units (#102 @ $16 and #103 @ $20) = $36
Cost of goods sold: 2 units (#101 @ $12 and #104 @ $20) = $32

**Average Cost**: The units held in ending inventory and listed as sold are valued at the average cost of goods available for sale:

\[
\text{Cost of goods available: 4 units at a total cost of $68}
\]

\[
\text{Average cost = } \frac{\text{beginning inventory + purchases}}{\text{number of units in inventory}} = \frac{12 + 16 + 40}{2} = \frac{68}{2} = 34
\]

Cost of goods available: 4 units at a total cost of $68
Average cost = $68 / 4 = $17
Ending inventory: 2 units @ $17 = $34
Cost of goods sold: 2 units @$17 = $34

**First in, First out (FIFO)**:

- Under FIFO, the unit cost of the one unit in beginning inventory and the January 6, 2005 unit purchased (first in) are assigned as the 2 units sold to calculate the cost of goods sold.
- FIFO then assigns the remaining (or last in) costs to inventory. Hence, the 2 units in ending inventory will be valued at the unit price of the 2 units purchased on January 20, 2005 (#103 and #104):

Ending inventory: 2 units @ $20 = $40
Last in, First out (LIFO)

Ending inventory: 1 unit @ $12 and 1 unit @ $16 = $28
Cost of goods sold: 2 units @ $20 = $40

- Under LIFO the unit cost of the two units of the January 20, 2005, purchase (last in) is assigned to the two units sold.
- LIFO then assigns the initial (or first in) costs to inventory. Hence, the unit cost of the beginning unit and the unit purchased on January 6, 2005, are assigned to the two units in ending inventory.

Please understand that LCM valuation is not performed in lieu of LIFO or FIFO inventory valuation. First, the company values inventory based on the chosen cost-flow methodology and then the LCM value is compared to this balance. If the LCM value is less than the LIFO/FIFO valuation, LCM is applied.

<table>
<thead>
<tr>
<th></th>
<th>AVG</th>
<th>FIFO</th>
<th>LIFO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beginning inventory</td>
<td>$1</td>
<td>$12</td>
<td>$1</td>
</tr>
<tr>
<td>$2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Plus purchases</td>
<td>$5</td>
<td>$56</td>
<td>$5</td>
</tr>
<tr>
<td>$6</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of goods available</td>
<td>$6</td>
<td>$68</td>
<td>$6</td>
</tr>
<tr>
<td>$8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less ending inventory</td>
<td>($34]</td>
<td>($40]</td>
<td>($28</td>
</tr>
<tr>
<td>$4</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cost of goods sold</td>
<td>$3</td>
<td>$28</td>
<td>$4</td>
</tr>
<tr>
<td>$4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

During periods of increasing inventory and rising prices:
- The FIFO method will result in the lowest COGS—first in, which goes to cost of goods sold, is the less expensive—and the highest net income. The higher the net income, the greater the inventories on the balance sheet [under FIFO, the last in (most expensive) goes to inventory]. Higher net income also means the firm will pay higher taxes, which in turn results in lower cash flows.
- LIFO will result in the highest cost of goods sold (last in is the most expensive) and lowest income. The lower the net income, the smaller the inventories on the balance sheet [under LIFO, the first in (least costly) goes to inventory]. Lower net income also means the firm will pay less in taxes, which in turn results in higher cash flows.
- The average cost method, being an average, is between the FIFO and LIFO valuations.
- Specific identification cannot be generalized because it depends upon the specific situation.

Figure 4 shows a comparison of the effects of LIFO and FIFO in periods of rising prices and stable or increasing inventory quantities.
<table>
<thead>
<tr>
<th>LIFO results in . . .</th>
<th>FIFO results in . . .</th>
</tr>
</thead>
<tbody>
<tr>
<td>higher COGS</td>
<td>lower COGS</td>
</tr>
<tr>
<td>lower taxes</td>
<td>higher taxes</td>
</tr>
<tr>
<td>lower net income</td>
<td>higher net income</td>
</tr>
<tr>
<td>lower inventory balances</td>
<td>higher inventory balances</td>
</tr>
<tr>
<td>lower working capital</td>
<td>higher working capital</td>
</tr>
<tr>
<td>higher cash flows</td>
<td>lower cash flows</td>
</tr>
</tbody>
</table>

**Figure 4: Comparisons of the Effects of LIFO and FIFO**

There are instances in which the sales price that can be expected for inventory items falls below the inventory value. These cases are more rare than declines in replacement cost and subject to fairly complex valuation procedures. Thus, our discussion here focuses on the decrease in replacement cost.

The opposite relationships hold for falling prices. If prices do not change, the income and inventory results are identical under all alternatives.

Goods for sale in a given period will result in two categories: COGS and the remaining goods which were not sold (ending inventory). Due to the relationship between these two figures, any misstatements in ending inventory will cause an equal misstatement in COGS, and therefore income before taxes on the income statement. In working out the effects of an overstatement or understatement, realizing that the ending inventory in one period is the beginning inventory of the next period is necessary.

To see the effect of misstatements of inventory, consider the relation:

\[ \text{COGS} = (\text{BI} - \text{EI}) + \text{purchases} \]

From this formulation we can easily see that if ending inventory (EI) is too low, COGS in the current period will be overstated. Beginning inventory (BI) in the next period is then too low, and correcting this at the end of the period by raising EI will reduce COGS for this period, in effect reversing the overstatement of COGS in the prior period.

An overvaluation of EI in the current period will have the opposite effects—an understatement of COGS for the current period and a corresponding overstatement of COGS when the misstatement of inventory value is corrected in the next period.

Cash flows are affected to the extent that net income is affected because of the effect of changes in net income on taxes (which are a cash expense).

After inventory is valued using specific identification, average cost, FIFO, or LIFO, that value is compared to the current replacement cost.

If the replacement cost is higher than original cost, nothing is done. If replacement cost is lower than historical cost, ending inventory is “written down” to the lower replacement cost, and a loss is recorded.

There are two methods of valuing inventories at the lower of cost or market which are acceptable under U.S. GAAP and IRS tax regulations:
Item-by-item method. Inventory value cost and replacement cost are compared for each item in inventory. Each individual item is then valued at the lower of the two amounts.

Major category method. The total inventory value and total replacement cost for categories of items are compared. Each major category is then valued at the lower of the two amounts.

Chapter Objective: Describe accounting procedures for long-term assets, including depreciation (straight line and accelerated methods), depletion, and asset impairment or disposal.

Long-Term Assets

A long-term asset is an asset that is typically employed in the production process of the firm and has a useful life of greater than one year. Long-term assets are not made available for sale to the firm’s customers (i.e., they do not represent inventory for sale).

Long-term assets are classified in three main categories:

- **Tangible assets** have a physical existence. Examples include land, buildings, and equipment. The process of allocating the cost of a tangible asset over its useful life is called *depreciation*.

- **Natural resources** are purchased for the economic value that can be taken from the earth and used up over time. Examples include oil fields, timberland, and mines. The process of allocating the cost of a natural resource according to its use (e.g., cutting timber, pumping oil) is called *depletion*.

- **Goodwill** is an intangible asset that is not amortized under U.S. GAAP. We will discuss accounting for goodwill later in this chapter.

- **Intangible assets** have no physical existence, but have a value that is based on rights or advantages that are conferred to the owner. Examples include copyrights, patents, trademarks, franchises, and goodwill. The cost of most intangible assets is allocated to the periods over which it provides benefits through a process called *amortization*.

Long-term assets are generally reported at their carrying value or book value (i.e., historical cost less accumulated depreciation depletion). If, however, the asset has lost its revenue-generating ability, it may be written down (referred to as *asset impairment*, in which case the amount of the write-down is recorded as a loss).

The decision to acquire long-term assets is based on some type of present value analysis in which the present value of the asset’s cash inflows is compared to the present value of the asset’s cash outflows (e.g., initial outlay).

The following are accounting issues pertaining to long-term assets:

- How to spread the cost over the useful life.
- How to represent the value of the asset each period on the balance sheet.

The cost of plant assets includes all expenditures (e.g., transportation of the asset, insurance while the asset is transported, installation cost, initial timing cost, search cost, broker cost, and legal fees to transfer title) that are necessary to acquire the assets and ready them for use. All these expenditures are made prior to and are necessary for placing the asset in service.

If the plant is constructed, capitalized costs (added to the purchase cost of the asset) include materials, labor, reasonable amounts of overhead, interest cost during the construction period, architectural fees, etc.

Included in the cost of land are expenditures such as search cost, real estate commissions, title transfer fees, back property taxes paid, surveying, and landscaping costs.
For example, a sample entry to record the capitalized expenditures (assuming they were made in cash) is:

**Depreciation** is used to allocate the cost of an asset over a period of time. *Depreciation expense* is the amount of this allocation for a given period.

Land represents space for production facilities (real estate) and is not depreciated. Land remains valued at its original cost.

Plant and equipment, however, have limited lives due to wear and tear and/or obsolescence. Because of this, plant and equipment costs must be allocated to expense over the plant and equipment’s estimated economic life. There are several different methods of depreciation.

The **straight-line method** allocates the depreciable cost of an asset evenly over the asset’s estimated useful economic life. The following is an example of the straight-line method of calculating depreciation.

- A machine has a historical cost of $12,000.
- The estimated useful life is ten years.
- After ten years, the machine will have an estimated salvage value of $2,000.
- Cost less salvage value equals the depreciable value ($12,000 – $2,000 = $10,000).

The straight-line depreciation method results in equal depreciation expenses each year over the equipment’s 10-year life:

\[
\text{straight-line depreciation} = \frac{\text{cost} - \text{salvage value}}{\text{useful life}} = \frac{12,000 - 2,000}{10} = \$1,000 \text{ per year}
\]

After three years of use (accumulated depreciation is $3,000), the determination is made that the machine can only be used for two more years. To revise the depreciation schedule, the net book value of the machine ($12,000 – $3,000 = $9,000) less the salvage value of $2,000 will be depreciated over the remaining two years of useful life:

\[
\text{straight-line depreciation} = \frac{\text{net book value} - \text{salvage value}}{\text{useful life}}
\]

\[
= \frac{9,000 - 2,000}{10} = \$3,500 \text{ per year}
\]

The **production (units-of-production) method** allocates the depreciable cost of the asset as a function of the asset’s use rather than time. The following is an example of the units-of-production method of calculating depreciation.

- A truck costs $920,000.
- It has an estimated life of 300,000 miles.
- Salvage value is $20,000.
- Cost of the truck per mile driven is:

\[
\text{depreciation} = \frac{\text{cost} - \text{salvage value}}{\text{estimated miles}} = \frac{920,000 - 20,000}{300,000} = \$3.00 \text{ per mile}
\]

If the truck is driven for 50,000 miles in year 1, the units-of-production depreciation expense is:

\[
\text{depreciation} = (\text{miles driven})(\text{depreciation per mile})
\]

We’ve been discussing the “double” declining balance method. The general method is that of the declining balance method, and you can compute declining balance depreciation based on any one of a number of factors, double, 1.5, triple, etc.
Accelerated depreciation speeds up the recognition of depreciation expense in a systematic way so that more depreciation expense is recognized in the earlier years of the asset’s life and less in the later years. Total depreciation expense over the life of the asset, however, will be the same as with straight-line depreciation.

The declining balance method (DB) is a method that requires applying a constant rate to a declining book value. The most common declining balance method is the double declining balance method (DDB), which uses 200 percent of the straight-line rate as the rate applied against the declining balance. If an asset’s life is 10 years, the straight-line rate is 1/10, or 10 percent. The DDB rate for this asset is 2/10, or 20 percent.

\[
\text{DDB depreciation} = \frac{2}{\text{useful life}} (\text{cost} - \text{accumulated depreciation})
\]

DB does not explicitly use the salvage value in calculations, but depreciation expense will be halted when the cost less salvage value has been depreciated.

The following is an example of declining balance depreciation.

- A machine is purchased for $12,000 on January 1 of year 1.
- The estimated useful life is five years.
- Estimated salvage value is $2,000.

The depreciation expense using the double declining balance method is:

- Year 1: \((2 / 5)(12,000 - 0) = 4,800.00\)
- Year 2: \((2 / 5)(12,000 - 4,800) = 2,880.00\)
- Year 3: \((2 / 5)(12,000 - 7,680) = 1,728.00\)

In years 1 through 3, the company has recognized cumulative depreciation expense of $9,408. Since the total depreciation expense is $10,000 ($12,000 – $2,000 salvage value), the depreciation in year 4 is limited to $592, rather than the \((2 / 5)(12,000 - 9,408) = 1,036.80\) using the DDB formula.

Year 5 depreciation expense is $0 since the asset is fully depreciated to salvage value.

The rate of depreciation is doubled (2/5) from straight-line, and the only thing that changes from year to year is the previous depreciation expense taken out.

Assets that are worn out or no longer useful may be discarded, sold, or exchanged for another asset. When an asset is sold or discarded, its market value at the time of sale or disposal will most likely be different from the asset’s book value. The book value of an asset is equal to its original historical cost minus all accumulated depreciation (including depreciation for partial years) on that asset.

- Discarded assets are simply disposed of, and the firm receives nothing in return. The market value for the asset is zero. If the asset has been depreciated to zero before being discarded, no gain or loss is recorded. However, if the asset has any remaining book value at the time of disposal, the book value amount is recognized as a realized loss on the income statement. When the asset is disposed of, all records of the asset must be removed from the balance sheet.
- When an asset is sold, the firm receives a cash payment in exchange for the asset. The asset’s book value is compared to the sale price, and any difference is recognized as a realized gain or loss on the income statement. Please note that realized gains and losses are always posted to the income statement.

Firms also dispose of assets by exchanging assets for credit toward the purchase of other (typically newer) assets. If the trade-in allowance received is greater than the book value of the asset being disposed of, the result is a gain; if the trade-in allowance is less than the book value, the result is a loss.

The key to accounting for asset exchanges is whether the asset is being exchanged for a similar asset (e.g., a new model of a printing press) or a dissimilar asset (e.g., exchanging a printing press for a grain silo).
For financial accounting purposes:
- For exchanges of dissimilar assets, both gains and losses are recognized on the income statement.
- For similar assets, only losses are recognized. If a “gain” results from the exchange of similar assets, the book value of the old asset (which is lower than the trade-in allowance) is added to the cash paid, resulting in a lower cost basis than would otherwise be recorded for the new asset. The “gain” is thus effectively postponed until the new asset is sold or disposed of.

For income tax purposes:
- For exchanges of dissimilar assets, both gains and losses are recognized on the income statement.
- For exchanges of similar assets, no gains or losses are recognized. Gains or losses are effectively postponed to future periods.

Natural resources, also known as wasting assets, are assets such as timberlands, oil fields, and mineral deposits. Natural resource assets become inventory through the process of cutting timber, pumping oil, or mining for ore. As the resource is extracted from the asset, the carrying value of the asset should be reduced proportionately.

The cost of natural resources is allocated based on units-of-production and is referred to as depletion. The amount of depletion in a given period is determined using the units-of-production method.

Example: Depletion

Suppose a firm acquired mineral rights for $1.5 million, and suppose it is estimated that the mineral deposits will produce 100,000 tons of ore. If 10,000 tons were extracted during the period, 1/10 of the cost is allocated to this period. The entry to record the depletion is:

```
Debit          Credit
Depletion expense $150,000
Accumulated depletion   $150,000
```

Chapter Objective: Discuss the accounting for intangible assets.

Intangible assets have no physical existence, but legal rights confer benefits to the asset’s owner. Intangible assets are distinguished from other assets that are classified as current assets (e.g., receivables) because intangibles are investments that are used in operations (e.g., produce products or provide services).

Examples of intangible assets include:
- Trademarks or brand names.
- Copyrights.
- Patents.
- Licenses or franchises.
- Leaseholds or leasehold improvements.
- Technology.
- Non-compete covenants.

Typically, intangible assets are only recorded on the balance sheet when they are purchased from another firm. All costs for developing intangible assets internally are expensed as incurred.

When a company acquires an intangible asset (e.g., buys a patent), an asset is created by debiting the asset account for the acquisition cost. The cost of intangible assets is allocated over the life of the asset (e.g., as prescribed by law) or an estimated life—which typically does not exceed 40 years. This allocation process is referred to as amortization. Amortization of intangibles uses the straight-line method.
**Goodwill** is created when a firm purchasing another business pays more than the fair market value of the business’ assets if they were purchased individually. If the excess purchase price cannot be attributed to patents, brands, copyrights, or other intangible assets, it is recorded as goodwill. Goodwill reflects the factors that enable a company to earn an above-average rate of return, such as strong management, manufacturing efficiency, and customer approval.

The process of accounting for goodwill is different from the process for other intangible assets. According to U.S. GAAP, goodwill is not amortized, but is subject to an *annual impairment review*. Each year, a company must calculate the fair market value of its goodwill. If the fair market value is less than the carrying value on the balance sheet, the goodwill is said to be *impaired*. If impairment occurs, the carrying value of the goodwill account is reduced to its fair market value, and an impairment charge is recorded on the income statement.

**Chapter Objective:** Describe the accounting for uncertain or contingent liabilities.

### Current Liabilities

*Liabilities* are probable future payments of assets (usually cash) or services (prepaid revenue) that a firm is obligated to make as a result of previous operations.

- **Current liabilities** are obligations that the company expects to pay within one year or one operating cycle from the firm’s existing current assets.
- **Long-term liabilities** are obligations that will be paid after the current year or operating cycle.

There are several uncertainties related to some liabilities:

- Sometimes the payee is unknown. For example, when the board of directors declares a cash dividend (dividends payable), the stockholders at the future date of record are not known with certainty.
- Warranty payables are recognized at the time of sale, but the payees are not yet known; sometimes the due date is uncertain. Examples would be warranty payables and the prepayment for goods and services to be delivered at a future unspecified date. Finally, the amount may be uncertain.
- At the end of the year, a firm must estimate and recognize some expenses (e.g., utilities, pensions, taxes, and employee benefits).

In some cases, the precise amount of a liability is not known, but the liability can be reasonably estimated. Examples include vacation pay, income taxes payable, product warranty liability, and property taxes payable.

### Warranties:

- When a company sells products covered under warranty, future warranty expense associated with those sales must be estimated to achieve a matching of expenses with the revenue they generate.
- The amount of the future possible liability is estimated, most often, from past experience. This amount must consider the extent of the warranty—what it covers and the length of time covered.
- The *estimated warranty liability* (a.k.a. *estimated warranty payable*) is created upon the sale of the asset (debit warranty expense, credit liability).

Assume a toaster manufacturer sells 1,000 toasters, each with a $10 warranty liability. The recognition and payment of warranties are noted in the following ways.

**During period of sale:**

<table>
<thead>
<tr>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warranty expense</td>
<td>$10,000</td>
</tr>
<tr>
<td>Estimated warranty payable</td>
<td>$10,000</td>
</tr>
</tbody>
</table>
When repairs are made under warranty (assume 100 toasters at $10 each):

<table>
<thead>
<tr>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warranty expense</td>
<td>$1,000</td>
</tr>
<tr>
<td>Parts inventory</td>
<td>$400</td>
</tr>
<tr>
<td>Cash</td>
<td>$600</td>
</tr>
</tbody>
</table>

**Contingent liabilities:** a contingent liability exists when, as a result of a past event, a firm is obligated to pay only if a future event occurs.

The most frequent source of contingent liabilities is lawsuits for which future cash payments depend upon the result of court action.

Disclosure depends on the ability to estimate the liability and likelihood of future payment of the liability:
- If the future payment is *probable and reasonably estimable*, then the loss (expense) and liability must be disclosed on the income statement and balance sheet, respectively.
- If the future payment is *reasonably likely or not reasonably estimable*, only footnote disclosure is required.
- If future payment is *remote*, no disclosure is required.

**Chapter Objective:** Explain the accounting procedures for issuing debt securities, including the amortization of any discount or premium.

**Long-Term Liabilities**

Long-term debt represents an obligation to repay a borrowed amount, plus interest, over a period greater than one year. All long-term liabilities, such as bonds, are recorded as the present value of future cash flows.

A bond’s issue price does not always equal its par value. When bonds are issued at a price greater than par, the bonds are said to be issued at a *premium*. When bonds are issued at a price less than par, the bonds are said to be issued at a *discount*.

- A premium or discount arises because the *stated interest rate* (a.k.a. *coupon rate*) on the bonds is above or below, respectively, the *market rate of interest*.
- The accounting entry for bonds issued at a premium requires crediting the unamortized bond premium account. Suppose the $1 million par value bond is issued at a premium of $100,000. The entry is:

<table>
<thead>
<tr>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>$1,100,000</td>
</tr>
<tr>
<td>Unamortized bond premium</td>
<td>$100,000</td>
</tr>
<tr>
<td>Bonds payable</td>
<td>$1,000,000</td>
</tr>
</tbody>
</table>

- The accounting entry for bonds issued at a discount requires debiting the unamortized bond discount account. Suppose the $1 million par value bonds are issued at a discount of $100,000. The entry is:

<table>
<thead>
<tr>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>$900,000</td>
</tr>
<tr>
<td>Unamortized bond premium</td>
<td>$100,000</td>
</tr>
</tbody>
</table>
Total interest cost consists of the total amount of coupon interest paid to bondholders over the life of the bond and any premium or discount that exists when the bonds are issued. Total interest cost can be calculated by subtracting the amount received by the firm when the bonds are issued from the total amount paid out to bondholders over the bond’s life.

The total interest cost for a par bond is simply the amount of interest paid over the life of the bond. Suppose a company issues $1,000,000 worth of bonds with a coupon rate of 6 percent and a maturity of 5 years. The total interest cost is calculated as:

\[
\text{total amount paid to bondholders} = \text{par value} + \text{interest payments} \\
= \$1,000,000 + (\$1,000,000 \times 0.06 \times 5) \\
= \$1,000,000 + 300,000 = \$1,300,000
\]

\[
\text{total amount received at issuance} = \text{par value} = \$1,000,000
\]

\[
\text{total interest cost} = \text{total amount paid} - \text{total amount received} \\
= \$1,300,000 - \$1,000,000 = \$300,000
\]

The total interest cost for a bond issued at a discount is equal to the amount of interest paid over the life of the bond plus the amount of the discount. This is because the discount effectively raises the (lower-than-market) interest rate the firm is paying on the bond. Suppose a company issues $1,000,000 of bonds with a coupon rate of 6 percent and a maturity of 5 years, while the market rate of interest is 7 percent. Based on the 7% market rate, the bonds would sell for $958,417.

\[
\text{total amount paid to bondholders} = \text{par value} + \text{interest payments} \\
= \$1,000,000 + (\$1,000,000 \times 0.06 \times 5) \\
= \$1,000,000 + 300,000 = \$1,300,000
\]

\[
\text{total amount received at issuance} = \text{par value} - \text{discount} \\
= \$1,000,000 - 41,583 = \$958,417
\]

\[
\text{total interest cost} = \text{total amount paid} - \text{total amount received} \\
= \$1,300,000 - \$958,417 = \$341,583
\]

The total interest cost for a bond issued at a premium is equal to the amount of interest paid over the life of the bond minus the amount of the premium. This is because the premium effectively lowers the (higher-than-market) interest rate the firm is paying on the bond. Suppose a company issues $1,000,000 of bonds with a coupon rate of 6 percent and a maturity of 5 years, while the market rate of interest is 5 percent. Based on the 5 percent rate, the bonds would sell for $1,043,760.

\[
\text{total amount paid to bondholders} = \text{par value} + \text{interest payments} \\
= \$1,000,000 + (\$1,000,000 \times 0.06 \times 5) \\
= \$1,000,000 + 300,000 = \$1,300,000
\]

\[
\text{total amount received at issuance} = \text{par value} + \text{premium} \\
= \$1,000,000 + 43,760 = \$1,043,760
\]

\[
\text{total interest cost} = \text{total amount paid} - \text{total amount received} \\
= \$1,300,000 - \$1,043,760 = \$256,240
\]
For bonds issued at a price above (i.e., at a premium) or below (i.e., at a discount) face value, the difference between the par value and the issue value must be amortized over the life of the bond as adjustment of interest expense in the income statement.

As a result of amortization, the carrying value of a bond issued at a premium or discount on a company’s balance sheet will be equal to par on the bond’s maturity date.

A premium or discount can be amortized either using the straight-line method (equal amount each period) or the effective interest method (the difference between the interest paid and the effective interest; effective interest is the market interest rate that existed at the time the bonds were issued multiplied by the carrying value of the bond).

**Example: Bond Premium Amortization**

Consider a bond issue of $1,000,000 of 10-year bonds that have a coupon rate of 10 percent but were issued to yield 9 percent. Interest is paid semiannually. In this case, the premium is $65,039. Today's bond price is $1,065,039.

**Answer:**

Initially, the bond issue is recorded as:

<table>
<thead>
<tr>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash $1,065,039</td>
<td></td>
</tr>
<tr>
<td>Unamortized bond premium</td>
<td>$65,039</td>
</tr>
<tr>
<td>Bonds payable $1,000,000</td>
<td></td>
</tr>
</tbody>
</table>

Using straight-line amortization, the entry for the first semiannual interest payment is:

<table>
<thead>
<tr>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bond interest expense $46,748</td>
<td></td>
</tr>
<tr>
<td>Unamortized bond premium $3,252</td>
<td></td>
</tr>
<tr>
<td>Cash (semiannual coupon payment)</td>
<td>$50,000</td>
</tr>
</tbody>
</table>

Recognizing that there are 20 interest payments, the amortized amount of the bond premium = $65,039 / 20 = $3,252. The bond interest expense is computed as a plug figure (i.e., 50,000 – 3,252 = 46,748).

Using the effective interest method, the interest expense at the end of the first period is:

interest expense = $1,065,039(0.09)(0.5) = $47,927

The amortized amount of the bond premium is the difference between the $50,000 and the $47,927, or $2,073:

<table>
<thead>
<tr>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bond interest expense $47,927</td>
<td></td>
</tr>
<tr>
<td>Unamortized bond premium $2,073</td>
<td></td>
</tr>
<tr>
<td>Cash (semiannual coupon payment)</td>
<td>$50,000</td>
</tr>
</tbody>
</table>

Non-interest bearing debt (i.e., zero-coupon bonds) should be initially recorded at discounted present value, using a discount rate equal to the company’s normal borrowing rate. The issuer will recognize the interest
expense for each period by applying the discount rate to the book value of debt at the beginning of the period (this is the *effective interest method*, a.k.a. *present value amortization method*).

*Bond issue costs* are generally amortized over the life of the bond along with any premium or discount.

When a bond reaches its maturity date, the final interest payment is made and the principal is paid in full. A key point is that at maturity, the market value of the bond will equal its *book value*. This action reduces the cash account and reduces the long-term liability.

If a bond is retired prior to maturity, any difference between the market and book value of the bond is treated as an *extraordinary gain or loss* and is shown on the income statement. This gain or loss is shown “below the operating line, net of tax.”

**Chapter Objective:** Describe different types of long-term liabilities, including convertible bonds, mortgages, leases, and pension liabilities.

**Convertible bonds** are debt securities that are convertible (exchangeable) into the company’s common stock. For example, if Company X issues convertible bonds with a 10-to-1 conversion ratio, each bond may be converted into ten shares of common stock. Please note that upon conversion, the company must issue ten new shares of common stock for each bond converted in this case.

When the convertible debt is issued, the conversion feature (equity component) is ignored and the entire proceeds of the bond issue are treated as a long-term liability. Upon conversion into equity, the bond issue is reclassified from debt into equity on the balance sheet.

A *mortgage* is long-term debt that is typically backed by real estate or land. In the typical mortgage, equal payments are made at regular intervals, and each payment is composed of both interest and principal repayment. The amount of interest paid in each period is based on the outstanding principal from the previous period. As each mortgage payment pays a portion of the principal, each successive payment will consist of less interest and a greater principal repayment.

A *lease* represents an executory contract, but a long-term lease commitment may be equivalent to an asset purchase using long-term debt. Operating leases are often used in an attempt to keep debt off the balance sheet.

All leases must be classified as either operating leases or capital leases [Statement of Financial Accounting Standards (SFAS) 13].

From the lessee perspective, if a lease meets any of the following criteria, it is a capital lease:
- Lease transfers ownership to property by end of lease.
- Lease contains bargain purchase option.
- Lease term is 75% or more of estimated economic life of the property.
- Present value of minimum lease payments at beginning of lease equals or exceeds 90% of the fair market value of property.

Operating leases are accounted for as executory contracts. No obligation appears on the lessee’s balance sheet; no receivable appears on the lessor’s balance sheet.
- Rental payments are recognized as an expense by the lessee and as income by the lessor.
- Disclosures of cash payments due under operating leases for each of the next five years and in aggregate are required in the notes to financial statements.

In the case of a capital lease, the lessee treats the lease as if it were a purchase of property.
- Assets and related long-term obligations are recorded at the present value of future minimum lease payments.
The value of the asset is allocated to expense in the income statement, on a straight-line basis, over the term of the lease. The depreciation period depends on whether the lease transfers ownership or has a bargain purchase option.

Each rental payment is treated as part interest expense and part payment of principal.

A pension plan is an agreement under which an employer agrees to pay monetary benefits to employees once their period of active service ends. The benefits normally depend on certain requirements, such as age and number of years of service.

A pension fund is an intermediary used by the employer to meet plan obligations. The employer makes payments to the fund. The fund makes investments and makes pension payments to employees. Most pension plans in the U.S. are funded because of Employee Retirement Income Security Act (ERISA) requirements and tax advantages.

Remember, cash dividends paid do not reduce net income but instead reduce retained earnings:

\[
\text{RE (beginning of period)} + \text{net income} - \text{dividends} = \text{RE (end of period)}
\]

A defined contribution plan is a pension plan that requires the employer to make only a specified contribution into the employee’s retirement account. The contributions may be fixed or variable (profit-sharing).

- The key point is that there is no promise of any specific level of future benefits, and employees bear all the risk of investment performance.
- Employer accounting for defined contribution plans is very straightforward. Pension cost equals the contributions made, and the employer will report an asset or liability reflecting the difference between actual payments made and the required payments.

With a defined benefit plan, the employer promises a specified monetary benefit upon retirement. The promised benefits may be fixed (called a flat benefit plan) or pay related.

- By promising a defined future benefit, the employer bears all the risk of investment performance.
- Determining the pension expense for defined benefit plans is extremely complicated. In basic terms, if the amount contributed to the plan is more or less than pension expense, the respective result is an asset or liability reported on the balance sheet.

Accounting for pension plans has been governed by SFAS 87 since 1985. SFAS 87 requires that all companies use the same actuarial cost method and requires disclosure of assumptions about the pension obligation and the pension cost. The major problem with SFAS 87 is that firms may make actual pension fund contributions using different assumptions. This may cause the fund to be over- or underfunded.

Other post-retirement benefits. Many employers may provide benefits such as life insurance and health care for retirees and their dependents. These benefits differ from pension benefits because they involve “coverage” or “entitlements” whose costs are very difficult to estimate.

Historically, these costs were expensed as incurred and were unfunded since only actual benefits are deductible for tax purposes, and earnings from any funds were not tax exempt. SFAS 106, issued in 1990, provided guidance for the accounting of these post-employment benefits other than pensions.

Estimation of the expected post-retirement benefit obligation requires assumptions about the number of employees (and dependents) and over what time period they will become eligible for benefits. It is also necessary to estimate the health care cost trend rate, per capita claims costs, and Medicare reimbursement rates.

The employer must also take into account any employee contributions required by the benefit plan. Forecasting health care cost trends is the most difficult aspect of this problem. Employers have some
latitude in their estimates. The *expected post-retirement benefit obligation* is computed by taking the present value of expected postretirement benefits; the discount rate is the employer’s choice but is intended to be a current rate.

**Chapter Objective:** Describe the various accounts found in the Equity section of the balance sheet, and explain the accounting for dividends (both cash and stock), stock splits and treasury stock.

---

**Equity**

**Contributed equity capital** consists of the par value of any preferred stock, the par value (if applicable) of common stock, and paid-in capital in excess of par value.

- The *par value* of a stock is an amount that is arbitrarily set by management. The product of the par value per share and the number of shares issued represents the *legal capital of the corporation*. Par value has no bearing on the market value of a share of stock—the two are completely uncorrelated.

- *Paid-in-capital in excess of par* is the difference between what the corporation initially sold the shares for and the par value (if applicable).

- If the stock does not have a par value, the amount the stock is initially sold for is recorded simply as *common stock*.

**Cash dividends** are payments to stockholders that are made either on a regular basis (typically quarterly) or occasionally (*special dividends*).

Dividends are paid out of retained earnings. If a dividend is paid that exceeds the balance in retained earnings, the amount by which it exceeds retained earnings is a *liquidating dividend*.

A corporation is not required to pay cash dividends. The corporation’s board of directors makes the decision whether to pay a cash dividend to shareholders and how much to pay.

There are several relevant dates with respect to the payment of a dividend. For this example, assume that a company’s board of directors recently declared a $1.00 per share dividend for a total of $100,000.

- The *date of declaration*. This is the date on which the board declares the dividend. On this date, a cash dividends payable is created for the amount of the dividend:

<table>
<thead>
<tr>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash dividends declared</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$100,000</td>
</tr>
<tr>
<td>Cash dividends payable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$100,000</td>
</tr>
</tbody>
</table>

- The *date of record* is the date on which the ownership of the stock is set. All shareholders as of this date are entitled to the declared dividend.

- The *date of payment* is the date on which the cash dividend is paid to shareholders. On this date, the actual payment is made, debiting the cash dividends payable:

<table>
<thead>
<tr>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash dividends declared</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$100,000</td>
</tr>
<tr>
<td>Cash</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$100,000</td>
</tr>
</tbody>
</table>

**Stock dividends** are distributions of stock, rather than cash, and have the following characteristics:

Note that no gain or loss is recorded when treasury stock is reissued. Adjustments are reflected in the paid-in-capital and retained earnings accounts.
Stock dividends do not affect assets.

A stock dividend is an intra-stockholders’ equity event that transfers an amount from retained earnings to contributed (paid-in) capital.

After a stock dividend, a corporation has less retained earnings and more common stock and other contributed capital, leaving assets, liabilities, and total stockholders’ equity unaffected.

If the stock dividend is small (the guideline is 25 percent or less of the previously outstanding shares), the amount transferred is equal to the market value of the stock issued in the stock dividend. If the stock dividend is large (generally greater than 25 percent of the previously outstanding shares), the amount transferred is the par or stated value of the stock issued in the stock dividend.

No financial ratios, except per share ratios (earnings-per-share), are changed because of a stock dividend, small or large.

A stock split results in an increase in the number of shares of stock in a way that each stockholder owns the same proportion of equity but has more shares of stock to represent that ownership.

A stock split does not change the amount in any asset, liability, or stockholders’ equity account. It does increase the number of shares of common stock issued and outstanding while proportionately decreasing the par or stated value of that common stock.

A stock split is a change in units of measure for common stock, not unlike changing a $10 bill for two $5 dollar bills. For example, if a corporation declares and issues a three-for-one stock split on 1,000 shares of $30 par value common stock, no entry would be made, but the common stock account would be described as 3,000 shares issued and outstanding with a $10 par value. The amount in the common stock account is $30,000 before and after the stock split.

Preferred stock (a.k.a. preference stock) is an equity interest in a corporation that has seniority (i.e., preference) over common stock with respect to claims on income and assets.

Preferred stock dividends are usually a fixed amount, stated as either a fixed amount per share or a fixed percentage of the stock’s par value.

In the case of cumulative preferred stock, any dividends not paid when scheduled must be paid before any other preferred or common dividends can be paid. Dividends not paid when due are referred to as dividends in arrears.

In the case of noncumulative preferred stock, the corporation is not obligated to pay any dividends not paid when scheduled.

Convertible preferred stock may be exchanged into common stock at a stated rate. This is an option the investors have if they own the stock.

Callable preferred stock may be bought back by the corporation at a specified price per share. This is an option that the corporation has if it issues callable preferred stock.

Stock issuance. If the common stock has a par value, the issuance of the shares results in increasing both the common stock and paid-in capital accounts. For example, if a company issues 100,000 shares of $1 par value stock for $25 per share:

<table>
<thead>
<tr>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>$2,500,000</td>
</tr>
<tr>
<td>Common stock</td>
<td>$100,000</td>
</tr>
<tr>
<td>Paid-in capital in excess of par value</td>
<td>$2,400,000</td>
</tr>
</tbody>
</table>

If the common stock has no par value, the issuance of the shares results in an increase in the common stock account. For example, if the company issues 100,000 shares of no par stock for $25 per share:

Debit                  Credit
Cash      $2,500,000
Treasury stock. Outstanding stock may be repurchased by the issuer and either held for future use (e.g., employee stock options) or retired.

Stock reacquired and held for future use is referred to as treasury stock. The purchase of treasury stock results in a debit to treasury stock and is typically recorded at cost. Suppose the company purchases 100,000 shares at $50 each. The entry is:

Debit
Credit
Treasury stock, common $5,000,000
Cash $5,000,000

The treasury stock account is reported within contributed capital as a reduction in capital. If shares of treasury stock are sold, the treasury stock account is credited and cash is debited. If the stock is sold for more than the cost of repurchase, the excess is credited to paid-in capital, treasury stock account. If the stock is sold for less than the cost of repurchase, the difference is deducted from a paid-in-capital, treasury stock account. If there is no paid-in-capital, treasury stock account, the excess cost of the shares above the repurchase price is reflected as a debit to retained earnings.

If the treasury stock is retired, all related accounts (i.e., common stock, paid-in capital, retained earnings, and treasury stock) are affected. If treasury shares are acquired at a price less than their original issue price, the difference is recognized as paid-in-capital, retirement of stock. If the treasury shares are acquired at a price greater than the original issue price, the difference is deducted from stockholder’s equity by debiting retained earnings.

If the treasury shares are used to provide shares for the exercise of employee stock options, this is accounted for similar to a reissue of treasury shares.

Section 4: Concepts In Action

Let’s illustrate the basic function of financial statements with a simple example. Henry Hill has decided to open a book store in his home town and has decided to name the store “Hills of Books.” The first step is for Henry to open a bank account. He takes $50,000 of his own money and deposits the money in a new account in the name of Hills of Books. At this point, the balance sheet for Hills of Books would show the bank balance as an asset called cash. The offsetting entry would reflect the source of the cash asset. In this case, the source of funds was a contribution of capital by the owner and will be recorded as Owner’s Equity. The entry is:

Debit
Credit
Cash $50,000
Capital contributions $50,000

Henry has arranged to open his store for business on January 1, 2005 and has made several decisions regarding its day-to-day operations during November and December of 2004.

- After locating vacant space in a local shopping mall, Henry signed a two-year lease. At a rate of $1,500 per month, the landlord required advance payment of the first 3 months’ rent and that he also submit a deposit of one month’s rent that will be refunded upon termination of the lease. Initially, all rent paid in advance will be treated as prepaid rent (an asset). As time passes and the rent expires the asset, prepaid rent, will be written off to rent expense. The deposit will also be recorded as an asset.
The source for these payments is the cash account, which is reduced by \((1,500 \times 3) + 1,500 = $6,000\). The entry to record this transaction is as follows:

\[
\begin{array}{ll}
\text{Debit} & \text{Credit} \\
\text{Deposits—rent} & $1,500 \\
\text{Prepaid rent} & $4,500 \\
\text{Cash} & $6,000 \\
\end{array}
\]

- Henry ordered books from a wholesale book distributor, at a cost of $100,000. The distributor requires 40 percent of the total to be paid on delivery, another 30 percent paid within 30 days, and the remaining 30 percent within 60 days. The books will be Hills of Books’ inventory. The amount paid on delivery \((0.40 \times $100,000 = $40,000)\) will reduce cash. The remaining balance \((0.60 \times $100,000 = $60,000)\) represents accounts payable.

\[
\begin{array}{ll}
\text{Debit} & \text{Credit} \\
\text{Inventory} & $100,000 \\
\text{Cash} & $40,000 \\
\text{Accounts payable} & $60,000 \\
\end{array}
\]

- In order to allow customers to browse books before making a purchase, Henry bought shelves and some easychairs. Combined with the cost of a cash register and various fixtures, the total Furniture and Fixtures outlay amounted to $20,000. This cost will be recorded as Furniture and Fixtures, a long-term asset, and will reduce cash. Henry plans to depreciate these assets using the straight-line method of depreciation, assuming a four year useful life and no salvage value.

\[
\begin{array}{ll}
\text{Debit} & \text{Credit} \\
\text{Furniture & fixtures} & $20,000 \\
\text{Cash} & $20,000 \\
\end{array}
\]

- Henry then hired a salesperson to help out so that he would not have to be at the store during all operating hours. The employee will work part-time, at a rate of $1,200 per month. There is no accounting entry for the new employee until wages are paid.

- After arranging for a loan from the local bank, the business borrowed $40,000. Henry signed a note payable that requires an annual payment of $10,000 at the end of each of the next four years, plus annual interest of 8%, payable quarterly. The initial entry for this loan is (remember that the portion of debt due in one year is separated out and treated as a current liability):

\[
\begin{array}{ll}
\text{Debit} & \text{Credit} \\
\text{Cash} & $40,000 \\
\text{Notes payable—current} & $10,000 \\
\text{Notes payable} & $30,000 \\
\end{array}
\]

Although the step-by-step process of accounting has been abbreviated in this example, the end result is the same. The balance sheet below shows the result of Hills’ transactions prior to year-end. You can verify balances, such as the balance in cash, by totaling the debit (left) entries, totaling the credit (right) entries, and taking the difference. Outside of cash, most accounts had only one change to them during the accounting period, so their ending balances are quite simple to determine.

**Balance Sheet**  
**December 31, 2004**

<table>
<thead>
<tr>
<th>Current assets</th>
<th>Current liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>$24,000</td>
</tr>
<tr>
<td>Accounts</td>
<td>$60,000</td>
</tr>
</tbody>
</table>
Important points to remember about the balance sheet:

- It is a snapshot of the business at one point in time.
- It shows all assets (what you have), liabilities, and equity (who has claims to what you have).
- Assets and liabilities are separated into short-term and long-term categories. Current assets are those that are expected to be consumed, sold, or converted to cash in less than one year. Current liabilities are expected to be paid within one year (e.g., accounts payable). Long-term assets and long-term liabilities have lives greater than one year.

We will look at the balance sheet for Hills of Books at the end of January, after one month of operation. Many of the changes over that time period will occur as a result of the revenues and expenses incurred in the day-to-day operation of the store. Those transactions are captured in the income statement.

Let's return to our example for Hills of Books. In January, Henry opened his store as planned. He bought supplies for his store (shopping bags, printed book marks to give to customers, gift wrap, plus some basic office supplies) at a cost of $500. Henry also paid $3,100 for advertising in local newspapers and on a local radio station. The advertising paid off, as Hills of Books generated $24,000 in sales revenue from selling books. The books sold cost Hills $16,000. On January 25, Henry bought a sophisticated cash register that had inventory tracking capabilities for $2,500. At the end of the month, Henry paid his employee the agreed upon $1,200. Also at the end of the month, Henry became concerned about the dwindling cash balance, and contributed another $5,000 of his own money to the business. The income statement for January is shown in the following table:
### Income Statement

**Month ended January 31, 2005**

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>$24,000</td>
</tr>
<tr>
<td>Less: Cost of Goods Sold</td>
<td>(16,000)</td>
</tr>
<tr>
<td>Gross Profit</td>
<td>$8,000</td>
</tr>
<tr>
<td>Selling, Gen. &amp; Admin. Expenses</td>
<td></td>
</tr>
<tr>
<td>Advertising</td>
<td>$3,100</td>
</tr>
<tr>
<td>Depreciation</td>
<td>417</td>
</tr>
<tr>
<td>Rent</td>
<td>1,500</td>
</tr>
<tr>
<td>Supplies</td>
<td>500</td>
</tr>
<tr>
<td>Telephone</td>
<td>150</td>
</tr>
<tr>
<td>Utilities</td>
<td>350</td>
</tr>
<tr>
<td>Wages</td>
<td>1,200</td>
</tr>
<tr>
<td><strong>Total SG&amp;A</strong></td>
<td>(7,217)</td>
</tr>
<tr>
<td>Income From Operations</td>
<td>$783</td>
</tr>
<tr>
<td>Less: Interest Expense</td>
<td></td>
</tr>
<tr>
<td><strong>Net Income</strong></td>
<td>(267)</td>
</tr>
<tr>
<td><strong>Net Income</strong>[^1]</td>
<td>$516</td>
</tr>
</tbody>
</table>

[^1]: Since Hills of Books is a sole proprietorship, there will be no income tax for the business. Instead, any net profits are taxable as part of Henry’s income on his personal income tax return.

The sales were mostly cash sales, but several customers established credit accounts. Their purchases will be billed to them at the end of the month. They are required to pay the balance due within 15 days of the date they are billed. The sales on credit for January totaled $3,000.

The cost of goods sold literally represents the cost of the books Hills sold. The $16,000 worth of inventory is removed from the inventory account at the time of sale and recorded as an expense. Therefore, on sales of $24,000, Hills of Books earned a gross profit of $8,000. Gross profit is what remains after covering the cost of the sale and is the amount available to pay operating expenses, interest expense, and hopefully allow some residual profit.

The SG&A expenses are the operating expenses required to keep the store up and running. Advertising falls into this category. It might be argued that advertising expenses should be allocated over multiple periods, since it may well be that customers will remember the advertisements for some time. However, the convention is to expense advertising costs immediately. For a large scale ad campaign that would take place over more than one accounting period, some capitalization across periods might be appropriate.

Depreciation is included as an SG&A expense because it applies to assets used for the day-to-day conduct of business (e.g., chairs, shelves). If this were a manufacturing company depreciating a machine that produced books, depreciation would probably belong in COGS. The calculation of depreciation in this case is the depreciable cost divided by four years, then divided by 12 to get a monthly amount (20,000 / 4 = 5,000 per year; 5,000 / 12 = $417 per month. Unless an asset is about to be disposed of, depreciation is generally only calculated once at year-end.

The rent expense was not really a cash outlay in January. Remember that the landlord required 3 months rent in advance. Rather than crediting the cash account on January 1, the credit would be to the prepaid rent (asset) account. Hence, as time went by, part of the asset expired and was written off.
The supplies, telephone, and utilities charges are just ordinary costs of doing business. Sometimes there will be a supplies account on the balance sheet, reflecting the fact that management believes those supplies will be used for several accounting periods, and possibly more than one year. In this case, given the nature of the supplies, it seems appropriate that they be expensed.

The wages expense is simplified for our example. In reality, there would be employment taxes to pay in addition to the wages, and payroll taxes to deduct from the employee’s check. For simplicity, we have shown gross wages only.

The total SG&A expenses are deducted to derive operating income, or EBIT. As the name implies, this is net income remaining after deducting all operating expenses from the gross margin. Some firms would have a category below income from operations for other income and expense. This category would include non-operating income and expense items. For example, if Henry had opened an interest-bearing account for his excess cash, the interest earned would be classified as other income.

Interest expense is also shown separately. The interest expense is not really an operating expense, since Henry could have elected to use 100 percent equity financing, and there would have been no interest expense. In this case, Henry will accrue one month’s interest, even though it’s not due until the end of the first quarter. We will make this adjustment for the sake of consistency in our example. The amount is calculated as principal ¥ rate ¥ time, or $40,000 ¥ 0.08 ¥ 1/12 = $267. Since the interest will not be paid until the end of the quarter, we will record an increase (credit) to interest payable rather than a decrease (credit) to cash.

The net income of $516 is the amount taxable to Henry. Since Hills of Books is a sole proprietorship, this amount will be reported on Henry’s personal tax return. However, it will only be the net profit at the end of the year that must be reported. There is no interim requirement for a monthly figure.

Notice that there were three transactions in January that do not appear in the income statement. The purchase of the new cash register is not an expense—this is an asset that should be capitalized. Henry will begin depreciating the cash register in February. Also, the additional capital contribution is not income. This contribution will merely increase the capital contributions equity account. Finally, the required payment to the inventory supplier does not appear in the income statement. The inventory is expensed (through COGS) only as it is sold. Don’t forget the payment against accounts payable for 30 percent of the original $100,000 purchase. We will now take another look at Hills of Books balance sheet to see how it has changed after one month of operation.

**Balance Sheet**  
**January 31, 2005**

<table>
<thead>
<tr>
<th>Current assets</th>
<th>Current liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash $12,200</td>
<td>Accounts payable $30,000</td>
</tr>
<tr>
<td>Accounts receivable 3,000</td>
<td>Current portion long-term debt 10,000</td>
</tr>
<tr>
<td>Inventory 84,000</td>
<td>Interest payable 267</td>
</tr>
<tr>
<td>Prepaid rent 3,000</td>
<td>Total current liabilities $40,267</td>
</tr>
<tr>
<td><strong>Total current assets</strong> $102,200</td>
<td><strong>Total current liabilities</strong> $40,267</td>
</tr>
<tr>
<td>Furniture &amp; fixtures $22,500</td>
<td>Long-term debt 30,000</td>
</tr>
</tbody>
</table>
Less: accumulated

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total liabilities</td>
<td>$70,267</td>
</tr>
<tr>
<td>depreciation</td>
<td>(417)</td>
</tr>
<tr>
<td>Net fixed assets</td>
<td>22,083</td>
</tr>
<tr>
<td>Capital contribution</td>
<td>55,000</td>
</tr>
<tr>
<td>Deposits—rent</td>
<td>1,500</td>
</tr>
<tr>
<td>Retained earnings</td>
<td>516</td>
</tr>
<tr>
<td>Total equity</td>
<td>$55,516</td>
</tr>
<tr>
<td>Total assets</td>
<td>$125,783</td>
</tr>
<tr>
<td>Total liabilities &amp; equity</td>
<td>$125,783</td>
</tr>
</tbody>
</table>

Cash = 24,000 + (24,000 – 3,000) – 3,100 – 500 – 150 – 350 – 1,200 – 2,500 – 30,000 + 5,000
= $12,200

Let’s take a look at some of the changes in the balance sheet. Cash has declined despite a good month of sales, largely due to the $30,000 payment to the supplier. The $3,000 balance in accounts receivable reflects the January sales on credit. Hopefully Hills of Books will be able to collect all of this balance. Most firms establish a contra-asset account called allowance for doubtful accounts to show that, unfortunately, not all customers will pay their bills. Over time a business can estimate this allowance fairly accurately as a percentage of credit sales. Of course, a firm can control this allowance to a certain extent by requiring customers to meet certain criteria before they are allowed to make purchases on credit.

The inventory decreased by $16,000, the amount of the cost of goods sold. Prepaid rent also declined to reflect the expensing of January rent.

Furniture and fixtures increased by the purchase of the cash register. January depression is also shown in the accumulated depreciation account. Depreciation is not a cash expense—the furniture and fixtures were already paid for. Depreciation is used to allocate the cost to expense over more than one accounting period, since the asset will be used and benefit more than one accounting period. The entry to record depreciation would be:

<table>
<thead>
<tr>
<th>Debit</th>
<th>Credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depreciation expense</td>
<td>417</td>
</tr>
<tr>
<td>Accumulated depreciation</td>
<td>417</td>
</tr>
</tbody>
</table>

On the liability side, there are four changes: the reduction in accounts payable, the additional capital contribution, recorded interest payable, and the inclusion of current income in the retained earnings account. Current income must be included in retained earnings for the balance sheet to balance, since the profitability of the business increases assets as sales generate new cash and receivables, hopefully exceeding day-to-day costs. At the end of the year, current income must be added to the business’ retained earnings in order to balance all the daily changes that have taken place in the rest of the balance sheet.
We mentioned above that some expenses do not require a current cash outlay, such as purchases on credit and depreciation expense. Furthermore, there were a number of cash payments/receipts that are not recorded as revenues and expenses. For example, borrowing from the bank and purchasing assets. Next we will look at Hills’ statement of cash flows to see where Hills is generating and using cash. Remember, we would like to see a company that generates most of its cash internally, although that’s not usually the case with a new company that’s barely off the ground. Let’s look.

**Statement of Cash Flows**
*Month ended January 31, 2005*

<table>
<thead>
<tr>
<th>Cash Flow</th>
<th>Operating Activities:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Net income $ 516</td>
</tr>
<tr>
<td></td>
<td>Adjustments to NI:</td>
</tr>
<tr>
<td></td>
<td>Depreciation add back</td>
</tr>
<tr>
<td></td>
<td>Reductions in prepaid items</td>
</tr>
<tr>
<td></td>
<td>Increase in interest payable</td>
</tr>
<tr>
<td></td>
<td>Decrease in accounts payable</td>
</tr>
<tr>
<td></td>
<td>Increase in accounts receivable</td>
</tr>
<tr>
<td></td>
<td>Decrease in inventory</td>
</tr>
<tr>
<td></td>
<td>Net cash from operations</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cash Flow</th>
<th>Investing Activities:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Acquisition of assets</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cash Flow</th>
<th>Financing Activities:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Additional capital contribution</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cash Flow</th>
<th>Summary:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Net change in cash</td>
</tr>
<tr>
<td></td>
<td>Cash beginning of January</td>
</tr>
<tr>
<td></td>
<td>Cash end of January</td>
</tr>
</tbody>
</table>

It seems confusing at first, when trying to decide how and why to adjust for all of the changes. Let’s take a look back at the basic accounting equation for a fairly simple explanation. We saw earlier that the basic accounting equation is:

\[
\text{assets} = \text{liabilities} + \text{owner’s equity}
\]

Since this is an equation, we also know that if there is a change on either side, there must be an equal and offsetting change on the other side. Therefore:

\[
\Delta \text{assets} = \Delta \text{liabilities} + \Delta \text{owner’s equity}
\]
Furthermore, since we are interested in explaining the change in cash (where it came from and where it went) we must isolate cash on one side of the equation. We can do this by simply breaking cash down into two pieces: cash assets and non-cash assets. Therefore:

\[ \Delta \text{ cash} + \Delta \text{ non-cash assets} = \Delta \text{ liabilities} + \Delta \text{ owner's equity} \]

and:

\[ \Delta \text{ cash} = \Delta \text{ liabilities} + \Delta \text{ owner's equity} - \Delta \text{ non-cash assets} \]

Now let's use what we have to explain the statement of cash flows. The statement of cash flows presented above was prepared using the indirect method, starting with net income. Depreciation and any reductions in prepaid expenses are added back to net income because these expenses did not require any cash outlays during the current period. Next, changes in any current asset or current liability accounts are considered. Increases in current assets would indicate reductions in cash; for example, if accounts receivable increased, there were credit sales during the period, which are included in net income but which have not yet generated cash inflows. Similarly, decreases in current assets are sources of cash; a reduction of inventory means more goods were sold. A reduction in current liabilities is a use of cash, since cash was needed to pay them down. Note that all of these changes in current accounts arise out of daily operations: selling goods, collecting cash, paying bills.

What we've essentially done is convert an accrual-based income figure to one that is cash only. In Hills’ case, cash flows from operating activities are not positive. Can you see why? In an effort to get the business up and running, Henry had to purchase the necessary inventory. More of the inventory has been paid for (use of cash) than has been sold (source of cash). Once Hills generates a steady source of business and chooses an optimal level of inventory, this trend should reverse.

To determine the true change in cash over the period, cash from operations must be adjusted for non-cash expenses, changes in working capital, and investing and financing cash flows. Non-cash expenses on the income statement include prepaid items and depreciation. They are expenses whose cash outflow takes place independently of the expense being incurred. Paying for the asset and using it are two different things.

Henry paid his landlord $4,500 for three months’ rent during December of the previous period. This resulted in a $4,500 decrease in the cash account along with an entry for the prepaid item under current assets on the balance sheet. When Henry deducts the $1,500 rent expense from January’s operating income, the deductions look like any other expense. Since this deduction reduces operating income but is not an actual cash flow, we must add the amount back to operating income to determine cash flow from operations for the month.

Generally speaking, if non-cash assets went up, they consumed cash in the process. On the contrary, if non-cash assets went down, they created cash in the process. Liabilities are just the opposite. Liabilities are only recorded when the company has done one of two things: they either borrowed cash (source) or incurred an expense that they have not yet paid. The increase from borrowing is obvious, but what you might have forgotten is what happens when a company incurs an expense that has not been paid for. The expense will be deducted as soon as it is incurred, but to show income from a cash flow perspective only, we must remove the change.

The statement of cash flows and the balance sheet must agree. The change in cash for the period as stated in the statement of cash flows plus the cash balance on the previous balance sheet must equal the cash balance on the current balance sheet.

Investing cash flows refer to cash transactions involving long-term assets. The purchase of the new cash register was an investing cash out-flow. Since the purchase required a cash outlay, the amount on the statement of cash flows is a negative number.
Financing cash flows refer to transactions involving the capitalization of the business, regardless of whether the source of capital is debt or equity. In this case, Henry has contributed an additional $5,000 of equity capital. This amount was a cash inflow and is therefore a positive number on the cash flow statement.

The summary line in the statement of cash flows shows a net change in cash for the month of −$11,800, which brings our current cash balance to $12,200. (This is confirmed on the balance sheet).

**Statement Of Owners’ Equity**

The statement of owners’ equity shows the value of any assets the owner has invested in the business. On December 31, 2004, Hills of Books had assets totaling $150,000. Since Henry owed the bank $40,000 and his suppliers $60,000, the business does not own all of the assets “free and clear.” After deducting the $100,000 owed to others, Henry’s equity totals $50,000 (his initial investment).

This is similar to the situation facing most homeowners. Consider a family who purchased a home last year for $90,000. To make the purchase, the homeowners invested $20,000 of their own money and took out a mortgage for $70,000. The house is currently worth $100,000. The amount of the mortgage has not changed (ignoring whatever principal payments have been made). Thus, they now have an asset worth $100,000, and a liability of $70,000. This leaves them $30,000 of equity (assets minus liabilities) in the home. Notice that there is not necessarily any relationship between the value of equity and the amount of cash on hand. Hills of Books’ statement of owners’ equity at the end of January is shown in the following table:

<table>
<thead>
<tr>
<th>Statement of Owner’s Equity</th>
<th>January 31, 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner’s Equity 1/1/05</td>
<td>$50,000</td>
</tr>
<tr>
<td>Additions:</td>
<td></td>
</tr>
<tr>
<td>January net income</td>
<td>516</td>
</tr>
<tr>
<td>Additional capital contribution</td>
<td>5,000</td>
</tr>
<tr>
<td>Withdrawals:</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>0</td>
</tr>
<tr>
<td>Owner’s Equity 1/31/05</td>
<td>$55,516</td>
</tr>
</tbody>
</table>

Net income has been transferred or “closed” to owners’ equity. As a proprietorship, net income for Hills of Books belongs to Henry Hill, but Henry chose not to withdraw any of it during January. Had he done so, the cash and owners’ equity accounts would be reduced to reflect the withdrawal.

Let’s consider our homeowners again. If they still have a $70,000 outstanding mortgage and the value of their house drops below $100,000, their equity in the home will also fall. In the same fashion, if Hills of Books shows an operating loss (negative net income), Henry’s equity in the business declines and could even fall below his initial investment. To illustrate, assume a $3,500 loss for the month of February, along with an additional contribution of $2,000. The combined impact of this situation is shown in Hills of Books’ February 28 statement of owners’ equity:

**Statement of Owner’s Equity**

<table>
<thead>
<tr>
<th>February 28, 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Owner’s Equity 2/1/05</td>
</tr>
<tr>
<td>Additions:</td>
</tr>
</tbody>
</table>
February net income $ (3,500)
Additional capital contribution $ 2,000
Withdrawals:
None $ 0
Owner’s Equity 2/28/05 $ 54,016

Note that even though Henry has invested a total of $57,000 ($50,000 initially plus $5,000 in January and $2,000 in February), his equity in the business is only $54,016 due to the $3,500 operating loss for the month of February. However, if the business shows a profit of $1,200 in the month of March, the end-of-March statement of owners’ equity (in the following table) would indicate the partial recovery of his lost equity. In this fashion, the value of owner’s equity is subject to change from month to month.

Statement of Owner’s Equity
March 31, 2005

<table>
<thead>
<tr>
<th>Owner’s Equity 3/1/05</th>
<th>$ 54,016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additions:</td>
<td></td>
</tr>
<tr>
<td>March net income</td>
<td>$ 1,200</td>
</tr>
<tr>
<td>Additional capital contribution</td>
<td></td>
</tr>
<tr>
<td>Withdrawals:</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>$ 0</td>
</tr>
<tr>
<td>Owner’s Equity 3/31/05</td>
<td>$ 55,216</td>
</tr>
</tbody>
</table>

A point worth remembering is the relationship between successive statements. Notice that the ending balance on the January 31 statement of owners’ equity becomes the beginning balance for the next month’s statement. Similarly, the ending balance on the February statement becomes the beginning balance on the March statement.

Although somewhat more complicated, the statement of owners’ equity for a publicly traded corporation is similar to that for Hills of Books in many respects. Let’s look at a statement of owners’ equity for Hills of Books assuming it “goes public.” You will probably notice first that owners’ equity is now called stockholders’ equity. This is because there are now many owners of the business, each of whom has purchased shares of stock on an organized exchange.

Let’s move forward in time and assume that Hills of Books has been highly successful and has expanded to open several additional stores. Henry has incorporated the business and has invested $300,000 of his own capital (this represents his cumulative investment to date). He currently holds 30,000 shares of common stock but has decided to issue 25,000 new shares at $20 per share. The par value of Hills of Books stock is $1.00 per share. Therefore, the sales price of $20 will be allocated $1.00 per share to common stock (par value) and $19.00 per share to additional paid-in capital. Hills of books issued the new stock in January 2008 and paid a $0.50 per share dividend in December 2008. The statement of stockholder’s equity for 2008 would be as follows:

Statement of Stockholder’s Equity
December 31, 2008

| Stockholder’s Equity 1/1/08 | $378,622 |
Additions:
Issued new stock at par 25,000
Additional paid-in capital 475,000
2008 net income 44,917

Withdrawals:
Dividends paid 27,500

Stockholder’s Equity 12/31/08 $951,039

The beginning balance 1/1/08 reflects Henry’s contributed capital of $300,000, plus cumulative retained earnings (i.e., several years’ net income) of $78,622. The new stock issue (25,000 shares) is allocated to par value and additional paid-in capital. The 2008 net income is $44,917, and the only withdrawal was the dividends paid to all shareholders—Henry with 30,000 shares plus the 25,000 new shares. The total dividend amount was therefore 55,000 shares @ 0.50 each, or $27,500. Dividends reduce the equity account because they are a payment made to providers of equity capital. Dividends are not deducted in deriving net income, so they must be deducted separately in the equity section of the balance sheet. Dividends require a cash outlay and are included in the financing section of the statement of cash flows, as we saw earlier.

It is important to remember that these numbers reflect only the historical book value, which is the amount received at issuance of the stock. The market price of the stock will not be reflected in the Hills of Books financial statements. The actual value in the market place on December 31, 2008 could have been $5 per share or $50 per share, and the Stockholder’s equity numbers would still be the same. Also, just as with our discussion of owner’s equity above, the equity balance provides no indication of how Hills of Books has used the money raised through equity sources—the money might be in fixed assets, inventory, accounts receivable, or even cash.

The value of any capital (cash, land, buildings, equipment, fixtures, furniture, etc.) contributed to the business by the owner is considered investment.

Summary

Section 1: Principles And Procedures
A. FASB sets accounting standards with the intent to generate standardized information with the following characteristics: relevance, timeliness, reliability, consistency, comparability and materiality.
B. Financial statements in the U.S. are created under a set of principles known as GAAP that help assure consistency and comparability of accounting procedures.
C. The periodicity concept states that financial statements are prepared at regular, predetermined times.
D. In the double entry accounting system, every debit has a corresponding credit.
   1. Debit is Latin meaning “left side.”
      a. Debits increase asset, expense, loss, and dividend accounts.
      b. Debits decrease liability, equity, revenue, and gain accounts.
   2. Credit is Latin meaning “right side.”
      a. Credits increase liability, equity, revenue, and gain accounts.
      b. Credits decrease asset, expense, loss, and dividend accounts.
   3. The basic accounting equation is as follows: assets = liabilities + owners’ equity. The equation, with its two equal sides, is the underlying reason for the use of double entry accounting, wherein two equal changes (at least) must take place in an entry in order for the
equation to maintain balance. The equation is also the underlying format of the balance sheet.

E. The general journal is the book of original entry, where transaction data is captured in chronological order.

F. The process of posting classifies transaction data in the general ledger, where it becomes organized, useful information.

G. Under accrual basis accounting, revenues are recorded when earned and expensed when incurred, regardless of the timing of their related cash flows. The matching principle requires that revenues and the expenses related to or incurred for the production of those revenues be recorded in the same accounting period. These two basic principles facilitate the most meaningful measure of profitability.

H. Cash basis accounting recognizes revenues when cash is received and expenses when cash is paid. The recognition of revenues and expenses on a cash basis can result in confusing and misleading financial statements.

Section 2: Four Primary Financial Statements

A. The balance sheet is also known as the statement of financial position. It includes asset, liability, and equity accounts, which represent both the resources owned by the firm as well as claims to those resources as of a specific point in time—usually December 31st or whichever date represents the company's year end.

1. Assets are those resources owned and/or used by the firm that bring a current or future benefit. Assets may be contributed to the business by the owner(s), borrowed, or generated by the business. They can be current (short term) or fixed (long term).
   a. Current assets are those that will be used up, sold, or converted into cash within one year or the operating cycle, whichever is longer. They include cash, marketable securities, accounts receivable, inventory, supplies, and prepaid items.
   b. Long-term assets are those with lives greater than one year and include property, plant, and equipment, long-term investments, natural resources, and intangibles.

2. Liabilities are external claims on the firm’s assets by lenders and creditors. They can be current (short term) or long term.
   a. Current or short-term liabilities are payable within one year. These include wages payable, accounts payable, short-term notes payable, and the current portion of long-term debt.
   b. Long-term liabilities are those that extend beyond one year. These include long-term notes payable, mortgages payable, leases, and bonds payable.

3. Owners’ equity represents the total value of the ownership claim(s) of the proprietor, partners, or stockholders. It represents what remains of assets (residual) after all debts are satisfied. Equity can be created in one of two ways.

4. Contributed capital represents claims to assets that were literally contributed by the owners of the company, whether by private capital contributions or public stock issues in exchange for assets.

5. Retained earnings represents the sum of all current and prior period earnings that have not been returned to the owners by way of dividend distributions. Retained earnings differs from current-year earnings (net income) in that it is a multi-period cumulative figure.

B. The income statement measures the results of operations for a period of time, usually one year. Profitability is determined by taking the difference between revenues and gains and expenses and losses.

1. Revenues represent an “inflow,” or creation of new assets, that is typically created through the day-to-day operations of the business.

2. Gains result from the disposal of long-term assets for an amount greater than their book or carrying value on the balance sheet (i.e., you received more than you gave).

3. Expenses result from the consumption of assets. When the amount of assets created during the period (revenues) is greater than the amount of assets consumed (expenses) the difference is a positive net income or operating profit figure.
a. Cost of goods sold is an expense associated with the sale of inventory. When the inventory is sold, its cost is removed from the balance sheet and written off on the income statement against the revenue created in the sale (the matching principle).

b. Depreciation, depletion, and amortization are the systematic allocation of the cost of long-term assets to expense over the period of time benefited by the assets. Rather than removing long-term assets from the books as they are expensed, the total of depreciation taken is recorded as a credit to an account called accumulated depreciation. Accumulated depreciation is a contra-asset account that is netted against long-term assets to create an indirect reduction in their book values.

c. The cost vs. expense issue arises when costs are incurred: Do you record an asset or expense? If the cost results in an asset, the cost should be capitalized, or recorded as an asset. If the cost does not result in the creation of an asset, it should be expensed immediately.

4. “Below the line” items are reported separately from net income from operations, and include gains and losses not related to normal ongoing operations of the firm. Gains or losses on discontinued operations are reported here, as are extraordinary items and effects of any changes in accounting methods.

C. The statement of changes in equity provides a detailed look at the increases and decreases in equity during the year. Equity can be increased with additional capital contributions and positive earnings during the year, or it can be decreased by losses incurred during the year as well as dividends paid to the owners of the company.

D. The statement of cash flows identifies the sources and uses of cash from three different business functions:

1. Cash flows from operating activities are created through the day-to-day conduct of business. This section of the statement of cash flows can be created in one of two different ways.
   a. The direct method of determining cash flows from operating activities is a top-down approach whereby items on the income statement are adjusted for changes in related working capital accounts (current assets and current liabilities) to turn accrual-based income and expenses into cash basis figures.
   b. The indirect method is a bottom-up approach that begins with net income and adjusts it back to a cash basis figure.

2. Cash flows from investing activities are those sources and uses of cash created by the purchase and sale of long-term assets. All related dividends and interest received as a result and gains and losses created on disposal are included as adjustments in the operating activities section, since they are included in the determination of net income.

3. Cash flows from financing activities are those cash flows created by borrowing from and repayment to the lenders, creditors, and owners of the business. Dividends paid to owners are also included as a use of cash in this section.

E. Analysts should look further than the prepared financial statements when evaluating a publicly traded company. More extensive information is available in footnotes to the financial statements, management’s discussion and analysis, and other public sources such as filings with the SEC.

**Section 3: A Closer Look At The Balance Sheet**

A. Marketable securities are classified as either securities held to maturity (reported at original cost), trading (reported at fair market value), or available for sale (reported at fair market value).

B. Accounts receivable must be adjusted for bad debts. There are two methods to make this adjustment: the direct write-off method (where bad debt expense is recorded as the accounts are written off) and the allowance for doubtful accounts method (where bad debts are estimated). The allowance method is preferred.

C. Inventory costing methods include specific identification, average cost, FIFO, and LIFO. FIFO and LIFO are the most common. In normal periods of rising prices, FIFO will generate higher net income (lower COGS) and higher ending inventory. LIFO will generate lower net income (higher COGS) and lower ending inventory. The effects of inventory accounting choices can be evaluated using the basic inventory equation:
ending inventory = beginning inventory + purchases – cost of goods sold

D. Long-term assets are capitalized, with their cost then expensed over their useful lives. This expense is called depreciation for tangible assets, depletion for natural resources, and amortization for intangible assets.
   1. Straight-line depreciation allocates the cost evenly over the asset’s life.
   2. Accelerated depreciation methods (e.g., double declining balance) allocate more of the cost to the earlier years of the asset’s life.

E. Contingent liabilities must be disclosed in the balance sheet if the future payment is probable and reasonably estimable.

F. Long-term liabilities (e.g., bonds) are recorded at the present value of future cash flows. Any premium or discount from face value at issuance must be amortized annually over the life of the debt.

G. Capital leases must be shown on the balance sheet. Operating leases are not recorded on the balance sheet, and firms sometimes try to use operating leases to keep debt off the balance sheet.

H. Cash dividends are declared by a corporation and then paid on the date of payment to all shareholders who owned the stock as of the date of record. Cash dividends do not reduce net income—they are deducted from retained earnings. Stock dividends represent additional shares of stock that are distributed to shareholders. Stock splits do not affect any other balance sheet account but merely increase the number of shares outstanding.

I. Preferred stock is stock with a claim on income and assets that is senior to common stock. Treasury stock is stock that has been repurchased by the issuing corporation.

**Practice Questions: Financial Statement Analysis**

1. Which of the following desirable characteristics of accounting information are *most likely* to be in conflict with each other?
   - A. Relevance and materiality.
   - B. Timeliness and reliability.
   - C. Relevance and reliability.
   - D. Timeliness and materiality.

2. Assume that Jill’s Dress Shop paid cash to buy inventory of 50 dresses in January. The *most likely* effect on Jill’s Dress Shop financial statements would be:
   - A. an increase in assets.
   - B. an increase in sales.
   - C. a decrease in owners’ equity.
   - D. no change in assets.

3. Which of the following is *INCORRECT* with regard to the dual entry accounting system?
   - A. Additions to inventory are recorded as debits to inventory.
   - B. Increases in accounts payable are recorded as credits to accounts payable.
   - C. Increases in depreciation expense are recorded as credits to depreciation expense.
   - D. Cash payments for rent are recorded as credits to cash.

4. You sign a note to borrow $10,000 from your banker. The $10,000 will be repaid in one payment in one year. What are the original entries in the general journal that account for this transaction?
   - A. $10,000 credit to cash account, $10,000 credit to notes payable account.
   - B. $10,000 debit to cash account, $10,000 debit to notes payable account.
   - C. $10,000 debit to cash account, $10,000 credit to notes payable account.
   - D. $10,000 credit to cash account, $10,000 debit to notes payable account.

5. The balance sheet is constructed on the basic accounting equation which states that:
   - A. current liabilities plus long-term debt equal assets.
   - B. total liabilities plus equity equal assets.
6. In a classified balance sheet, which of the following accounts would be listed first? 
   A. Land.  
   B. Intangible assets.  
   C. Inventory.  
   D. Prepaid expense.  

7. Earnings before interest and taxes (EBIT) is also known as:  
   A. income from operations.  
   B. gross profit.  
   C. free cash flow.  
   D. net profit.  

8. All of the following would be reported on the income statement “below the line” EXCEPT:  
   A. discontinued operations.  
   B. income tax expense.  
   C. extraordinary items.  
   D. cumulative effect of changes in accounting methods.  

9. Which of the following would NOT affect cash flow from operations?  
   A. An increase in accounts payable.  
   B. Payment of interest expense.  
   C. Payment of income taxes.  
   D. Payment of dividends.  

10. Prepaid expense items, such as prepaid rent, are usually considered:  
    A. capital assets.  
    B. current assets.  
    C. current liabilities.  
    D. long-term liabilities.  

11. MicroChip Technologies, Inc. owns 50,000 shares of stock in Zenathon Corp. Microchip paid $6.00 per share for the stock, which had a value of $9.00 per share on December 31, 2004. If Microchip classifies the Zenathon investment as a trading investment, then the value reported on the 12/31/04 balance sheet would be:  
    A. $300,000, and the unrealized gain would not be included in income.  
    B. $450,000, and the unrealized gain would be shown on the income statement.  
    C. $450,000, and the unrealized gain would be listed as an adjustment to stockholder’s equity.  
    D. $450,000, and the unrealized gain would not be included in income or equity.  

12. Jake’s Spoons made the following inventory purchases in the first quarter:  
    Month | Units | Cost per unit  
    -------|-------|--------------  
    January | 50    | $7            
    February | 40    | $8            
    March   | 25    | $9            

    Assume that Jake’s had no inventory at the beginning of January and that 95 units were sold during the first quarter. Ending inventory for the first quarter under FIFO and LIFO methods of inventory accounting would be:
13. Expenses that are related to specific revenues but not with a specific product should be:  
   A. deferred and amortized over the lifetime of the specific product.  
   B. expensed immediately.  
   C. expensed in the period in which revenues are recognized.  
   D. expensed as incurred.  

14. An analyst is evaluating two firms in the same industry. Firm A uses the LIFO method of inventory accounting, while Firm B uses FIFO. In a period of rising prices, the analyst should expect that Firm A would report:  
   A. higher net income and higher inventory than Firm B.  
   B. higher net income and lower inventory than Firm B.  
   C. lower net income and higher inventory than Firm B.  
   D. lower net income and lower inventory than Firm B.  

15. A piece of industrial equipment costs $100,000, and it will cost $20,000 to ship and install. The equipment is expected to have a 6-year useful life and no salvage value. Calculate the annual depreciation expense and book value at the end of the fourth year using straight line depreciation:  
<table>
<thead>
<tr>
<th>Depreciation</th>
<th>Book Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. $16,667</td>
<td>$40,000</td>
</tr>
<tr>
<td>B. $20,000</td>
<td>$40,000</td>
</tr>
<tr>
<td>C. $16,667</td>
<td>$33,333</td>
</tr>
<tr>
<td>D. $20,000</td>
<td>$33,333</td>
</tr>
</tbody>
</table>

16. Depreciation:  
   A. is a cash expense.  
   B. reduces income tax liability.  
   C. increases gross operating profits.  
   D. is considered a long-term liability.  

17. Charles Corp has just purchased a new machine for $400,000. Charles Corp plans to depreciate the machine over the next four years using the double declining balance method of depreciation. If the machine has a salvage value of $80,000, what will Charles Corp report as depreciation expense in year 3?  
   A. $50,000.  
   B. $40,000.  
   C. $20,000.  
   D. $0.  

18. All of the following are examples of intangible assets EXCEPT:  
   A. timberland.  
   B. patents.  
   C. goodwill arising from an acquisition.  
   D. licenses to use technology developed by another firm.
19. Gears Inc. issued $10 million par value of bonds in 2004 with an annual coupon rate of 8.0 percent. The bonds were issued at a price of $1,050 per $1000 par value, and they mature in ten years. The total interest cost of these bonds over their life is:
   A. $8,500,000.
   B. $8,400,000.
   C. $8,000,000.
   D. $7,500,000.

20. Regal Corp has leased a machine under a long-term agreement that includes a bargain purchase option. This transaction should be treated as:
   A. an operating lease, regardless of other features of the agreement.
   B. a capital lease, so long as the term of the agreement is at least 75% of the estimated economic life of the machine.
   C. an operating lease, so long as the term of the agreement is at least 75% of the estimated economic life of the machine.
   D. a capital lease, regardless of other features of the agreement.

21. The primary financial statement effect of a stock split is:
   A. a reduction in retained earnings.
   B. an increase in shares outstanding.
   C. an increase in the contributed capital account.
   D. a reduction in the common stock account.

22. Treasury stock is best defined as:
   A. outstanding stock repurchased by the issuer.
   B. stock with no par value.
   C. additional paid-in capital.
   D. stock payable to shareholders as part of a stock dividend.

23. Stockholder’s equity would be increased by all of the following EXCEPT:
   A. issuing new stock at par value.
   B. increase in market price of common stock.
   C. positive net income.
   D. issuing new stock above par value.

Use the following information to answer Questions 24 through 30:

Burle Industries is a manufacturer of heavy mining equipment. The company has been in operation for ten years, and during the last five years the company has been a publicly held firm. Financial data (in random order) for Burle Industries for the year ending 12/31/04 are presented as follows:

<table>
<thead>
<tr>
<th>Account</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Profit</td>
<td>$20,000</td>
</tr>
<tr>
<td>Accum. Depreciation</td>
<td>$60,000</td>
</tr>
<tr>
<td>Accounts Payable</td>
<td>$6,000</td>
</tr>
<tr>
<td>Revenue</td>
<td>$35,000</td>
</tr>
<tr>
<td>Depreciation Expense</td>
<td>$6,000</td>
</tr>
<tr>
<td>Cash</td>
<td>$9,000</td>
</tr>
<tr>
<td>Notes Payable</td>
<td>$500</td>
</tr>
<tr>
<td>Paid-in Capital</td>
<td>$10,000</td>
</tr>
<tr>
<td>Fixed Assets</td>
<td>$90,000</td>
</tr>
</tbody>
</table>
Retained Earnings $21,500
Accounts Receivable $15,000
SG&A Expenses $2,000
Inventory $7,000
Long-term Debt $3,000
Interest Expense $270
Common Stock $20,000
Income Taxes $4,692

Over the course of the year, accounts receivable increased by $1,200, inventory decreased by $750, accounts payable increased by $400, new fixed assets were purchased for $10,000, and long-term debt was reduced by $1,000.

24. Calculate the dollar value of Burle Industries’ current assets and total assets as of December 31, 2004:

Current Assets
Total Assets
A. $24,000 $61,000
B. $31,000 $114,000
C. $31,000 $61,000
D. $24,000 $114,000

25. Calculate the net working capital for Burle Industries as of December 31, 2004:
A. $17,000.
B. $17,500.
C. $24,000.
D. $24,500.

26. Calculate the total value of equity for Burle Industries as of December 31, 2004:
A. $41,500.
B. $30,000.
C. $61,000.
D. $51,500.

27. Calculate the cost of goods sold for Burle Industries for the period ending December 31, 2004:
A. $15,000.
B. $20,000.
C. $10,000.
D. $5,000.

28. Assuming that Burle Industries did not pay any dividends to common stockholders, what was the addition to retained earnings in 2004?
A. $4,692.
B. $7,038.
C. $11,730.
D. $21,500.

29. Calculate the cash flow from operations for Burle Industries for the year ending December 31, 2004:
30. Calculate the total cash flow for Burle Industries for the year ending December 31, 2004:

A. $1,988.
B. $2,988.
C. $3,988.
D. $11,988.

Answers

1. C

Information that is highly reliable, such as historical cost, is often not relevant, and information that is highly relevant, such as market value, is often not reliable.

2. D

The increase in inventory would be offset by the payment from cash.

3. C

Increased expenses are recorded as debits. Depreciation is handled like any other expense—an increase in depreciation would be a debit.

4. C

Signing the note represents both an increase to cash (an asset) and an increase to notes payable (a liability).

5. B

The accounting equation equates the two sides of the balance sheet—assets equal total liabilities plus equity.

6. C

Land and intangible assets are long-term assets, while inventory and prepaid expense are current assets. Inventory is listed before prepaid expense in a classified balance sheet because inventory is expected to be converted to cash more quickly.

7. A

Gross profit is sales less cost of goods sold. Gross profit less selling, general, and administrative
expense is income from operations, or EBIT. EBIT less interest and taxes is net profit.

8. **B**

"Below the line" items are reported after net income. Income taxes are deducted in determining net income.

9. **D**

Accounts payable is a working capital account, and changes to working capital accounts are included in cash from operations. Interest paid and taxes paid also are included in cash from operations. Dividends paid are considered in cash from financing.

10. **B**

Prepaid items are typically expenses that have been paid in advance. A good example is insurance, which may be paid for several months or a year at a time, then expensed monthly. The prepaid amount, which has not been expensed, is carried on the balance sheet as a current asset.

11. **B**

Trading investments are reported at fair market value, and any unrealized gain or loss is shown on the income statement.

12. **B**

Ending inventory would be \((50 + 40 + 25) - 95 = 20\) units. Under FIFO, the units remaining would be the most recent purchased, so inventory would be \(20 \times 9 = \$180\). Under LIFO, the units remaining would be the first ones purchased, so inventory would be \(20 \times 7 = \$140\).

13. **C**

Matching principle requires that revenues and expenses are matched with each other and matched within the appropriate accounting period.

14. **D**

In a rising price environment, LIFO would mean more expensive inventory was being included in cost of goods sold, so net income would be lower. The remaining inventory would be the less expensive inventory purchased earlier, so ending inventory would be lower also.

15. **B**

The total capitalized cost of the equipment is \(120,000\) (invoice \(100,000\) plus shipping and installation). Since we are using straight-line depreciation, the depreciation expense in any given year is equal to \(120,000 / 6 = \$20,000\). The following table will help demonstrate the depreciation of the asset over time:

<table>
<thead>
<tr>
<th>Open table as spreadsheet Year</th>
<th>Capitalized Cost</th>
<th>Depreciation Expense</th>
<th>Accumulated Depreciation</th>
<th>Book Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>120,000</td>
<td>120,000</td>
<td>20,000</td>
<td>20,000</td>
<td>100,000</td>
</tr>
</tbody>
</table>
As the table demonstrates, the book value (i.e., original cost minus accumulated depreciation) at the end of year 4 is $40,000.

16. B

Although depreciation is a non-cash expense, it reduces taxable income and taxes. It also reduces gross operating profit.

17. C

Depreciation expenses:

\[
\text{Year 1: } \left( \frac{2}{4 \text{ years}} \right) (\$400,000 - 0) = \$200,000
\]

\[
\text{Year 2: } \left( \frac{2}{4 \text{ years}} \right) (\$400,000 - 200,000) = \$100,000
\]

\[
\text{Year 3: } \left( \frac{2}{4 \text{ years}} \right) (\$400,000 - 300,000) = \$50,000
\]

Under the declining balance method, salvage value is not used in the annual expense calculation, but the asset cannot be depreciated below salvage value. Therefore, after year 2 only $20,000 of additional depreciation may be taken.

18. A

Timberland is a tangible asset.

19. D

Total interest cost is total coupon interest paid to bondholders less the premium received at issuance. In this case, the total interest cost would be:

\[(\$10M \times 8\% \times 10 \text{ years}) - \$500,000 = \$7,500,000\]

20. D

The agreement would be a capital lease so long as it included either a bargain purchase option or a term of 75% of the machine’s life. The agreement would also be considered a capital lease if the agreement transferred ownership or if the present value of the lease payments were greater than or equal to 90% of the fair market value of the property.

21. B
Stock splits do not affect any asset, liability, or equity accounts. The only effect is to increase shares outstanding and reduce par value per share.

22. A

Treasury stock is stock that has been repurchased by the issuing firm.

23. B

Issuing new stock would increase equity, regardless of whether the stock was issued at or above par value. Positive net income adds to retained earnings, which would also increase equity. Changes in the market price of the stock are not reflected in the firm’s balance sheet.

24. C

Burle’s current assets consist of cash, accounts receivable, and inventory: $9,000 + $15,000 + $7,000 = $31,000. Total assets for the company consist of current assets plus fixed assets less accumulated depreciation: $31,000 + $90,000 – $60,000 = $61,000.

25. D

Net working capital is defined as current assets minus current liabilities. Total current liabilities for Burle Industries is equal to the sum of its current liabilities, which include accounts payable and notes payable: $6,000 + $500 = $6,500. For Burle Industries, the net working capital equals $31,000 – $6,500 = $24,500.

26. D

The total value of equity for Burle Industries is simply the sum of the equity accounts as given in the problem. Burle is a public company and therefore has the following equity accounts: common stock, paid in capital, and retained earnings. When we add all the accounts together we get a total value of equity equal to $20,000 + $10,000 + $21,500 = $51,500.

27. A

The cost of goods sold can be determined from income statement data. We already know the revenue and gross profit for Burle Industries. Therefore we only need to substitute what we know into the following equation and determine the cost of goods sold figure: Revenue – COGS = Gross Profit; $35,000 – COGS = $20,000; COGS = $35,000 – $20,000 = $15,000.

28. B

If a firm does not pay any dividends, the amount added to retained earnings is equal to the firm’s net income for the period. Calculate net income as follows:

revenue – COGS – SG&A – depreciation – interest – taxes = net income

$35,000 – $15,000 – $2,000 – $6,000 – $270 – $4,692 = $7,038

29. C

Cash flow from operations is calculated as follows: net income + depreciation – increases in current assets + decreases in current assets – decreases in current liabilities + increases in current liabilities. More specifically, for Burle the operating cash flows are calculated as follows: net income + depreciation – increase in accounts receivable + decrease in inventory + increase in accounts payable
= operating cash flow: 7,038 + 6,000 − 1,200 + 750 + 400 = $12,988.

30. A

Total cash flow is the sum of cash flows from operations, investing, and financing. Since Burle bought fixed assets in the amount of $10,000, this represents a cash outflow for investment. Also, the company paid down debt (a cash outflow) by $1,000 over the course of the year. Therefore investing and financing cash flows are negative for Burle. We sum all the cash flows as follows: operating cash flow + investing cash flow + financing cash flow: 12,988 − 10,000 − 1,000 = $1,988.
Chapter Four: Corporate Finance

Overview

The field of finance is actually three interrelated areas: (1) financial institutions and capital markets; (2) investments; and (3) corporate finance. The financial institutions and capital markets area deals with financial institutions, such as banks and investment companies, and the markets through which long- and short-term debt and equity securities are sold and traded by investors. The investments area focuses on valuing investment opportunities and making investment decisions. Corporate finance, also called financial management, is one of the most extensive areas of financial theory and is the focus of this chapter.

Corporate finance seeks to understand how corporations acquire financing as well as how they use financing to increase firm value through capital investment.

Corporate finance is the study of how corporations raise and use capital, how corporate financial managers evaluate possible capital investments, and how investors value corporations. Unlike a proprietorship or partnership, the corporation is a separate, legal, tax-paying entity. Typically the owners, known as stockholders, are numerous and scattered literally anywhere in the world. They rely upon managers, who may or may not be owners, to make all the operating decisions.

Due to this separation of corporate management and ownership, some interesting conflicts arise. The owners of the firm may or may not be interested in daily operations, but they are very interested in the value of their investment in the company (the stock they hold). Alternatively, management is very interested in daily operations, particularly as they relate to salary and job security. The implication is that not every decision a corporate manager makes is necessarily in the owners’ best interest.

Section 1 of this chapter discusses the three primary forms of business: the proprietorship, the partnership, and the corporation. Section 2 addresses agency costs. Section 3 presents the concepts of risk and return and corporate capital structure. Section 4 introduces capital budgeting and breakeven analysis, two processes by which managers make long-term expansion decisions.

Section 1: Forms Of Business

Chapter Objective: Describe the three basic business forms: proprietorship, partnership, and corporation.

When humans first walked the Earth, they probably foraged for food like any other living thing trying to survive. Individuals probably didn’t give much thought to the welfare of others outside of their group. Those who could best fend for themselves got sufficient food, animal skins for clothing, and decent shelter. Individuals who could hunt well, but didn’t like to forage for food, ended up with more animal skins than they needed and only occasional fruits and vegetables to eat. Those who were too slow or weak to hunt animals probably ate fruit and vegetables but had little clothing and ate little meat.

A barter system is a type of market system in which goods are traded for goods of equal value rather than bought or sold using currency.
Some industrious non-hunting individual no doubt got the idea of gathering more fruit than he needed so he could trade the extra for a better place to sleep, a better skin to wear, or even another type of food. Hunters started trading their game and extra skins for fruit or a better place to sleep. Soon all the people in the group began similar trading, and business had begun. This form of transaction is known as barter. In a barter system people trade items that have equivalent value. Of course this isn’t exactly what we study in corporate finance, but the barter system is alive and well in many parts of the world.

Whether or not this is how it began, business, in one form or another, has become an integral part of every culture. Whenever an opportunity has arisen, someone has taken advantage of it, and the myriad types and sizes of businesses we see today are the result. Of course, without the necessary funding along the way, the business world would not have developed to its current status.

Let's turn our attention to the financial aspects of the development of business. Jim Smith owns and operates a portable hot dog kiosk in a large city. Since his business is flourishing, he purchases another inexpensive hot dog stand for cash and hires Jean Jones to manage the new stand.

Some time later, because of the growth of business, Jean approaches Jim with the suggestion that they rent a small building she has found. The location is excellent, and rent is inexpensive. Since sales are increasing and customer loyalty is high, Jim feels renting the building is something he should pursue. However, Jim will need $100,000 to purchase new equipment and make repairs and alterations to the building. Jim has $20,000 that he can invest in the business, and the bank will loan him $60,000. Jean offers to invest the other $20,000, but only in exchange for half ownership. Under this arrangement they both own the business, and they share equally in the profits.

The evolution from sole proprietorship to partnership to incorporation is likely to occur as a business expands and grows.

Eventually, Jim and Jean own and operate several hot dog shops and have hired a team of managers for each of the shops. With the number of locations and increasing obligations and liabilities, Jim and Jean's attorney, John, has recommended that they incorporate as J&J Dogs. Incorporation will allow J&J Dogs to continue operations as usual while freeing Jim and Jean from some of the liabilities of business ownership and the hassle associated with the limited life of a partnership.

John has indicated to Jim and Jean that by forming a corporation, they effectively create a separate entity. The corporation has a life of its own, separate from those of Jim and Jean, while the life of their original partnership is tied directly to the lives of the partners. If either one of them dies, the partnership ceases to exist. If they choose to incorporate, J&J Dogs could continue indefinitely regardless of whether or not Jim and Jean survive. In addition, by forming a corporation, Jim and Jean insulate themselves from some of the liabilities of operating a business.

Let's look at a simple example of how liabilities can arise. Jim and Jean cannot possibly ensure that all sanitary and safety precautions are being followed all the time at all their shops. For example, a careless employee could leave hot dogs out of refrigeration too long before cooking them. From this seemingly minor oversight, a customer contracts a rare disease.

Under their current arrangement as a partnership, Jim and Jean could be held personally liable for the victim’s illness. An ensuing lawsuit could take all the assets of J&J Dogs, as well as the personal assets of Jim and Jean. However, if J&J Dogs is incorporated, Jim and Jean’s losses are limited to what they have invested in J&J Dogs. The lawsuit could take the business assets, but none of their personal assets are at risk. After considering the potential for an unexpected and possibly disastrous liability, Jim and Jean agree to form a corporation.
In an initial public offering (IPO), a firm sells shares of ownership to the investing public. Each shareholder then owns a small portion of the now public firm.

After incorporation, their business flourishes and they have people from all over the country clamoring to learn the secrets of their success. While Jim and Jean will not give away their secret recipes, they will let others lease the rights to use them by offering franchises locally. Soon, they’re on their way to real success!

J&J Dogs rapidly becomes a household name. Jim and Jean consider establishing a national franchise of their business. Of course, this requires a substantial investment. The only way they can come up with the millions of dollars needed to "go national" with their franchises is to go public. After the initial public offering (IPO) of shares, there are thousands of owners of J&J Dogs.

Although totally fabricated, the story makes a very important point. Business as we know it could not have developed without finance. When Jim first expanded his operation from one to two kiosks, it was his own savings that made this possible. He financed the expansion. However, expansion into a fixed location was beyond his means. He needed the infusion of capital only a partner could provide.

Later, forming a corporation provided Jim and Jean with limited liability and protected the company from the death of either partner. However, it ultimately could not provide the necessary capital for national expansion. Jim and Jean had to sell a portion of their company to the public through an IPO. This provided a major infusion of capital as well as future access to capital markets.

Let’s sum up what we know about the various business forms.

**Proprietorship**

The least-complicated form of business to establish is the **proprietorship**. When Jim had only one hot dog kiosk, his business was a proprietorship. Legally, the business and Jim were indistinguishable. When his kiosk earned a profit, it belonged exclusively to Jim, and he paid income taxes on it. If the business showed a loss for the period, Jim could use that loss to offset profits from other sources of personal income. He alone had total claim to all profits, but he alone also had to accept all losses.

A **proprietorship** is a business owned by a single individual. In the event that an individual or entity has a legal claim against a proprietorship, the claim can be satisfied using the assets of the business as well as the personal assets of the owner.

Any liability incurred by the business was also directly tied to Jim. If the business did not pay a liability (e.g., a note to a bank or debt to a supplier) Jim could be forced to pay the debt from his personal assets. If Jim couldn’t pay the liability, creditors could seize the business and all of Jim’s personal assets, if necessary, to cover the amount owed. In a proprietorship, liability to the owner is unlimited. If someone sues the business, all personal and business assets are considered the same. The lawsuit could seize any or all of Jim’s assets, including those in the business. In addition, the life of a proprietorship is limited to the proprietor’s life. If the proprietor dies, the business effectively dies, also. Its assets then become assets in the proprietor’s estate.

**Sole proprietorships** are often started by entrepreneurs who are willing to accept the risks associated with starting a business from scratch with their own ideas and money.
One of the most frequently given reasons for starting and maintaining a proprietorship is freedom to make
decisions. As the sole proprietor, Jim made all the business decisions. He decided where to locate the
kiosk, the types of hot dogs he would sell, the price he would charge, and the hours of operation for the
business.

**Partnership**

A *partnership* is a more complicated form of business. It is a legal contract between two or more
individuals that share the ownership interests in a business. For J&J Dogs, the partnership agreement
specified that Jim and Jean each own 50 percent of the business. While J&J Dogs was being operated as a
partnership, the partnership agreement defined how ownership in J&J Dogs was divided between Jim and
Jean.

Legally, a partnership is very similar to a proprietorship. As with a proprietorship, we say profits and losses
“flow through” to the owners. That is, the partnership itself does not pay income taxes. Jim and Jean divided
any profits and losses equally and reported them on their personal income tax returns.

A *partnership* is a business with two or more owners. Much like proprietorships, partnerships are subject to
unlimited liability, causing both business and the partners' personal assets to be at risk. Partnerships are
formed in some cases solely to gain access to necessary capital, but in other instances the partner may
have other desirable assets to bring to the partnership, such as business savvy or experience.

Also, like a proprietorship, partnership debts “flow through” to the owners according to their proportional
ownership. Since Jim and Jean each owned 50 percent of the business, they each were liable for 50
percent of any debts or other claims against the business. If J&J Dogs went out of business with large
debts, Jim and Jean would each be liable to repay 50 percent of the debt. Creditors would seize business
and personal money and/or assets from both of the partners to satisfy the claims.

From Jim’s perspective, the primary benefit from forming the partnership was getting the capital necessary
to expand the business. Expansion required additional equity[1] capital, which he did not have but which
Jean could provide. There were other benefits (e.g., sharing management responsibilities and division of
the liability exposure), but financing was paramount to the expansion and ultimate success of the business.

While he gained assistance in running the business, Jim was no longer free to make decisions on his own.
There was the distinct possibility that Jean might not agree with him on the types of food to purchase, the
hours of operation, prices to pay for inputs and prices to charge, along with many other daily business
decisions. In our example, Jim never had problems with his partner, but disagreements among partners are
one of the primary reasons for the dissolution of partnership agreements and subsequent business failures.

**Corporation**

In our previous example, J&J Dogs waited to incorporate its business until it was large enough that the
benefits from forming a corporation outweighed the drawbacks from giving up their partnership. A
*corporation* is a business entity that is legally separate from the owners. This separateness affords the
Corporate form three specific advantages over the proprietorship and partnership forms of business.

1. **Unlimited Life.** Since the corporation is a legal entity totally separate from its owners, its life is not
tied to that of the owners. If both Jim and Jean, owners of the hot dog business in Section 1, died,
their ownership shares in the corporation, not the total assets of the corporation, would become part
of their respective estates.

2. The owners of a *corporation* are legally separate from the corporation itself. The corporation can
own assets and incur liabilities separate from the owners’ assets and liabilities. The corporate form
of business ownership has three distinct advantages over other forms of business: unlimited life, limited liability, and ease of ownership transfer.

4. **Limited Liability.** In a proprietorship or partnership, all profits, losses, debts, and other liabilities “flow through” to the owner(s). In the case of a corporation, the owners are only liable for the amount they have invested in the corporation. For instance, a large lawsuit could easily claim more than the available assets of J&J Dogs, Inc. Since Jim and Jean are considered legally separate from the corporation, the suit cannot take their personal assets. They can only lose their time, effort, and monetary investments in the business.

5. **Ease of Ownership Transfer.** Publicly traded corporations are known as Subchapter C Corporations.[2] These would include firms such as Microsoft, IBM, McDonald’s, and Exxon Mobil. Ownership interest in these large firms is obtained by purchasing their common stock. Common stock is sold in shares, with each share indicating a percentage ownership in the firm. If you hold 10 percent of all the common stock of a firm, you own 10 percent of that firm. Ownership interest permits holders of common stock to vote at stockholder meetings, giving the owners of the firm a say in how the firm is managed. Stockholders usually have one vote per share of stock they own. Votes are cast on major questions faced by the corporation, such as the election of the Board of Directors.

**Control**

Large corporations typically have millions of shares of stock outstanding and have thousands of owners. Since some owners would have to travel hundreds or even thousands of miles to attend the stockholder meeting to cast their votes, management will send out what are known as proxies. A *proxy* is nothing more than an absentee ballot. On the proxy, the stockholder indicates his choice for members of the **Board of Directors** (the Board) and yes or no on other questions included in the proxy. If a stockholder fails to return the proxy by the indicated date, management typically has the right to cast that stockholder’s votes.

If the common stock of a firm is registered with the Securities and Exchange Commission (SEC), it can be traded publicly. The common stock of most large C corporations can be bought or sold quickly and easily.

As mentioned above, a shareholder meeting is held to elect new members to the Board. The charge of the Board is to elect, advise, and oversee the president of the corporation. They are paid an honorarium and are expected to meet regularly, usually quarterly. The only prerequisite to being a member of the Board is interest and valuable expertise.

**Taxation**

At the end of the year, when financial statements are drawn up and taxable income for the year is determined, the corporation itself pays income taxes. In this regard, corporations are different from proprietorships and partnerships, where taxable income flows through to the owners. The corporation’s taxable income minus taxes equals net income, or income after taxes.

**Dividends** are the portion of net income paid out to the owners (i.e., the stockholders). The firm’s Board of Directors decides if and when dividends will be paid. Dividends are distributed after the firm pays income taxes (i.e., after tax).

A very important decision made by the Board is when to pay **dividends** and how much to pay. Dividends are cash (and in some cases additional shares of common stock) that corporations pay to their
stockholders. Since dividends are paid out of net income, the income that generated the dividends has already been taxed. Stockholders then pay income taxes on the dividends they receive, creating **double taxation**.

Corporations also purchase the common stock of other corporations. For example, corporation B is considered the investor when it buys the common stock of corporation A. When corporation A pays dividends to its stockholders, corporation B pays taxes on the dividends just as any other investor would. Corporation B pays dividends to its stockholders, also. The income used to generate those dividends includes the now double-taxed dividends from corporation A. When corporation B’s stockholders pay taxes on the dividends they receive, the dividends from corporation A have essentially been taxed **three** times.

**Double taxation** occurs when the stockholders pay income taxes on dividends that have already been taxed at the corporate level.

The U.S. Congress enacted the **dividends received deduction** to help alleviate this **triple taxation**. According to this provision of the tax code, corporate owners of equity securities may deduct between 70 and 100 percent of dividends received before calculating taxable income. As a result, these dividends will flow to corporation B tax free.

Firms generally keep a portion of the profits earned in any period for reinvestment back into the company.

**Internal Investment**

The profits of any firm (e.g., net income) belong to the owners of the firm. Rather than pay out all net income to the stockholders, the Board will “retain” a portion for future investment. This means that net income is divided into two parts. The first is the portion paid to stockholders in the form of dividends, and the second is the portion reinvested by management for the stockholders. This portion is called **retained earnings** on the firm’s balance sheet.

The income held for reinvestment is referred to as **retained earnings**.

Since they are a part of net income, retained earnings represent profits generated by the firm that have not been paid to the stockholders. By retaining part of the firm’s earnings, management is implicitly promising to use it to maintain or replace equipment or to invest it in profitable projects or expansion. As a general rule, firms with many investment opportunities tend to pay smaller dividends, while firms with fewer investment opportunities, such as public utilities, tend to pay larger dividends.

The above discussion pertains to the (typically) larger form of corporation, the C Corporation. This is the form of corporation whose stock is listed on the New York Stock Exchange, the American Stock Exchange, regional exchanges, and the NASDAQ. These securities have been pre-approved for public sale by the Securities and Exchange Commission (SEC). Approval by the SEC means only that management has disclosed all relevant information and followed all guidelines for selling securities publicly. It does not guarantee the quality of the securities. This point will be discussed in more depth in the Capital Markets Chapter.
S Corporations

Although definitely not a requirement, the first corporation formed by Jim and Jean might have been a **Subchapter S corporation**. Similar to a C corporation, S corporations give the owners (stockholders) limited liability, but taxation and certain legal requirements are more like a partnership. There is a limit to the number of stockholders, and shares in S corporations are not publicly traded. The limited liability corporation (LLC) is another entity form that is taxed like a partnership but limits the liability exposure of owners.

S corporations are legally very similar to C corporations but have a limited number of owners. Their securities are not registered with the SEC and cannot be traded publicly.

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1. Equity means ownership. Equity capital is the owners’ contribution to the business in the form of money or other assets.

2. The "C" pertains to the chapter in the U. S. Internal Revenue Service (IRS) code that describes taxation of this form of corporation.

3. This includes common and preferred stockholders.

4. Please note that retained earnings do not represent cash. This is a very important concept, which is explained in the Financial Statement Analysis chapter.

Section 2: Agency Costs

Since the owners of a large corporation are not available to make daily operational decisions, the manager acts as their agent. Agency costs are the actual or implied costs that arise from this separation of ownership and management.

Chapter Objective: Discuss agency costs.

In the introduction to this chapter, we noted that certain conflicts can arise as a result of the separation of ownership and management of a corporate entity. In general, management is supposed to strive to maximize stockholder wealth by maximizing the firm’s stock price. However, this assumes that management and the stockholders always have the same personal goals. This is not necessarily the case.

Agency arises from the separation of corporate ownership and management. Since the owners are numerous and scattered all over the country (and possibly the world), managers must act as their agents and run the firm for them. Every operating and investment decision the manager makes is actually made for the owners. It’s very similar to the relationship between homeowners and real estate agents. Agents represent homeowners to potential buyers, while homeowners must depend upon the agents to act in their best interest.

There are two agency relationships in large corporations: between the firm’s stockholders and its managers and between the firm’s stockholders and the firm’s bondholders. Before we discuss these, however, let’s be
sure you completely understand the relationship between stockholders and bondholders and the sources of risk in a large corporation.

Although we thoroughly discuss risk later in this chapter, we must introduce a few concepts related to risk in order to fully discuss agency costs. It is important to realize that the characteristics of the firm issuing stocks and bonds contribute a large portion of the risk of its securities. We divide these characteristics into two categories: financial risk and business risk. Financial risk comes from the way management finances the firm’s assets and growth. Using common equity stabilizes the firm’s cash flows, while using debt creates leverage which can lead to volatility in the firm’s cash flows (i.e., using debt makes the firm riskier). There is also a certain amount of volatility in the firm’s earnings due to business risks. Much of this risk is associated with the type of industry in which the firm operates, but management can make asset choices that will increase or decrease the firm’s business risk.

Agency relationships exist between the stockholders and bondholders of a firm and between the stockholders and the management of a firm. Stockholders and bondholders are at odds over the management of a firm. In order for a firm’s management to maximize the value of one group’s investment, it may be necessary to take value away from the other group.

Stockholders are primarily concerned with the price of their stock. They want management to make decisions that will cause the price to increase, regardless of the risk involved. Bondholders, on the other hand, are far more interested in the firm’s ability to make the required periodic interest payments and repay the principal when due. The ability to make interest payments as part of the normal operations of the firm depends upon management’s ability to consistently generate sufficient operating income or EBIT (Earnings Before Interest and Taxes).

This is one source of disagreement between stockholders and bondholders. Stockholders want management to undertake risky projects and increase the amount of debt in the capital structure to maximize their expected returns relative to their individual investments, even though doing so also increases the firm’s overall risk. A large portion of the increased risk is a result of unsystematic (company specific) factors which can be diversified away by stockholders who hold their stock as part of a large portfolio. Thus the stockholders can achieve higher expected returns without the associated higher risk. This will be discussed in more detail later.

Bondholders, on the other hand, would prefer that management be cautious in running the firm. They prefer less risky projects that are expected to maintain a stable level of operating profit that is sufficient to cover the requisite interest payments on the bonds. In addition, a firm’s creditors will want to limit further issuance of debt as much as possible to protect the stability of their investment. The issuance of more and more debt securities will likely come at increasing interest rates. These higher interest rates increase interest payments and the overall risk of the firm. Thus it is a matter of self preservation for a firm’s debt holders to discourage further debt issuances. This is in contrast to the desire of stockholders to employ as much debt as possible to amplify their expected returns.

Stockholders will tolerate additional risk with its accompanying increased expected returns. Bondholders want stability with its lower, more consistent returns. If stockholders get their wish, they in effect steal value from the bondholders. The increased risk reduces the value of the debt claims on the firm while simultaneously increasing the value of the equity claims. If the bondholders get their way, their value is maintained, but the value of the equity claims is not maximized. With whom do you think management will side?

Agency costs can come in the form of an opportunity cost to stockholders or an explicit cost resulting from management’s excessive personal use of the firm’s assets.
Continuously increasing the risk of the firm to pacify its stockholders will make the firm’s bottom line (i.e., net income) more uncertain. Since managers are not only ultimately responsible for the bottom line, but also for acting in the stockholders’ best interest, they are faced with a challenging dilemma. Should management increase the firm’s risk to increase the returns to the stockholders, or should management stabilize the firm’s earnings to preserve their positions with the company (their jobs)?

Obviously, the manager will not make the firm as risky as possible to please the stockholders because this would actually threaten the manager’s job. This means the stock price will never reach its theoretical maximum. This loss of value (price) is a form of agency cost to the stockholder.

In addition to the loss of shareholder value, agency costs can come in the form of extravagant perquisites for management. Since the manager is responsible for maximizing the value of the stockholders’ stock but does not benefit equally from the creation of that value, he will be inclined to use the company’s resources for his own personal gain. The manager also has strong incentive to ensure he maintains his job even if providing such assurance to himself imposes a cost to the shareholder.

The only way to ensure managers will always make decisions that are in the stockholders’ best interest is to hire someone to oversee everything they do, which would be quite expensive as well as confining for the manager. The value saved through this overseer’s actions might not be as great as the cost. Once again, a tradeoff is required. Stockholders must allow managers to make everyday decisions without someone looking over their shoulders. However, managers must be monitored in some way to prevent a complete abuse of the stockholders’ investment. This is usually accomplished through the annual audits performed by large independent accounting firms as well as oversight provided by the firm’s board of directors.

**Section 3: Risk And Return**

**Risk** is the possibility of an unfavorable event (i.e., the possibility the return on the investment will be lower than expected). If the future outcome of an event is not known with certainty, the future event contains an element of risk.

**Chapter Objective:** Discuss the relationship between risk and return

**Risk**

In the Economics Chapter, we discussed how all of our personal decisions are made in terms of costs and benefits. Corporate finance is not immune from this concept. When a corporate manager makes a decision to purchase a certain piece of equipment, expand operations, or start a new product line, the manager must consider both the costs and the benefits of that decision.

In this section we will study costs and benefits in the framework of risk and return. Decisions made by the corporate financial manager will usually involve money, since money is both the cost and the benefit of most financial decisions. Risk is quite important when virtually no financial decision is immune from uncertainty.

We will use the word **uncertainty** as a synonym for risk. In finance, whenever there is uncertainty about an outcome, that outcome is considered risky. Let’s assume today is the day your best friend Chris promised to pay back the $20 he borrowed from you last week. Are you certain Chris will pay you the $20 today as promised? If Chris gives you the money today, you will have received the payment exactly as you expected.
If you receive the money tomorrow or the next day, you will have received the amount expected but not at the original time expected.

Let’s define risk as “the possibility of an unfavorable event.” Is receiving the $20 late an unfavorable event? What if you needed the money today to pay your cable television bill? It doesn’t matter if you receive the money late or even if you don’t receive it at all because either outcome results in discontinued cable service.

Risk tends to increase with time because more time means more opportunities for an adverse event (i.e., an event with negative cash flow consequences) to occur.

Since most financial decisions result in receiving (or paying) a cash flow in the future, and since the future is always uncertain, there is obviously risk associated with any future cash flow. In fact, as the cash flow occurs farther and farther into the future, the cash flow will tend to become riskier.

Given enough time, just about anything can happen. That means that the longer the time before you expect a cash flow, the higher the possibility that something will happen to affect the way it is received or even if it is received at all. Since no one can predict the future, we must accept that some amount of risk is inevitable.

What causes risk?

Risk, as it applies to common stock, is defined exactly the same as it is for any other investment. It is the possibility of an unfavorable event. From the investor’s perspective, a particularly unfavorable event is a decline in the price of the stock. We can define the unfavorable event for a common stock as a decline in price, but what causes stock prices to fall?

Macroeconomic factors, such as inflation, unemployment, or government spending, affect the prices of all assets. Certain assets will be more sensitive than others to any given factor.

The forces that can affect stock prices can be separated into two general categories: macroeconomic and microeconomic. Macroeconomic variables (e.g., inflation, the national unemployment rate, government policies) are economy-wide in nature and affect all stock prices to varying degrees. For instance, inflation causes overall price increases, resulting in decreased demand and reduced profits. As the unemployment rate increases, economy-wide consumption declines, also resulting in reduced profits. We will see later in the book that macroeconomic factors such as these can be the most troublesome for investors.

Microeconomic (Firm-Specific) Variables

Microeconomic variables are those that are specific to each firm. They are the characteristics of the firm: its management, employees, products, financing choices, etc. Let’s take a little time to discuss some of the most important microeconomic forces that affect stock prices.

Microeconomic factors are factors that affect an individual firm but do not have an impact on the aggregate economy.
**Business Risk.** From the Financial Statement Analysis Chapter we know there are several factors that can affect income from operations, also known as operating income or Earnings Before Interest and Taxes (EBIT). Let’s look at the top portion of Figure 1, the Income Statement for J&J Dogs, our rapidly expanding company from the first section of this chapter.

After deducting selling and operating costs from revenue, we observe that EBIT for J&J Dogs is $1,614. A change in the value of any one of those factors, including revenue, will change EBIT. From Chapter 1, Quantitative Methods, we know that a factor with many different possible values has a **distribution of possible values.** A change in any of the factors leading to EBIT (revenue or expense) will yield a different value from the distribution of possible values for EBIT. In other words, EBIT is variable.

Think of **business risk** as the uncertainty associated with the realized value of EBIT in the future. As the predictability of a company’s EBIT decreases, the business risk increases.

### Figure 1: J&J Dogs—Income Statement

<table>
<thead>
<tr>
<th>Revenue</th>
<th>Less:</th>
<th>$8,500</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost of Goods Sold:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hot dogs</td>
<td>975</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>975</td>
<td></td>
</tr>
<tr>
<td><strong>Operating Expenses:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wages</td>
<td>2,500</td>
<td></td>
</tr>
<tr>
<td>Utilities</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td>Rent</td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td>Insurance</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>Depreciation</td>
<td>36</td>
<td></td>
</tr>
<tr>
<td><strong>Income From Operations</strong></td>
<td></td>
<td><strong>$1,614</strong></td>
</tr>
</tbody>
</table>

Of course risk doesn’t apply to Figure 1 because this level of EBIT has already been realized. We encounter risk when we’re trying to **predict a future value.** Whenever the true value of a future cash flow is not known with certainty, we call it an unknown. We might have a pretty good idea about the range of values it could have, but we can’t predict it with certainty. Having defined what business risk is, we now turn our discussion to some of the better-known sources of business risk: revenue variability, cost and price structure, competition, and operating leverage.
Variability in Revenue. If the firm’s future revenues are highly variable (subject to extreme changes), future EBIT will be highly uncertain. Anything that causes sales variability is considered a source of business risk. This would include demand for the product or service (quantity sold) and the price at which it sells.

If demand for the firm’s output is subject to seasonal swings or if the product has many substitutes, sales will be very hard to predict. Also, if the product market is subject to severe price variability, as with the market for computer chips, there will be variability in sales revenues.

Cost and Input Price Structure. Some firms face uncertainty in the costs of their inputs. This variability in input costs will obviously cause variability in the firms’ operating and net income. Also at issue is the firms’ ability to pass along increased input prices to the consumer through an increased sales price. Firms with little price flexibility and uncertain input costs will be exposed to higher levels of risk.

Competition and New Product Development. Some firms’ revenues are very difficult to predict because competitors—domestic or international—may enter the market at any time with a competing or improved product. The degree to which competing products affect revenues will depend upon how quickly and inexpensively the firm can develop another product.

Operating Leverage: Operating leverage depends upon the proportion of the firm’s costs that are fixed. In the short run, the higher the proportion of fixed costs, the less flexibility management has in lowering costs to accommodate weak sales. In the long run, management can change the entire cost structure.

Operating leverage is caused by the level of fixed operating costs relative to variable costs. Mathematically it is the percentage change in EBIT given a percentage change in revenues.

Operating leverage is measured as the percentage change in EBIT that results from a given percentage change in revenues. With no fixed costs, the change in EBIT is the same as the change in revenues. For example, if revenues increase (decrease) by 10 percent, EBIT will also increase (decrease) by 10 percent. Fixed costs act as a lever and cause the percentage change in EBIT to be greater than the percentage change in revenues. A high proportion of fixed costs could cause the percentage change in EBIT to be three or four times the percentage change in revenue. In this case, a 10 percent increase (decrease) in revenues would lead to a 30 or 40 percent increase (decrease) in EBIT. If EBIT has been leveraged through the use of fixed costs, its distribution of possible values has been widened and the firm’s business risk has been increased.

You might have guessed that business risk is more dependent upon the industry than upon management’s decisions. For example, the auto and steel industries can do little about their fixed cost structure since they have many large fixed assets, and labor costs are fixed for extended periods by unions. Alternatively, real estate development companies tend to own very few assets, utilize subcontracted labor and therefore have low fixed costs and operating leverage.

Financial risk is the added risk borne by the stockholders due to management’s use of debt. Financial leverage is calculated as the percentage change in Net Income (or earnings per share) given a percentage change in EBIT.

Financial Risk. Whereas business risk is mostly a result of the firm’s assets and its revenue and cost structure, financial risk is the risk of the firm due to management’s choices regarding the use of debt financing. The effects of debt financing are shown on the income statement below EBIT in the form of interest expense. Interest expense has the effect of leveraging (i.e., magnifying) the percentage change in net
income up or down, depending upon the movement in revenue. This levering of net income effectively increases or widens the distribution of its possible values (increases risk).

**Financial leverage** is the percentage change in net income (NI) resulting from a given percentage change in EBIT. With no interest charges, the change in NI is the same as the change in EBIT.\(^6\) For example, if EBIT increases (decreases) by 10 percent, NI also increases (decreases) by 10 percent. Interest is a fixed cost and acts as a lever to make the percentage change in NI greater than the percentage change in EBIT. Much like the use of high levels of fixed operating costs, heavy dependence upon debt financing could cause the percentage change in NI to be many times the percentage change in EBIT. The amplification in net income could be a boon for companies with high operating profit margins but could be a hurdle to a struggling firm.

**Capital Structure**

**Chapter Objective:** Discuss the key elements of a firm’s capital structure.

A firm’s capital structure can be observed on the right-hand side of its balance sheet. It shows the mix of debt and equity management used to pay for the firm’s assets.

Capital structure refers to the relative proportions of debt and equity the owners of a firm have used to finance its operations. We can observe a firm’s capital structure by examining its balance sheet. In Figure 2, we have reproduced the balance sheet for J&J Dogs. The left side of the balance sheet shows the assets of the firm, including current and fixed assets. The right side is divided into liability and owners’ equity accounts. These accounts represent the sources of capital utilized to pay for the assets.

Capital structure gives information about the firm’s long-term or permanent sources of capital. In the balance sheet below, we see the relationship between the long-term liabilities and the equity accounts.

<table>
<thead>
<tr>
<th>Current assets</th>
<th>Current liabilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>Accounts payable</td>
</tr>
<tr>
<td>$2,434</td>
<td></td>
</tr>
<tr>
<td>Inventory</td>
<td></td>
</tr>
<tr>
<td>1,150</td>
<td></td>
</tr>
<tr>
<td>Supplies</td>
<td>Long-term liabilities</td>
</tr>
<tr>
<td>750</td>
<td>Note payable</td>
</tr>
<tr>
<td>Prepaid rent</td>
<td></td>
</tr>
<tr>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td>Prepaid insurance</td>
<td>Total liabilities</td>
</tr>
<tr>
<td>3,000</td>
<td></td>
</tr>
<tr>
<td><strong>Total current assets</strong></td>
<td></td>
</tr>
<tr>
<td>Fixed assets:</td>
<td>Total liabilities plus owners’ equity</td>
</tr>
<tr>
<td>Equipment</td>
<td></td>
</tr>
<tr>
<td>3,100</td>
<td>Owners’ equity</td>
</tr>
<tr>
<td>Less acc. depreciation</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td></td>
</tr>
<tr>
<td>Net fixed assets</td>
<td></td>
</tr>
<tr>
<td>3,064</td>
<td></td>
</tr>
<tr>
<td>Total assets</td>
<td>Total liabilities plus owners’ equity</td>
</tr>
<tr>
<td>$11,398</td>
<td></td>
</tr>
</tbody>
</table>
The typical large corporation has several different issues of long-term debt (bonds) outstanding as well as a great deal of common stock and retained earnings. It is the relative proportions of these sources of financing that represent the capital structure of the firm.\[9\]

If a firm with $1,000,000 in total assets is “financed” with $500,000 long-term debt (usually simply referred to as debt) and $500,000 common equity, we say the firm’s debt ratio is 50 percent (i.e., $500,000/$1,000,000 = 0.50). Notice its equity ratio, the ratio of equity to total assets, is also 50 percent, and its debt-equity ratio is $500,000/$500,000 = 1.0.\[9\]

Capital structure will affect the rate at which the firm can borrow as well as the rate required by its equity holders. Management’s choices for funding can affect not only the firm’s cost of capital but the value of the firm as well.

**Target Capital Structure**

A firm’s target capital structure and its optimal capital structure should coincide. In other words, the firm’s target should be the mix of debt and equity that optimizes the value of the firm. A firm’s optimal capital structure will be influenced by its business risk, the degree to which it can take advantage of the tax shield, and its financial flexibility.

A firm’s *target capital structure* is the debt ratio that the firm tries to maintain over time and is typically similar to the average for the industry in which the firm operates. Should the firm’s debt ratio fall below the target level, new capital needs will be satisfied by issuing debt. On the other hand, if the debt ratio is greater than the target level, the firm will raise new capital by retaining earnings or issuing new equity.

When setting its target capital structure, management must weigh the tradeoff between risk and return associated with the use of debt, since the use of debt increases the risk borne by both shareholders and bondholders. However, using debt also leads to higher expected rates of return for stockholders. The higher risk associated with debt may depress stock prices, while the higher expected return may increase stock prices. Thus, the firm’s *optimal capital structure* is the one that balances the influence of risk and return and maximizes the firm’s stock price. The optimal debt ratio will be the firm’s target capital structure.

Several factors influence management’s ability and desire to issue debt and, hence, the optimal capital structure.

- **Business risk** is the risk inherent in the firm’s basic operations due to the type of industry in which the firm operates. For example, a public utility could be viewed as fairly low risk. Compared to most industrial firms, a public utility firm’s demand is fairly predictable. Therefore it is uncommon for utilities to face financial difficulties. On the other hand, a deep sea exploration firm might be considered very risky. Not only does the ship and crew continually face the perils of the open sea, the probability of finding anything of value is remote. Firms that face a high degree of business risk will typically maintain a larger proportion of equity in their capital structure.

- One of the reasons for using debt is the *tax shield*. That is, interest payments on debt issued by businesses are tax deductible, whereas dividends are not. Thus the tax shield provided by debt financing lowers the effective cost of using debt relative to the cost of using equity. This would imply that firms should use as much debt as possible. However, when a firm already has a low tax rate because its income is shielded from taxes by depreciation, interest on current debt, or tax loss carry back/forwards,\[11\] additional debt will not be as advantageous as it would be to firms with higher effective tax rates.
The cost associated with retained earnings is actually an “opportunity” cost. By retaining earnings, management is effectively forcing the current stockholders to invest additional equity capital into the firm, robbing them of the “opportunity” to invest in another firm. Management should, therefore, be able to promise that the earnings retained will earn as much as the capital the stockholders have previously invested, which is the return the firm’s common stock currently earns in the market.

Financial flexibility refers to a firm’s ability to go to the capital markets during adverse times and raise funds at reasonable terms. If the firm already employs a good deal of debt, management might find it nearly impossible to sell new debt (i.e., the firm’s capacity to hold debt has already been reached).

Chapter Objective: Discuss component cost of capital and weighted average cost of capital.

Cost Of Capital

On the right (liability) side of a firm’s balance sheet, we have debt, preferred stock, and common equity, which are normally referred to as the capital components of the firm. Any increase in a firm’s total assets will have to be financed through an increase in at least one of these components. The costs of the components are called the component costs of capital.

We will focus on the three major capital components and their associated component costs:

- $k_d$ The coupon interest rate (the required return) at which the firm can issue new debt; also, the yield to maturity on existing debt. This is the before-tax component cost of debt.
- $k_d(1 - t)$ After-tax cost of debt. Here, $t$ is the firm’s marginal tax rate. Remember, the interest payments made by a firm are tax-deductible, which makes the after-tax cost of debt less than the before-tax cost.
- $k_{ps}$ Cost of preferred stock. Since all dividends, common and preferred, are issued out of net income (after-tax), they are not tax-deductible.
- $k_s$ Cost of retained earnings (or internal equity). It is identical to the required rate of return on common stock and is generally difficult to estimate since it represents an opportunity cost to the firm’s current investors.
- $k_e$ Cost of external equity. This is the cost of equity raised by issuing new common stock as opposed to retaining earnings. As you shall see, it is necessary to distinguish between the cost of equity obtained from retained earnings ($k_s$) and the cost of equity obtained by selling new stock ($k_e$). You should also know that $k_e$ will always be greater than $k_s$ since issuing new equity will incur floatation costs (i.e., the costs to get the new shares into the marketplace).

It is important to realize that the cost of debt is the interest rate on new debt, not the coupon rate on the firm’s existing (already outstanding) debt. Once debt is issued and outstanding, its required return can change. The new required return on the debt is a good estimate of the coupon rate the firm would have to pay on new issues.
Component Costs

Cost of Debt. Since the interest expense on debt is tax-deductible, we use the after-tax cost of debt \([kd(1 - t)]\) to compute the WACC. It is the interest rate at which the firm can issue new debt \((kd)\) net of the tax savings resulting from the tax-deductibility of interest payments \((kdt)\).

Example: Cost of Debt

J&J Dogs, Inc. is planning to issue new debt at an interest rate (coupon rate) of 8 percent. J&J Dogs is in the 40 percent marginal federal-plus-state tax rate. What is J&J Dogs’ cost of debt capital?

Answer:

\[
k_d(1 - t) = 8\%(1 - 0.4) = 4.8\%
\]

The equation

\[
k_{ps} = \frac{D_{ps}}{P_{net}}
\]

is just a rearrangement of the preferred stock valuation model

\[
P_0 = \frac{D_{ps}}{k_{ps}}
\]

where \(P_0\) is the actual market price today. \(P_0\) equals $100 in this example, but the cost of preferred stock \((k_{ps})\) will be just a bit higher than the rate required by investors because of flotation costs.

Cost of Preferred Stock. Preferred stock is a perpetuity that pays a fixed dividend \((D_{ps})\) forever. The cost of preferred stock [i.e., its required return \((k_{ps})\)]:

\[
\text{price of preferred stock } P_{ps} = \frac{D_{ps}}{k_{ps}}
\]

required return \(k_{ps} = \frac{D_{ps}}{P_{net}}\)

where:

\(D_{ps} = \$\) preferred dividend

\(P_{net} = \) net issuing price after deducting flotation (underwriting) costs

Example: Cost of Preferred Stock
Suppose J&J Dogs has preferred stock that pays an $8 dividend per share and sells for $100 per share. If J&J Dogs were to issue new shares of preferred, it would incur a flotation (or underwriting) cost of 5 percent. What is J&J Dogs’ cost of preferred stock?

**Answer:**

\[
 k_{ps} = \frac{D_{ps}}{P_{net}}
\]

\[
P_{net} = 100 - (0.05 \times 100) = $95
\]

\[
k_{ps} = \frac{$8}{$95} = 0.084 = 8.4\%
\]

**Cost of Retained Earnings.** The cost of retained earnings (ks) is the return that a firm’s stockholders require on the equity that the firm retains from its earnings. The opportunity cost of retaining earnings is ks. You should know that if a stock is in equilibrium, the rate of return investors require is equal to the rate of return they expect to get.

Since the CAPM approach calculates the required return based upon systematic risk (beta) and does not consider flotation costs, it is used to estimate the cost of retained earnings, not newly issued stock.

The cost of retained earnings can be estimated using one of the following three approaches: the CAPM approach, the bond yield plus risk premium approach, and the discounted cash flow approach.

**1. The capital asset pricing model (CAPM) approach.**

**Step 1:** Estimate the risk-free rate, \( R_F \). Arguments by practitioners and academics have been made both for using the short-term Treasury bill (T-bill) rate and the long-term Treasury rate as an estimate of the risk-free rate.

**Step 2:** Estimate the stock’s beta, \( \beta \). This is the stock’s systematic risk.

**Step 3:** Estimate the expected rate of return on the market (\( R_M \)).

**Step 4:** Use the capital asset pricing model (CAPM) equation to estimate the required rate of return.

\[
k_s = R_F + \beta (R_M - R_F)
\]

**Example: Using CAPM to Estimate ks**

Suppose \( R_F = 6\% \), \( R_M = 11\% \) and \( \beta = 1.1 \). What is the required rate of return for J&J Dogs’ stock?

**Answer:**

\[
k_s = 6\% + (11\% - 6\%) \times 1.1 = 11.5\%
\]

The CAPM is difficult to use because (1) you don’t know if you should use short-term or long-term Treasury rates as an estimate of the risk-free rate, (2) beta is hard to estimate, and (3) the market risk premium (\( R_M - R_F \)) is hard to estimate.
2. The bond yield plus risk premium approach.

For lack of a better method, an analyst may use this ad-hoc approach to estimate the required rate of return on equity. The method adds a risk premium (usually 3 to 5 percentage points) to the interest rate (required return) on the firm’s long-term debt.

\[ k_s = \text{bond yield} + \text{risk premium} \]

**Example: Estimating \( k_s \) With Bond Yields Plus a Risk Premium**

J&J Dogs’ required return on long-term debt is 8 percent. Suppose the risk premium is estimated to be 5 percent. What is J&J Dogs’ cost of equity estimate?

**Answer:**

\[ k_s = 8\% + 5\% = 13\% \]

Since it is difficult to estimate the firm’s risk premium, \( k_s \) will be just a ballpark estimate.

3. The discounted cash flow approach.

If dividends are expected to grow at a constant rate, \( g \), then the current price of the stock is given by the constant growth dividend valuation model:

\[ P_0 = \frac{D_1}{k_s - g} \]

where:

- \( D_1 \) = next year’s dividend
- \( k_s \) = the investor's required rate of return
- \( g \) = the firm’s expected constant growth rate

Rearranging the terms, you can solve for \( k_s \),

\[ k_s = \frac{D_1}{P_0} + g \]

But in order to use \( k_s = \frac{D_1}{P_0} + g \), you have to first estimate the expected growth rate \( g \). This can be done by:

- Using the growth rate as projected by security analysts.
- Using the following equation:\(^{13}\)

\[ \frac{\overline{g}}{g} = \text{(retention rate)(return on equity)} = (1 - \text{payout rate})(\text{ROE}) \]

**Example: Estimating \( k_s \) Using the Dividend Discount Model**
Suppose J&J Dogs’ stock sells for $21.00, next year’s dividend is expected to be $1.00, J&J Dogs’ expected ROE is 12 percent, and J&J Dogs is expected to pay out 40 percent of its earnings. What is J&J Dogs’ cost of equity?

**Answer:**

\[ g = (\text{ROE})(\text{retention rate}) \]

\[ g = (0.12)(1 - 0.4) = 0.072 = 7.2\% \]

\[ k_s = \left( \frac{\$1}{\$21} \right) + 0.072 = 0.12 \text{ or } 12\% \]

Note that the three models give you three different estimates of \( k_s \):

- **CAPM** → 11.5 percent
- Bond yield plus risk premium → 13.0 percent
- Discounted cash flow → 12.0 percent

Analysts will use their judgment in deciding which method is the most appropriate.

**Cost Of Newly Issued Equity**

The cost of new common equity (\( k_e \)) is higher than the cost of retained earnings because of **flotation costs**. Cost of new common equity is given by:

\[ k_e = \frac{D_1}{P_0(1-F)} + g \]

As we would have expected, since we used the same model, the cost of new equity (12.5 percent) is higher than the cost of retained earnings (12 percent) using the discounted cash flow technique. The manager would also note that the estimate of new equity is 12.5 percent, while the estimate of retained earnings using the bond yield approach is 13 percent. This would probably encourage the manager to throw out the 13 percent estimate of the cost of retained earnings.

where:

- \( P_0 \) = the price at which the stock is sold (i.e., issue price)
- \( g \) = firm's estimated constant growth rate
- \( D_1 \) = the next dividend to be paid
- \( F \) = the percentage flotation cost incurred in selling new stock

\[ \text{total flotation costs} \]

\[ \frac{\text{issue price}}{\text{issue price}} \]
Example: Cost of Newly Issued Equity

J&J Dogs’ stock sells for $21, next year’s dividend is expected to be $1, J&J Dogs’ expected ROE is 12 percent, and J&J Dogs is expected to pay out 40 percent of its earnings. Now assume that J&J Dogs has a flotation cost of 10 percent. Calculate the cost of new equity.

Answer:

The cost of new equity for J&J Dogs is:

\[ k_e = \frac{1}{21(1-0.10)} + 0.072 = 0.125 = 12.5\% \]

Weighted Average Cost Of Capital (Wacc)

Generally, it is necessary to raise each type of capital (i.e., debt, common stock, or preferred stock) in large sums. The large issues may temporarily overemphasize the most recently issued capital in the firm’s capital structure, but in the long run management will try to move toward target weights for each capital type.

Even though management typically issues only one type of capital at a time to fund operations and expansion, it is necessary to consider all the capital components when discussing the firm’s cost of capital. Following is a simplified example of why this is necessary.

The weighted average cost of capital (WACC) is the average cost of all of a firm’s sources of financing. The WACC is a reflection of both the component costs of capital and the capital structure.

Assume a manager has $100 in her pocket—$50 from selling common stock, $40 from selling bonds, and $10 from selling preferred stock—and she starts a firm by purchasing several assets with the $100. Can you determine which of those assets were purchased using cash received from selling common equity, which from debt, and which from preferred stock?

Obviously, it is impossible to allocate the capital sources to individual assets. The manager put all the cash together in her pocket and took out enough to pay for the assets, one at a time. Which specific funds were used each time is impossible to determine. Therefore, when we consider the cost of funds used to purchase the firm’s assets, we must consider the average cost of the three capital components. We will refer to the average cost of the funding sources as the firm’s weighted average cost of capital (WACC). This will become clearer as we proceed.

Since the effective cost of equity increases when the firm has to issue new stock, the firm’s WACC also increases.

Wacc Example

A firm’s weighted average cost of capital is the weighted average of the individual component costs. The weight of each component is defined by the firm’s capital structure:

\[ WACC = (w_d)(k_d(1-t)) + (w_p)(k_p) + (w_c)(k_c) \]

where:
Example: Computing WACC

Suppose J&J Dogs’ target capital structure and its component costs of capital are as follows:

\[
\begin{align*}
wd &= 0.45 \\
wp &= 0.05 \\
wc &= 0.50 \\
k_d(1 - t) \text{[\(\dagger\)]} &= 4.8\% \\
k_p &= 8.4\% \\
k_s &= 11.5\% \\
k_e &= 12.5\% \\
\end{align*}
\]

\([\dagger]\) Assumes a 40% marginal tax rate.

If all new equity will come from retained earnings, J&J Dogs’ WACC will be:

\[
WACC = (0.45)(0.08)(0.6) + (0.05)(0.084) + (0.50)(0.115) \\
= 0.0833 \approx 8.3\%
\]

On the other hand, if new equity comes from newly issued common stock:

\[
WACC = (0.45)(0.08)(0.6) + (0.05)(0.084) + (0.50)(0.125) \\
= 0.0883 \approx 8.8\%
\]

You might be wondering why the firm would issue new stock, since it costs more than retained earnings. The answer lies in the amount of retained earnings management expects the firm to generate, the firm’s target capital structure, and management’s capital budget. The capital budget is the amount of funds management intends to spend over the coming planning period.

Example:

Assume management expects to generate $5,000,000 in retained earnings over the next year and expects to spend $15,000,000 on expansion projects. If the firm’s target capital structure is 50% equity, will it have to issue new stock to meet its spending needs?

Answer:

To calculate whether management will have to issue new stock to meet its spending needs, we first need to calculate how much spending the retained earnings will support.

Since management wants equity to remain at 50 percent of all capital raised, any projects taken on by management must be funded 50 percent with equity. Using the following equation we can calculate how much it can fund using only retained earnings:

\[
\text{equity} = 0.50(\text{capital spent})
\]

If retained earnings = $5,000,000, $5,000,000 = 0.50 \cdot (\text{capital spending})
capital spending = $5,000,000/0.50 = $10,000,000

Let’s check the math: If management spends $10,000,000 and half must be equity:

0.50($10,000,000) = $5,000,000

Our calculations tell us that $5,000,000 in retained earnings will support capital spending of $10,000,000 and no more. This means our management has three choices:

1. Spend the full $15,000,000 and issue $2,500,000 in new stock (50 percent of the amount over $10,000,000).
2. Spend the full $15,000,000 and let the capital structure move away from the target structure.
3. Spend only $10,000,000 on capital expansion projects.

4. The net investment of any capital project is the initial cost to get the project started and may entail explicit costs to acquire new fixed assets and increase the level of working capital, or implicit opportunity costs to use previously unemployed assets such as undeveloped land.

Of course, even if they spend only $10,000,000, they will have to use debt and preferred stock (according to their weights in the capital structure). Assume the weights of debt and preferred stock are 40 percent and 10 percent, respectively. The amounts of debt, common equity, and preferred stock necessary to fund a $10,000,000 capital budget are:

Debt = 0.40($10,000,000) = $4,000,000
Preferred stock = 0.10($10,000,000) = $1,000,000
Equity (Retained Earnings) = 0.50($10,000,000) = $5,000,000

$10,000,000

If they choose to spend the entire $15,000,000, they must maintain the 50 percent, 40 percent, 10 percent weights (note the $2,500,000 increase in equity, as discussed previously).

Debt = 0.40($15,000,000) = $6,000,000
Preferred stock = 0.10($15,000,000) = $1,500,000
Equity (Retained Earnings) = 0.50($15,000,000) = $7,500,000

$15,000,000

[5] We will concentrate our discussion here on microeconomic (firm-specific) risk factors. Macroeconomic (systematic) risk factors are discussed in detail in the Portfolio Theory Chapter.

[6] As with many other terms in finance, there are other definitions for business risk, but this definition will fulfill our needs in this chapter.

[7] This assumes variable costs are a fixed percentage of sales revenue.

[8] This assumes taxes are a fixed percentage of taxable income.

[9] Some argue the firm’s capital structure includes all forms of permanent capital. This would include retained earnings, common stock, preferred stock, bonds, and any short-term sources that remain at a more or less constant level on the balance sheet. One short-term source could be trade payables that tend to stay at the same level or increase as the firm grows. In this case, the trade payables function as a permanent source of debt.

[10] These and other ratios are discussed and calculated in the Financial Statements Analysis Chapter.
Although not covered in detail in this text, firms are allowed to recoup or reduce taxes when they experience losses. They first “carry back” (apply) losses to the previous 2 years’ taxable income and adjust the tax liability accordingly to receive a tax refund. They then can carry forward any remaining loss (the loss might be greater than total taxable income for the previous two years) and apply it to taxable income for up to 20 years.

In this example the company is subject to both federal and state taxes. The combination of these two tax rates gives an overall marginal tax rate of 40 percent. The term marginal here indicates that the taxes paid on the next dollar earned will be 40 cents or 40 percent.

See the Financial Statement Analysis Chapter for a discussion of this equation.

Section 4: Capital Budgeting

The net cash flows from a capital investment project are the cash benefits expected in the future less the cash costs required to operate the project. Net cash flows can come in the form of increased cash flow or a cost savings or both.

Chapter Objective: Demonstrate capital budgeting using the Net Present Value (NPV), Internal Rate of Return (IRR), and Payback Period methods.

In order to maintain or expand its operating capabilities, every firm must weigh the costs and benefits of investing in their business. Evaluating on a quantitative basis and selecting potential investments (projects) that will increase the long-term value of the firm is known as capital budgeting. These decisions may relate to building a new facility, buying a new machine, or acquiring another firm. The basic question to address is whether the potential return on the project justifies the initial investment (i.e., its cost). To determine which projects are worthwhile, we must first assess the cash flows of the project.

Cash Flows

In general, an investment project will require an initial investment to initiate the project and provide a positive cash flow benefit as a result of investing in the project. The tradeoff between the cash costs and benefits of the project will determine its relative attractiveness.

Initiating a project requires that a firm invest in certain assets necessary to complete the project. The firm may need to purchase a new piece of machinery, update a warehouse, hold a higher balance of accounts receivable and accounts payable, or utilize undeveloped real estate. The sum of these initial costs is called the net investment (NINV). The net investment may involve direct costs such as purchasing and installing an asset or an opportunity cost such as using a previously idle asset instead of selling it in the market.

No rational firm would undertake an investment project unless the project provided a positive cash flow benefit. This cash benefit can come in the form of incremental (i.e., additional) cash inflow to the firm or incremental cash savings that would go unrealized without the project. The incremental cash benefit must be considered, however, net of any expenses and investments required to operate the project. These expenses may include operating costs, taxes, and investments in net working capital or fixed assets to support the project. The cash flow benefit after subtracting out expenses and continued investment is referred to as the project’s net cash flow (NCF).
An expansion project is undertaken to increase the production capacity of a firm. Usually a firm will need to invest in new machinery or technology to complete an expansion project. A replacement project is undertaken to replace an outdated piece of machinery or mode of technology. Higher production capacity can result, but often replacement projects focus on reducing costs.

Two key points must be made at this point. A project’s cash flows must be evaluated on an incremental, after-tax basis. We are only interested in the cash flows that the project adds to the firm’s total cash flow, not in the total cash flow itself. Also, taxes have a real cash implication and must be accounted for in the estimation of cash flows for the project.

Let’s return to J&J Dogs to provide a capital budgeting cash flow example. After becoming a publicly traded corporation, J&J Dogs has been presented with two alternative investment projects.

Project A is an expansion project that entails the purchase of equipment designed to increase the company’s current production capabilities. The net investment for Project A is $500,000 and includes the cost of the machinery, shipping and installation costs, and an increase in net working capital. Project A is expected to increase the company’s cash flows by $100,000 in year one, $200,000 in year two, and $275,000 in years three through five of the project.

Project B is a replacement project that entails the replacement of an old machine with a new machine that will significantly reduce the company’s operating costs. Project B will require a net investment of $600,000 for the new machine, shipping, and installation. The project will provide a cash savings of $245,000 per year for five years.

A comparison of the cash flows associated with Project A and Project B is provided in Figure 3.

<table>
<thead>
<tr>
<th>Year</th>
<th>Project A</th>
<th>Project B</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>−$500,000</td>
<td>−$600,000</td>
</tr>
<tr>
<td>1</td>
<td>100,000</td>
<td>245,000</td>
</tr>
<tr>
<td>2</td>
<td>200,000</td>
<td>245,000</td>
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<tr>
<td>3</td>
<td>275,000</td>
<td>245,000</td>
</tr>
<tr>
<td>4</td>
<td>275,000</td>
<td>245,000</td>
</tr>
<tr>
<td>5</td>
<td>275,000</td>
<td>245,000</td>
</tr>
<tr>
<td>Total</td>
<td>$625,000</td>
<td>$625,000</td>
</tr>
</tbody>
</table>

Figure 3: J&J Dogs—Project A & Project B Cash Flows

The net present value (NPV) of any investment project is calculated by adding the present values of the net cash flows expected from the project and subtracting the net investment required to begin the project.

According to Figure 3, we should be equally satisfied between investing in Project A and investing in Project B. The total net cash flows for the two projects are exactly the same. However, we have failed to take into account the time value of money and the timing of the cash flows. Therefore we are making an apples-to-oranges comparison. The capital budgeting process cannot be completed without an objective method to evaluate projects that take into account all of the project’s cash flows, the project’s level of risk, and the time...
value of money. We will examine two such methods in the next sections as well as a third method that, while commonly used, does not meet all of the criteria just listed. The three methods are the net present value (NPV) method, the internal rate of return (IRR) method, and the payback period method.

Projects with an NPV greater than zero should be accepted since they will add value to the firm. Conversely, negative NPV projects should be rejected. Firms will be indifferent between accepting or rejecting projects with an NPV of zero. These projects will neither add nor subtract value from the firm but may provide strategic opportunities.

NPV

A project’s net present value (NPV) is equal to the sum of the present values of the net cash flows minus the net investment required to initiate the project. In order to determine the present value of the project’s future net cash flows, a discount rate must be used to discount the future net cash flows back to the present. If the risk of the project is equal to the overall risk of the company, then the marginal WACC (i.e., the cost to raise more debt and equity capital in their current proportions) can be used as the discount rate. If the project is more or less risky than the company as a whole, then an adjustment to the marginal WACC will be necessary (we will have more to say about risk and discount rates in a later chapter).

In Figure 3 we presented the cash flows for two projects under consideration by J&J Dogs. Direct comparison of the two projects was not possible, however, because the cash flows were not stated on a comparable basis. We can restate the cash flows from the two projects on a present value basis by assuming that the appropriate discount rate for both projects is equal to J&J Dog’s current marginal WACC of 10 percent. We will not go into detail on the present value calculations since this topic was covered in Chapter 3. Just remember that each cash flow can be discounted as a lump sum value. The present value of each cash flow is summarized in Figure 4.

<table>
<thead>
<tr>
<th>Year</th>
<th>Project A</th>
<th>Project B</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>–$500,000</td>
<td>–$600,000</td>
</tr>
<tr>
<td>1</td>
<td>90,909</td>
<td>222,727</td>
</tr>
<tr>
<td>2</td>
<td>165,289</td>
<td>202,479</td>
</tr>
<tr>
<td>3</td>
<td>206,612</td>
<td>184,072</td>
</tr>
<tr>
<td>4</td>
<td>187,829</td>
<td>167,338</td>
</tr>
<tr>
<td>5</td>
<td>170,753</td>
<td>152,126</td>
</tr>
<tr>
<td>NPV</td>
<td>$321,392</td>
<td>$328,743</td>
</tr>
</tbody>
</table>

The internal rate of return on a project is the discount rate that, when applied to the net cash flows of the project, makes the net present value of the project equal to zero.

Figure 4 shows not only the present value of each cash flow associated with Project A and Project B but also the net present value of each project. The net present value of each project is simply the sum of the
present value of each project’s cash flows and the net investment. In the table above, the net investment is represented as a negative value at time zero. Remember the net investment is a cash outflow that reduces the NPV of the project.

According to Figure 4, J&J Dogs should undertake Project B, since it has a higher NPV and will add more value to the firm than Project A. If enough capital were available, however, the company could accept both projects. The reason is simple: any project with a positive NPV adds value to the firm and is acceptable.

This reasoning applies to all firms undergoing the capital budgeting process. A firm should rank, from highest to lowest, all projects with a positive NPV and, starting with the highest NPV project, select as many projects as the firm’s capital budget will allow. Projects with a negative NPV should never be considered since these projects would reduce the overall value of the firm. Projects with an NPV equal to zero can either be accepted or rejected but will not change the value of the firm.

Firms should accept projects with an IRR greater than the cost of capital appropriate for the risk level of the project. These projects will add value to the firm. Projects with an IRR less than the project’s cost of capital will subtract value from the firm and should not be accepted. Firms will be indifferent about accepting or rejecting projects with an IRR that is equal to the project’s cost of capital.

**Internal Rate Of Return (IRR)**

The IRR of any project is its expected return, given its cost and expected cash flows. That is, IRR is the discount rate that makes the present value of the expected cash inflows equal to the cost of the asset and makes the NPV zero. Mathematically, we can represent the IRR as the discount rate that makes the following true:

\[
\text{net investment} = \text{sum of the present values of cash inflows}
\]

IRR can be calculated using a calculator (recommended) or by trial and error. The trial and error method is performed by discounting the project’s cash inflows at various discount rates until you find the one that satisfies the formula. If you use trial and error in our J&J Dogs example, you would start with a rate greater than 10 percent because 10 percent generated a positive NPV for both Project A and Project B. However, it is much simpler and faster to use a calculator to find the IRR of a project.

Using the TIBAII+ calculator, the IRR for Project A is 29.2 percent and the IRR for Project B is 29.7 percent. In Figure 5, you will observe that when we discount the cash inflows from Projects A and B at 29.2 percent and 29.7 percent, respectively, the net present values of both projects fall to zero.
**Figure 5: J&J Dogs—NPV of Projects A & B Using the IRR as the Discount Rate**

The payback period (PBP) is the number of years (or other time period) required to fully pay back the net investment of a project. In other words, it is the length of time until a project’s cumulative cash flow becomes positive.

So how would you interpret the IRR? As stated earlier, the IRR is the expected return on a project, given its cost and expected cash flows. This means that if J&J Dogs spent $500,000 on Project A and $600,000 on Project B and the cash flows from each project came as expected, Project A would generate a return of 29.2 percent and Project B would generate a return of 29.7 percent. Since both projects are expected to generate a return greater than J&J Dog’s cost of capital of 10 percent, they are both acceptable investments and can be expected to increase the value of the firm. However, Project B should be preferred since it has an IRR greater than Project A.

Similar to the NPV rule from the previous section, the IRR decision process applies to all firms undergoing the capital budgeting process. A firm should rank, from highest to lowest, all projects with an IRR greater than the cost of capital and, starting with the highest IRR project, select as many projects as the firm’s capital budget will allow. The firm should reject projects with an IRR less than the cost of capital, since these projects will reduce the overall value of the firm. Projects with an IRR equal to the cost of capital can either be accepted or rejected but will not change the value of the firm.

**Payback Period**

The **payback period (PBP)** is the number of years it takes to recover the initial cost of an investment. In other words, PBP is the time required for a project’s net cash flows to pay off the net investment. The formula used to calculate the payback period is as follows:

\[
PBP = \frac{\text{unrecovered cost at the beginning of the last year}}{\text{cash flow during the last year}} + \text{years until full recovery}
\]

An example using the net cash flows from J&J Dogs will help demonstrate the concept. Figure 6 lists the net cash flows expected from Projects A and B as well as the cumulative cash flows.

The PBP method of evaluating capital investment projects is arbitrary in the sense that the acceptable PBP chosen by a firm’s management is not selected on an objective basis.

<table>
<thead>
<tr>
<th>Year</th>
<th>Project A</th>
<th>Project B</th>
</tr>
</thead>
<tbody>
<tr>
<td>NCF</td>
<td>Cum. NCF</td>
<td>NCF</td>
</tr>
<tr>
<td>0</td>
<td>$500,000</td>
<td>$500,000</td>
</tr>
<tr>
<td>1</td>
<td>100,000</td>
<td>400,000</td>
</tr>
</tbody>
</table>
Breakeven analysis provides insight into the degree of operating leverage employed by a firm by estimating the number of units that must be sold in order to just cover the firms’ fixed and variable operating costs.

Project A:  \[
PBP = 2 + \frac{200,000}{275,000} = 2 + 0.73 = 2.73 \text{ years}
\]

Project B:  \[
PBP = 2 + \frac{110,000}{245,000} = 2 + 0.45 = 2.45 \text{ years}
\]

In order to evaluate a potential project using the PBP, a firm would arbitrarily select a maximum payback period. Any project with a PBP greater than the maximum would be considered unacceptable. If J&J Dog’s were only willing to accept projects with a PBP less than two and a half years, project B would be selected. In this example, Project B has the highest NPV and would add the most value to the firm (J&J Dogs got lucky). However, it is also possible that a project with the lowest PBP could also have the lowest NPV. In this scenario the firm would select the projects that could increase the value of the firm the most.

The breakeven quantity of sales is the number of units that must be sold in order to generate an operating profit of zero.

As noted earlier, however, the payback period does not consider the risk of the project or the time value of money associated with the cash flows. As such, it is an inferior to the NPV and IRR methods as a method of project evaluation.

Chapter Objective: Demonstrate the usefulness of Breakeven Analysis in evaluating investment projects.

Breakeven Analysis

Breakeven analysis is a tool used by firms to quantify the effects of operating leverage on their investment projects and on the firm as a whole. Recall from an earlier discussion in this chapter that operating leverage
is the trade-off between variable costs and fixed costs. Operating leverage amplifies the earnings of the firm. A firm using high operating leverage will make years of good profitability look even better. Conversely, the same firm will make years of poor profitability look even worse. These effects are created by the use of fixed costs in the operating structure.

Fixed costs cannot be changed in the short run. The costs must be paid no matter how many units of a particular product the firm chooses to produce. Variable costs, on the other hand, are dependent on the number of units the firm produces. If no production is undertaken, no variable costs are incurred. In order to make a profit, the firm must sell enough of its product to cover both the variable and fixed costs. The level of sales at which a firm covers all of its fixed and variable costs is called the breakeven point. The breakeven sales quantity, \( Q_{BE} \), can be defined as follows:

\[
\text{sales revenue} = \text{operating costs}
\]

or:

\[
(price \text{ per unit})(\text{quantity}) = (\text{variable cost per unit} \cdot \text{quantity}) + \text{fixed costs}
\]

or:

\[
PQ = VQ + F
\]

At breakeven, operating profit is equal to zero: \( PQ - VQ - F = 0 \). Therefore \( Q_{BE} = F / (P - V) \). We have simply solved for \( Q \) which leaves us with a ratio of fixed costs to what is known as the contribution margin (i.e., \( P - V \)). The breakeven quantity of sales is the point at which operating profit (also known as EBIT) is equal to zero. Sales of a quantity greater than \( Q_{BE} \) will result in positive operating profit for the firm. Sales of a quantity less than \( Q_{BE} \) will result in operating losses for the firm.

To make the concept more concrete, let’s revisit the two projects under consideration by J&J Dogs. J&J Dogs sells its product for a price of $4.00 per hot dog. If selected, Project A would incur variable costs of $3.00 per unit and total fixed costs of $40,000. Project B, on the other hand, would only incur variable costs of $2.00 per unit but total fixed costs would be $120,000. Figure 7 summarizes all of this information.

<table>
<thead>
<tr>
<th>Project as spreadsheet</th>
<th>Project A</th>
<th>Project B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>$4.00</td>
<td>$4.00</td>
</tr>
<tr>
<td>Variable costs</td>
<td>$3.00</td>
<td>$2.00</td>
</tr>
<tr>
<td>Fixed costs</td>
<td>$40,000</td>
<td>$120,000</td>
</tr>
<tr>
<td>Assets</td>
<td>$500,000</td>
<td>$600,000</td>
</tr>
</tbody>
</table>

**Figure 7:** J&J Dogs—Project Costs

For Project A, the breakeven quantity of sales is:

\[
Q_{BEA} = \frac{40,000}{(4.00 - 3.00)} = 40,000 \text{ units}
\]

The breakeven quantity and the relationship between sales revenue, total operating cost, operating profits, and operating losses for Project A are illustrated in **Figure 8**.
Figure 8: Breakeven Analysis for Project A

For Project B, the breakeven quantity of sales is:

\[ Q_{\text{BEB}} = \frac{120,000}{(4.00 - 2.00)} = 60,000 \text{ units} \]

The breakeven quantity and the relationship between sales revenue, total operating cost, operating profits, and operating losses for Project B are illustrated in Figure 9.

Figure 9: Breakeven Analysis for Project B

The calculations and figures given above demonstrate that Project B has more operating leverage than Project A. We observe this from the higher breakeven quantity of sales associated with Project B.

J&J Dogs, and any firm for that matter, should be concerned with the operating leverage associated with potential investment projects. If the firm already has a high level of fixed costs and thus operating leverage, the firm must carefully consider whether or not to take on projects that also have a high degree of operating leverage.
Chapter 4: Corporate Finance

Summary

Section 1: Forms Of Business

A. Proprietorship
   1. A proprietorship is the easiest and least expensive way to start a business.
   2. The business and the owner are indistinguishable, with all profits and losses “flowing through” to the owner.
   3. It can be difficult to get necessary operating capital or capital for expansion, as collateral for loans is limited to assets in the business and assets held by the owner.
   4. The owner has unlimited liability, being personally responsible for any debts incurred by the business. If business assets are insufficient to satisfy business or legal claims, the owner’s assets can be seized.
   5. The life of the proprietorship is linked to the life of the proprietor.

B. Partnership
   1. A partnership is easy to form and is only slightly more expensive to form than a proprietorship.
   2. There can be two or more partners, but all will be bound by legal documentation that clearly specifies the proportional ownerships.
   3. Legally, the business and the owners are indistinguishable. All profits and losses “flow through” to the owners according to their proportional ownership.
   4. Operating and expansion capital are somewhat easier to obtain for a partnership than for a proprietorship.
   5. The owners have unlimited liability and are personally responsible for any debts incurred by the business.
   6. The life of the partnership is linked to each of the lives of the partners. If any partner dies, the partnership dies also.

C. S Corporation
   1. Operationally very similar to partnerships.
   2. While there can be more than one owner, the number of owners is usually small.
   3. Profits and losses “flow through” to the owners according to their proportional ownership. Owners pay personal income taxes on the corporation’s profits.
   4. Goodwill is an intangible asset that is not amortized under U.S. GAAP. We will discuss accounting for goodwill later in this chapter.
   5. Unlike a partnership, the owners have limited liability.
   6. The stock is not publicly traded, making transfer of ownership difficult.

D. C Corporation
   1. C corporations can have one or more owners (usually a large number of owners).
   2. Regardless of the number of owners, all owners have limited liability.
   3. All forms of corporations have unlimited life (i.e., if an owner dies, his or her stock becomes part of the estate).
   4. The ease of raising capital depends upon the size of the corporation.
      a. Very small C corporations have as much difficulty raising capital as a proprietorship does.
      b. It is usually much easier for very large C corporations to raise capital.
   5. Common stock of a corporation may pay dividends. Dividends are usually paid quarterly out of net income (after taxes) and require stockholders to pay taxes on dividends received, creating double taxation.
Section 2: Agency Costs

A. Agency costs are the actual or implied costs associated with the separation of ownership and management.

1. Managers are the owners’ agents (i.e., they operate the firm in the absence of the owners).
2. The goals of the managers might not agree with those of the owners.
   a. Owners want management to take risky projects to increase the expected return on the firm’s stock.
   b. Owners can diversify away the unsystematic risk by holding the firm’s stock in a portfolio.
3. Managers are concerned with the owners’ wishes but are probably more concerned with maintaining their employment.
   a. If the firm does well, management and owners do well.
   b. If the firm does poorly, the owners are partially protected by diversification, but management loses its jobs.
4. Managers will tend to be defensive in their decisions and will not always make the value-maximizing decision. As a result, the firm’s stock price will never reach its theoretical maximum (an implicit agency cost).
5. The owners can hire overseers to ensure their wishes are met, which can be expensive and is an explicit agency cost.

B. There is also an agency relationship between stockholders and bondholders.

1. Bondholders receive fixed interest payments and the face value of the bonds at maturity.
2. Bondholders want the firm to maintain a low level of risk.
   a. High firm risk increases stock prices but reduces bond prices.
   b. Bondholders are concerned management will increase the firm’s risk once they have purchased the bonds. The value lost by the bondholders is captured by the stockholders.

Section 3: Risk And Return

A. Risk is the possibility of an unfavorable event (usually a lower-than-expected return on the investment). Unfavorable events can include:

1. Receiving a cash flow later than expected.
2. Not receiving an expected cash flow.

B. Risk in publicly traded securities is caused by microeconomic and macroeconomic factors.

1. Microeconomic factors are characteristics of the issuing firm and the security itself. These cause the unsystematic or diversifiable risk of the security.
2. Macroeconomic factors are economy-wide forces such as inflation. These cause the systematic or non-diversifiable risk of the security.

C. Firm-specific factors consist of business risk and financial risk.

1. Business risk is due to characteristics of the industry (i.e., the type of business in which the firm operates).
   a. Firms in the industry might be subject to variable revenues.
   b. The firm’s cost and pricing structures might not be flexible.
   c. New product development might be slow.
   d. Use of fixed assets causes operating leverage; the greater the amount of fixed assets, the higher the operating leverage.
   e. Operating leverage is measured as the percentage change in EBIT given a percentage change in revenues.
2. Financial risk is due to the utilization of fixed-obligation sources of financing, primarily bonds. Financial leverage results from the use of debt:
   a. The more debt used and the greater the fixed obligation, the higher the financial leverage.
   b. Financial leverage is measured as the percentage change in net income given a percentage change in EBIT.

D. Capital structure refers to the way management has paid for the firm’s assets.
1. Any long-term form of capital is considered part of the capital structure. Usually this means common stock, preferred stock, and bonds.

2. Any permanent form of capital should be considered. Short-term sources of capital should be considered if they are maintained at a more or less constant significance level. If they represent a minute portion of the firm’s total capital, permanent short-term sources can be ignored.

E. The firm’s capital structure affects the firm’s cost of capital. The firm’s cost of capital is a weighted average of the costs (returns required by investors) of the firm’s sources of capital: common stock, long-term debt, and preferred stock.

F. A firm’s target capital structure is the debt-to-equity ratio that the firm tries to maintain over time. Several factors influence the firm’s ability and desire to issue debt and, hence, its target capital structure.

1. Business risk is the risk inherent in the firm’s basic operations due to the type of industry in which the firm operates. The greater the firm’s business risk, the lower its optimal debt ratio, so deep sea exploration would typically be financed with equity rather than debt.

2. Using debt creates a tax shield. That is, interest payments on debt issued by firms are tax deductible, which lowers the effective cost of using debt.

3. Firms maintain financial flexibility by not over-utilizing debt.

G. The firm’s cost of capital is the rate it must pay on the various capital components used to fund its assets:

1. \( k_d \) is the coupon interest rate (the component cost) of new debt; also, the yield to maturity on existing debt.

2. \( k_{of}(1 - t) \) is the after-tax cost of debt.

3. \( k_{ps} \) is the component cost of preferred stock.

4. \( k_c \) is the component cost of retained earnings (or internal equity).

5. \( k_e \) is the component cost of external equity.

H. The component cost of Preferred Stock is found by dividing its net price by its dollar (annual) dividend. The net price is the issue price less flotation costs.

\[
k_{ps} = \frac{D_{ps}}{P_{net}}
\]

I. The firm’s cost of retained earnings can be estimated using different methods:

1. The capital asset pricing model (CAPM) approach.

\[
k_s = R_F + \beta (R_M - R_F)
\]

2. The bond yield plus risk premium approach.

3. The discounted cash flow approach.

\[
k_e = \frac{D_1}{P_0} + g
\]

a. Use the growth rate as projected by security analysts.

b. Estimate \( g \) using:

\[
g = (\text{retention rate})(\text{return on equity}) = (1 - \text{payout rate})(\text{ROE})
\]

J. The firm’s cost of newly issued equity is found using the discounted cash flow technique because flotation costs can be included in the model:

\[
k_e = \frac{D_1}{P_0 (1 - F)} + g
\]

where:
Section 4: Capital Budgeting

A. Capital budgeting is the planning process for allocating funds to long-term projects, such as expanding operations.

B. An essential step in the capital budgeting process is the estimation of the cash flows expected from potential capital investment projects. Only incremental (i.e., resulting from acceptance of the project) cash flows should be considered.
   1. The cost to initiate a project is called the net investment and generally includes the cost to acquire new assets as well as investments in net working capital.
   2. Cash benefits come in the form of positive cash flow from increased revenue and profits or in the form of substantial cost savings.

C. Net present value (NPV) compares the cost of an asset to its expected cash flows.
   1. The present value of expected cash flows is found by discounting them at the required return.
   2. The NPV is the difference between the total present value of expected inflows and the cost of the asset.
   3. There are three basic rules to remember with NPV:
      a. A positive NPV indicates the project will add value to the firm.
      b. A negative NPV indicates the project will subtract value from the firm.
      c. A zero NPV indicates the project will meet its cost of capital but neither adds value to nor subtracts value from the firm.

D. The internal rate of return (IRR) is the asset’s expected return and is the discount rate that makes the present value of the inflows equal to its cost (i.e. NPV = 0).
   1. An IRR greater than the cost of capital indicates the project will add value to the firm.
   2. An IRR less than the cost of capital indicates the project will subtract value from the firm.
   3. An IRR equal to the cost of capital indicates the project will neither add value to nor subtract value from the firm.

E. The payback period (PBP) is the length of time required to recover a project’s net investment. PBP is arbitrary and not recommended as a stand-alone method of evaluating capital budgeting projects.

F. Breakeven analysis is used to determine the quantity of sales that will just cover a project’s fixed and variable operating costs and as such indicates the degree of operating leverage of the project.
   1. The breakeven quantity of sales results in an operating profit of zero.
   2. Sales in excess of the breakeven quantity result in operating profits.
   3. Sales below the breakeven quantity result in operating losses.

G. Firms that already employ a high degree of operating leverage should consider foregoing projects with high breakeven levels.

Practice Questions: Corporate Finance

1. All of the following are characteristics related to the ownership of a C corporation EXCEPT:  
   A. the amount of control exerted by any individual over the firm is equal to the percentage of shares owned by the individual.
   B. ownership is easily transferable in a public market.
   C. owners of the firm generally are entitled to vote on major issues regarding the firm’s management.
   D. limited liability applies only to the minority shareholders.
2. James Shoe is the CFO of a large publicly traded corporation. Shoe has been asked by the CEO of the company to explain the ways in which the company can reduce its weighted average cost of capital. Currently the company’s capital costs are as follows: retained earnings—11 percent, new equity—12 percent, preferred stock—7 percent, debt—6 percent. The company has a tax rate of 35 percent. Which of the following suggestions made by Shoe to reduce the WACC is incorrect?
   A. Finance new investments made by the company primarily with preferred stock.
   B. Decrease the unsystematic risk associated with the company.
   C. Decrease reliance on internal equity for financing the equity portion of new investment projects.
   D. Locate an investment banking firm that will charge less for flotation costs associated with new equity issuance.

3. Following are four statements given at a symposium on business structure. Which of the four statements correctly describes various attributes of the different forms of business?
   A. A proprietorship offers the greatest level of owner control over business decisions but is also the most complicated business structure.
   B. In a partnership the owners always share equal control over the operating decisions, making it the most complicated type of business.
   C. A corporation is the most difficult business structure to form, and each owner has little influence on operating business decisions.
   D. An owner’s control over operating decisions is the same in every business structure, but corporations are the most difficult to form.

4. VolTech Inc. is considering a change in its capital structure, which includes only debt and equity. The company has decided to increase the proportion of debt financing in order to move the capital structure toward what the company perceives as the optimal structure. The company has also recently experienced a decline in its marginal tax rate. Assuming the costs debt and equity capital remain unchanged, what effect will the change in capital structure and tax rate have on VolTech’s weighted average cost of capital?

<table>
<thead>
<tr>
<th>Capital structure</th>
<th>Tax rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Increase</td>
<td>Increase</td>
</tr>
<tr>
<td>B. Decrease</td>
<td>Increase</td>
</tr>
<tr>
<td>C. Decrease</td>
<td>Decrease</td>
</tr>
<tr>
<td>D. Increase</td>
<td>Decrease</td>
</tr>
</tbody>
</table>

5. Which of the following statements is FALSE?
   A. A corporation is not legally required to pay dividends.
   B. Dividends are subject to double taxation.
   C. Dividends get paid out of retained earnings.
   D. The Board of Directors declares dividends.

6. Williams Corporation has recently enacted a plan to hire a review board for the firm’s senior management team. The review board will be responsible for ensuring that the senior managers stop using company resources, such as the corporate jet, for personal uses. Which of the following is FALSE about Williams Corporation?
   A. The cost of hiring the review board for the management team is an explicit agency cost.
   B. The review board is likely to increase management’s operating efficiency.
   C. Management’s excessive use of company assets is an agency cost to the firm.
   D. The firm’s stockholders bear the agency costs associated with the firm’s current situation.
7. Shamus Fitzgerald is a partner in a company that provides cleaning services to office buildings. When the company was formed as a partnership three years ago, Shamus provided $5,000 in equity capital but has not provided any equity investment since then. Today, the company has a total of $27,000 in common equity capital. The company also has $11,000 in long-term debt. Using this information, determine which of the following statements is TRUE.

A. If the company fails, Shamus' personal assets cannot be used to repay the company's obligations.
B. Incorporating the company would increase the Shamus' liability exposure.
C. Shamus is personally responsible for $2,391 of the company's long-term debt.
D. In the event of company failure, Shamus is only responsible for repaying $5,000 of the company's outstanding liabilities.

8. Sylvia Hall is estimating changes in the level of risk related to Tyler Corporation. Hall believes that several microeconomic factors have a direct influence on the riskiness of Tyler Corp. and has developed a model predicting the risk level using microeconomic factors. Which of the following should NOT be included as a factor in Hall’s model?

A. Unanticipated changes in the rate of inflation.
B. A change in the firm’s management.
C. An unexpected decline in the economic viability of some of Tyler Corp.’s assets.
D. An increase in the firm’s cost to acquire raw materials.

Use the following data to answer Question 9.

<table>
<thead>
<tr>
<th>Tyler Heavy Industries Inc.</th>
<th>Actual</th>
<th>Forecast</th>
<th>2004</th>
<th>2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retained Earnings</td>
<td>$12,250,000</td>
<td>$13,530,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital Budget</td>
<td>$20,500,000</td>
<td>$25,000,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Preferred Stock</td>
<td></td>
<td>$45,000,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equity</td>
<td>$180,000,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Debt</td>
<td>$75,000,000</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

9. If Tyler Heavy Industries, Inc. wants to maintain its current capital structure, what capital budget level can be supported by retained earnings in 2005, and how much new equity would need to be issued to meet the forecasted capital budget?

<table>
<thead>
<tr>
<th>Capital budget</th>
<th>New equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>$22,550,000</td>
<td>$0</td>
</tr>
<tr>
<td>$25,000,000</td>
<td>$1,470,000</td>
</tr>
<tr>
<td>$25,000,000</td>
<td>$0</td>
</tr>
<tr>
<td>$22,550,000</td>
<td>$1,470,000</td>
</tr>
</tbody>
</table>

10. Forrest, Inc. wants to amplify its ability to convert revenue increases into increases in net income. Which of the following accurately describes a method Forrest could use to accomplish this goal?

A. Increase the financial leverage of the firm.
B. Utilize a smaller proportion of fixed assets in the asset structure.
C. Decrease the level of debt expense on the income statement.
D. Shift the firm’s cost structure to include a greater proportion of variable costs.

11. In a recent meeting with shareholders, the management at Washburn Chemicals made several statements regarding its plan to achieve the optimal capital structure for the firm. Which of management’s following statements regarding Washburn’s optimal capital structure is incorrect?
   A. Since Washburn has large tax loss carryforwards, using debt in the optimal capital structure will create additional tax advantages.
   B. At the optimal capital structure, Washburn’s stock price will be maximized.
   C. Because Washburn has little business risk, we can afford to have a significant proportion of debt in the optimal capital structure.
   D. In order to create the optimal capital structure, we must seek to minimize our capital costs.

12. Samantha Hurley assesses risk for Kowel & Associates, a risk management consulting firm. Hurley has observed that one of Kowel & Associates’ most important clients is exposed to a large degree of risk related to two factors: 1) changes in the overall level of interest rates and 2) changes in the number of competing products. Hurley’s risk estimates indicate that the client’s risk rating has exceeded acceptable levels. What advice should Hurley give the client?
   A. Reduce the systematic risk related to competing products, and reduce the total risk related to interest rates.
   B. Reduce the unsystematic risk related to competing products, and reduce the macroeconomic risk related to interest rates.
   C. Reduce the unsystematic risk related to competing products, and reduce the stand-alone risk related to interest rates.
   D. Reduce the stand-alone risk related to competing products, and reduce the macroeconomic risk related to interest rates.

13. Charleston, Inc. just experienced a decrease in revenue of 10 percent. In response, operating income and net income both decreased by 25 percent. Which of the following is TRUE about Charleston, Inc.?
   A. The firm has high operating leverage but no financial leverage.
   B. The firm has no operating leverage but high financial leverage.
   C. The firm has high operating leverage and high financial leverage.
   D. The firm has no operating leverage and no financial leverage.

14. Which of the following statements about a corporation declaring a cash dividend is TRUE?
   A. The cash dividend must be approved for payment by the shareholders.
   B. The cash dividend is a current liability to the corporation when declared.
   C. The cash dividend does not affect the corporation’s working capital.
   D. The cash dividend is taxed as capital gains.

15. Bill Garrison has been asked to explain the basics of leverage and a firm’s capital structure to a group of novice investors. Which of Garrison’s statements accurately describes leverage and capital structure?
   A. If a firm does not rely heavily on operating leverage, then the firm’s fixed costs are a relatively small proportion of total costs.
   B. An increase in the corporate tax rate will not change the way a corporation raises capital.
   C. A firm exposed to significant business risk is more likely to use financial leverage than a firm with little business risk.
   D. If a firm increases its financial leverage, the operating leverage will increase in a similar
16. Pieter Reinhardt recently made the following statements to a group of German investors regarding agency costs. Which of the statements does NOT accurately describe an aspect of agency costs?
   A. Agency costs arise as a result of management’s desire to use company assets for its personal gain and the owners’ desire to maximize the value of the firm.
   B. Agency costs are minimized when the owners of a firm and the management of a firm are the same.
   C. Agency costs arise as a result of stockholders’ desire to increase the price of the common stock and debtholders’ desire to secure interest payments.
   D. Agency costs do not have any impact on the overall value of the firm.

17. Green & Company is a manufacturer of flooring materials including carpets and hardwoods. Recently, management at Green & Company announced its intention to finance a new investment project without altering the current capital structure of the firm. Which of the following correctly explains Green & Company’s announcement?
   A. Green & Company intends to maintain the ratio of current liabilities to total liabilities as it initiates the new investment project.
   B. Any equity required to finance the new investment project will only come from retained earnings.
   C. Green & Company intends to maintain the ratio of current assets to total assets as it initiates the new investment project.
   D. The assets required to initiate the investment project will be acquired without altering the proportions of debt and equity capital currently on the balance sheet.

18. Madison Foods Company currently has $2,500,000 of debt on its balance sheet and $7,500,000 of equity. Madison has calculated that its long-term target capital structure should be 30 percent debt and 70 percent equity. Given the company’s current capital structure, which of the following is TRUE?
   A. Any projects undertaken in the future will need to be financed with 70% equity.
   B. Any projects undertaken in the future will need to be financed with more than 30% debt.
   C. Any projects undertaken in the future will need to be financed with less than 30% debt.
   D. Any projects undertaken in the future will need to be financed with more than 70% equity.

19. Which of the following is FALSE regarding dividends?
   A. The market price of a preferred stock is influenced by its dividend payout.
   B. Stockholders pay double income taxes on the dividends they receive.
   C. A utility company normally pays larger dividends.
   D. Dividends are the portion retained by a company to grow operations.

20. Jerry Matthews is reviewing a report written by several managers reporting directly to him. The report details opportunities to be considered in the capital budgeting process this year. Which of the following opportunities listed by the managers is NOT a capital budgeting matter?
   A. The firm needs to replace certain pieces of its assembly line machinery but does not need to replace the entire line.
   B. The firm can save significant amounts of money by increasing the relative proportion of equity on the balance sheet.
   C. The firm has a large tract of land that could be used to build a warehousing facility.
   D. The firm can reduce its costs significantly by implementing a just-in-time inventory system.

21. If a firm is considering a capital investment project that is significantly more risky than the firm proportion.
itself, which of the following will be **TRUE**?

A. The IRR necessary to make the project worthwhile will be lower than a project with risk equal to the firm as a whole.

B. The discount rate to find the project’s NPV will be higher than the firm’s weighted average cost of capital.

C. The discount rate to find the project’s NPV will be lower than the firm’s weighted average cost of capital.

D. The IRR will not be a meaningful measure in this instance.

22. In the capital budgeting process, which of the following is **NOT** relevant?

A. The cost to acquire a new piece of equipment or machinery.

B. Cost savings that result from the investment project under consideration.

C. The risk of the cash flows associated with the project.

D. Total cash flow of the firm.

23. The table below demonstrates the cash flow streams for Projects A, B, C, D, and E. Which of the projects has the shortest and longest payback periods, respectively?

<table>
<thead>
<tr>
<th>Year</th>
<th>Project A</th>
<th>Project B</th>
<th>Project C</th>
<th>Project D</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>–15,000,000</td>
<td>–1,500,000</td>
<td>–8,750,000</td>
<td>–950,000</td>
</tr>
<tr>
<td>1</td>
<td>2,500,000</td>
<td>250,000</td>
<td>6,250,000</td>
<td>465,000</td>
</tr>
<tr>
<td>2</td>
<td>3,000,000</td>
<td>300,000</td>
<td>2,300,000</td>
<td>465,000</td>
</tr>
<tr>
<td>3</td>
<td>2,950,000</td>
<td>575,000</td>
<td>1,275,000</td>
<td>465,000</td>
</tr>
<tr>
<td>4</td>
<td>2,450,000</td>
<td>205,000</td>
<td>580,000</td>
<td>465,000</td>
</tr>
<tr>
<td>5</td>
<td>2,000,000</td>
<td>115,000</td>
<td>245,000</td>
<td>465,000</td>
</tr>
<tr>
<td>6</td>
<td>2,500,000</td>
<td>95,000</td>
<td>165,000</td>
<td>465,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Shortest</th>
<th>Longest</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Project C</td>
<td>Project A</td>
</tr>
<tr>
<td>B. Project D</td>
<td>Project B</td>
</tr>
<tr>
<td>C. Project C</td>
<td>Project B</td>
</tr>
<tr>
<td>D. Project D</td>
<td>Project A</td>
</tr>
</tbody>
</table>

Use the following data to answer Questions 24 and 25:

Jason Brookshire is an equity analyst for Mays Investment Corporation (MIC). Brookshire has recently been assigned to cover the gourmet coffee industry. In general, MIC tries to invest in multiple areas of the supply chain in industries it finds attractive. Brookshire is thus evaluating making investments in two gourmet coffee suppliers, JNS Inc. and Hartle Corp., and two gourmet coffee retailers, WalCo and Bidwell. Data on each of these companies is provided in the table below.
24. Which of the following correctly ranks the four firms from highest to lowest operating profit earned in 2004?

25. Brookshire has been told by his supervisor that he must only invest in companies that are forecasted to have a quantity of sales above their breakeven level. Which supplier and retailer should Brookshire invest in?
   A. Hartle Corp., WalCo
   B. Hartle Corp., Bidwell
   C. JNS Inc., WalCo
   D. JNS Inc., Bidwell

26. Dodson Corp. expects a ten year replacement project designed to increase the company’s productivity to produce an NPV equal to $1.5 million. The project will provide positive cash flows in years one through ten of the project. If the project cash flows end unexpectedly after seven years, what will happen to the project’s NPV and IRR?
   A. Increase  Decrease
   B. Decrease  Decrease
   C. Decrease  Increase
   D. Increase  Increase

27. Which of the following statements is **FALSE**?
   A. Operating leverage is a key determinant of break-even levels.
   B. The degree of operating leverage tells us the sensitivity of operating cash flow to changes in sales volume.
   C. In the short run, management has the flexibility to change a company’s high fixed cost structure.
   D. With no fixed costs, the change in EBIT is the same as the change in revenues.

28. Mark Kelley is assessing an investment project. He has determined that, given his cash flow and risk assumptions, the project will add value to his firm. Three days after deciding the
project was acceptable, Kelley decided that the project was actually more risky than he originally thought. After reassessing the project’s risk, what should happen to the cost of capital and the NPV of the project Kelley is considering?

A. The cost of capital should decrease, while the NPV should increase.
B. The cost of capital should increase, and the NPV should increase.
C. The cost of capital should decrease, and the NPV should decrease.
D. The cost of capital should increase, while the NPV should decrease.

29. In a meeting with her colleagues, Martha Samuels detailed the ideal characteristics of measures to evaluate capital budgeting projects. Which of the following characteristics is NOT necessary?

A. The measure should account for the timing of the cash flows.
B. The measure should account for the method of financing.
C. The measure should account for the risk of the project.
D. The measure should account for all of the project’s cash flows.

Use the following information to answer Questions 30 through 33:

Harold Kumar is an analyst for Smythe Blarney Investment, Inc. Harold has been assigned the task of estimating the costs of capital for Zeta Company using various methods. Harold has estimated the following for Zeta Company: Zeta Company has a beta of 1.35; the appropriate market risk premium is 7.0 percent; the current risk free rate is 2.0 percent; Zeta’s stock sells for $35 per share and currently pays a dividend of $1 per share on $4 per share of earnings; the company’s return on equity (ROE) is 12 percent; flotation costs to issue new stock are approximately 10 percent; Zeta’s preferred stock pays an annual dividend of $1.50 and has a market price of $18.75; the company’s cost of debt is 6 percent; Zeta Company’s current capital structure is 25 percent debt, 5 percent preferred stock, and 70 percent equity; Zeta has a tax rate of 40 percent.

30. What is Zeta Company’s cost of retained earnings?
   A. 7.0%.
   B. 8.8%.
   C. 11.5%.
   D. 12.4%.

31. What is Zeta Company’s cost of new equity?
   A. 9.0%.
   B. 10.5%.
   C. 12.5%.
   D. 14.0%.

32. What is Zeta Company’s cost of preferred stock?
   A. 8.0%.
   B. 4.8%.
   C. 8.7%.
   D. 5.2%.

33. Harold’s boss wants him to calculate Zeta Company’s weighted average cost of capital (WACC). What is Zeta Company’s weighted average cost of capital (WACC) assuming no new shares of stock need to be issued?
   A. 8.0%.
   B. 9.3%.
   C. 12.0%.
   D. 12.5%.
34. Haversham Corporation is a publicly traded firm and is about to hold its annual meeting for which it has mailed out proxy voting forms. The company’s management team owns 10 percent of the outstanding shares with the remaining 90 percent in the hands of other individuals. If 20 percent of non-management shareholders fail to send in their proxies, which of the following scenarios is possible?

A. Management of Haversham will only be able to vote a maximum block of 10% at the shareholder meeting.
B. 30 percent of the proxy votes approve of a stock split favored by management but not favored by non-management shareholders.
C. Only eighty percent of the total available shareholder votes will be eligible to be cast at the shareholder meeting.
D. Non-management shareholders will only be able to vote a maximum block of 80% to stop dividends.

Use the following information to answer Questions 35 and 36:

Barret Clothing Manufacturers Inc. is considering adding a new piece of equipment that will significantly increase the production capabilities of their largest U.S. manufacturing facility. The project is expected to last for five years and will require an initial investment of one and a half million dollars. The net cash flows expected for this expansion project are $400,000 per year for each of the project's five years.

35. What is the NPV of the project at 10 percent?

A. $16,315.
B. $31,422.
C. $1,531,422.
D. $1,522,415.

36. What is the project's IRR?

A. 10.00%.
B. 11.02%.
C. 9.85%.
D. 10.42%.

Use the following information to answer Questions 37 through 41:

Jamestown Sporting Supplies is a large manufacturer of sporting goods equipment to the U.S. and Canadian markets. Jamestown has grown rapidly over the past few years, and as a result, one of their key pieces of machinery is wearing out. Jamestown is evaluating two potential projects, each of which would involve the purchase of a new machine to replace the old one. The incremental cash flows from each project including the net investment required today are summarized in the following table:

<table>
<thead>
<tr>
<th>Year</th>
<th>Undiscounted Values</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project A</td>
<td>Project B</td>
</tr>
<tr>
<td>0</td>
<td>–$175,000</td>
</tr>
<tr>
<td>1</td>
<td>100,000</td>
</tr>
<tr>
<td>2</td>
<td>90,000</td>
</tr>
<tr>
<td>3</td>
<td>10,000</td>
</tr>
<tr>
<td>4</td>
<td>5,000</td>
</tr>
</tbody>
</table>
Jamestown’s capital structure consists of 40 percent debt and 60 percent equity. The after-tax cost of debt for the company is 5.5 percent, and the cost of equity is 8.0 percent.

37. Jamestown’s weighted average cost of capital is equal to which of the following?
   A. 6.0%.
   B. 6.5%.
   C. 7.0%.
   D. 7.5%.

38. If Jamestown is unwilling to accept any project with a payback period greater than 3 years, which of the following is TRUE?
   A. Jamestown should accept Project B, since it has a PBP of 1.83 years.
   B. Jamestown should accept Project A, since it has a PBP of 1.83 years.
   C. Jamestown should not accept Project B, since it has a PBP of 4.57 years.
   D. Jamestown should not accept Project A, since it has a PBP of 4.57 years.

39. Calculate the net present value of each of the projects that Jamestown is considering.
   Project A   Project B
   A. $12,939   $10,411
   B. $10,386   $9,045
   C. $9,045    $10,836
   D. $10,411   $12,939

40. Using the net present values calculated previously, which of the following statements is TRUE?
   A. Because it adds more value to the firm, Project A should be preferred to Project B.
   B. Jamestown should not accept either of the projects, since they will decrease the value of the firm.
   C. Jamestown should be indifferent between Project A and Project B, since they both add value to the firm.
   D. Because it adds more value to the firm, Project B should be preferred to Project A.

41. Calculate the IRR for each project, and determine which project should be accepted.
   A. Accept Project B, since it has an IRR of 9.8%.
   B. Accept Project A, since it has an IRR of 10.5%.
   C. Accept Project B, since it has an IRR of 10.5%.
   D. Accept Project A, since it has an IRR of 9.8%.

Use the following information to answer Questions 42 through 45:

Toppers, Inc. manufactures and sells baseball caps in the United States. The company sells its complete line of caps for $25 apiece. The company is currently evaluating three different projects that would change the cost structure of its operations. Toppers is concerned about increasing the amount of operating leverage as a result of undertaking one of the three projects. Each of the projects’ expected costs are summarized in the following table.

<table>
<thead>
<tr>
<th>Project</th>
<th>Project A</th>
<th>Project B</th>
<th>Project C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price</td>
<td>$25.00</td>
<td>$25.00</td>
<td>$25.00</td>
</tr>
<tr>
<td>Variable costs</td>
<td>$15.00</td>
<td>$20.00</td>
<td>$10.00</td>
</tr>
</tbody>
</table>
42. What is the breakeven quantity of sales for Project B?
   A. 12,000 caps.
   B. 8,000 caps.
   C. 1,000 caps.
   D. 333 caps.

43. What is the breakeven quantity of sales for Project C?
   A. 12,000 caps.
   B. 8,000 caps.
   C. 1,000 caps.
   D. 229 caps.

44. Given Toppers’ aversion to additional operating risk, which of the following statements is correct?
   A. Project B has the lowest contribution margin and therefore the lowest operating leverage.
   B. Project A has more operating leverage than Project C.
   C. Project B will add the most operating leverage and should be avoided.
   D. Project C has more operating leverage than Project A.

45. If Toppers sells 10,000 caps, what will be the operating profit or loss for Projects A, B, and C?
   A. Project A will have an operating loss of $20,000, and Project C will have an operating profit of $30,000.
   B. Project C will have an operating profit of $30,000, and Project B will have an operating loss of $10,000.
   C. Project B will have an operating profit of $10,000, and Project C will have an operating profit of $30,000.
   D. Project A will have an operating profit of $20,000, and Project B will have an operating profit of $10,000.

Answers

1. D
   Limited liability extends to all of the owners of a C corporation. This is one of the reasons firms undergo the time consuming and, in some cases, expensive process of incorporating the firm.

2. C
   Internal equity (retained earnings) has a lower component cost of capital than external (newly issued) equity since there is no floatation cost associated with its use. Thus if the company uses less internal equity to fund capital investment, then higher-cost external equity must be used which would increase, not decrease the WACC.

3. C
   Corporations must be registered within their state of incorporation, and they require more external reporting. In a proprietorship there is a sole owner. This individual has complete control over all decisions. In all other forms or business there are multiple owners which diffuse the control of any one owner.
4. B

Since debt generally has a lower component cost of capital than does equity, increasing the proportion of debt in the capital structure will decrease the overall WACC. Consider the following example:

\[ k_{\text{equity}} = 15\%, \; k_{\text{debt}} = 8\%, \; t = 40\% \]

\[ \text{WACC} = 0.70 \times (15\%) + 0.30 \times [8\% \times (1 - 0.40)] = 10.5\% + 1.4\% \]
\[ = 11.9\% \]

\[ \text{WACC} = 0.60 \times (15\%) + 0.40 \times [8\% \times (1 - 0.40)] = 9.00\% + 1.92\% \]
\[ = 10.9\% \]

Thus we can see that as the proportion of debt increases, the WACC decreases. A decrease in the tax rate of a company will increase the WACC. Consider another example:

\[ k_{\text{equity}} = 15\%, \; k_{\text{debt}} = 8\%, \; w_{\text{equity}} = 70\%, \; w_{\text{debt}} = 30\% \]

\[ \text{WACC} = 0.70 \times (15\%) + 0.30 \times [8\% \times (1 - 0.40)] = 10.5\% + 1.4\% \]
\[ = 11.9\% \]

\[ \text{WACC} = 0.70 \times (15\%) + 0.30 \times [8\% \times (1 - 0.30)] = 10.5\% + 1.7\% \]
\[ = 12.2\% \]

As the tax rate decreases, the WACC increases.

5. C

Retained earnings is the amount of net income left over after dividends are paid. Therefore, dividends cannot be paid out of retained earnings. Dividends are paid out of the net income generated for the period.

6. B

Having the review board in place may eliminate the wasteful use of the company’s assets, but the cost will be the payment made to the board for their services as well as decreased operating flexibility. With someone watching their every move, management will become overly cautious and may forego profitable opportunities for fear of scrutiny by the review board.

7. C

In a partnership, each partner is personally responsible for company liabilities in proportion to the partner’s ownership in the company. In this question, Shamus owns \( \frac{5,000}{27,000} = 18.51\% \) of the company and is thus responsible for \( 0.1851 \times 11,000 = $2,037 \) of the company’s debt.

8. A

Microeconomic factors include firm-specific factors. Inflation is a macroeconomic (system-wide) factor.

9. D

Tyler Heavy Industries wishes to maintain its current capital structure. Therefore we must first calculate the relative proportions of capital as follows:
Therefore, 2005 retained earnings can support a capital budget of $13,530,000 / 0.60 = 22,550,000. This is the maximum capital budget that can be spent without issuing new equity to maintain the current capital structure. If the company wishes to go ahead with the forecasted capital budget of $25,000,000, then they will need total equity capital of $25,000,000 \cdot 0.60 = $15,000,000. Of this figure, $13,530,000 will come from retained earnings, and $15,000,000 – 13,530,000 = $1,470,000 must come from newly issued equity capital.

10. A
This is the definition of financial risk.

11. A
Debt will not provide significant benefits as a tax shield when tax loss carryforwards are present. The carryforwards effectively eliminate any taxes that might be owed, thereby canceling out any tax shield that might be gained from interest payments.

12. B
Unsystematic risk or firm-specific risk is the risk caused by microeconomic forces (such as the risk associated with competing products). Macroeconomic risk relates to economy-wide forces that affect all companies (such as the level of interest rates).

13. A
If a firm does not employ financial leverage, the percentage change in net income should be equal to the percentage change in operating income.

14. B
The Board of Directors of the corporation has the authority to declare a dividend, and when a dividend is declared it becomes a current liability of the corporation. The current liability impacts the company's working capital (current assets minus current liabilities).

15. A
Operating leverage comes from the use of fixed costs in the operating structure. As fixed costs decrease as a proportion of total costs, the operating leverage of the firm decreases.

16. D
The origin of agency costs is the separation of ownership and management. Also, the goals of the stockholders, bondholders, and management are sometimes at odds. Agency costs are detrimental to the firm and prevent the firm from realizing its maximum value.

17. D
Capital structure refers to the proportions of debt and equity financing used to pay for the firm’s assets. If Green & Company wants to finance a new investment without changing the capital structure, it will need to raise the required investment according to the existing proportions. For instance, if the current capital structure consists of 40% debt and 60% equity, Green & Company must raise 40 cents of debt capital and 60 cents of equity capital for every dollar of investment required for the new project.

18. B

The firm’s current capital structure includes a debt ratio of

\[
\frac{2,500,000}{2,500,000 + 7,500,000} = 25\%
\]

Since the target capital structure includes a debt ratio of 30%, new projects will have to make up the extra 5% needed to get to the target structure. Therefore the proportion of debt financing for new projects will have to be greater than the target 30% to make up the deficiency. If the firm was already at the target structure, then new projects would be financed with 30% debt and 70% equity.

19. D

Dividends are not retained by the corporation but are paid to shareholders. Earnings retained by the corporation are used to finance future projects, which, if successful, will allow the company to grow.

20. B

Increasing the proportion of equity on the balance sheet is a financing decision, not a capital budgeting decision. Capital budgeting decisions relate to the opportunities for investment in the business to increase its value. Changing the mix of debt and equity doesn’t change the value, just how it is divided among the stakeholders.

21. B

A project that is riskier than the firm as a whole will need to be evaluated on a present value basis using a discount rate that is higher than the weighted average cost of capital.

22. D

When considering capital budgeting projects, it is the incremental cash flow, not the total cash flow, that is relevant. The project needs to be evaluated in terms of how much value it will add to the firm. In order to do this, we must isolate only those cash flows that will result from the project itself.

23. D

First calculate the cumulative cash flows for each project as demonstrated in the table below:

<table>
<thead>
<tr>
<th>Year</th>
<th>Project A</th>
<th>Project B</th>
<th>Project C</th>
<th>Project D</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>−15,000,000</td>
<td>−1,500,000</td>
<td>−8,750,000</td>
<td>−905,000</td>
</tr>
<tr>
<td>1</td>
<td>−12,500,000</td>
<td>−1,250,000</td>
<td>−2,500,000</td>
<td>−440,000</td>
</tr>
<tr>
<td>2</td>
<td>−9,500,000</td>
<td>−950,000</td>
<td>−200,000</td>
<td>25,000</td>
</tr>
<tr>
<td>3</td>
<td>−6,550,000</td>
<td>−375,000</td>
<td>1,075,000</td>
<td>490,000</td>
</tr>
</tbody>
</table>
Once the cumulative cash flows for a project turn positive (indicating full recovery of the initial project cost), we can calculate the payback period for the project using the following formula:

\[ PBP = \text{years until full recovery} + \frac{\text{unrecovered cost at the beginning of the last year}}{\text{cash flow during the last year}} \]

Thus the payback period (PBP) for each project is as follows:

\[ PBP_A = 5 + \frac{2,100,000}{2,500,000} = 5 + 0.84 = 5.84 \]

\[ PBP_B = 5 + \frac{55,000}{95,000} = 5 + 0.58 = 5.58 \]

\[ PBP_C = 2 + \frac{200,000}{1,275,000} = 2 + 0.16 = 2.16 \]

\[ PBP_D = 1 + \frac{440,000}{465,000} = 1 + 0.95 = 1.95 \]

24. C

Recall that operating profit is defined as total revenue minus total operating cost where total operating cost is defined as total variable operating cost plus fixed operating costs. Calculate the operating profits in 2004 for each company as follows:

\[ \text{profit}_{\text{JNS}} = (10,875 \times 0.70) - (10,875 \times 0.10) - 6,200 = $325.00 \]

\[ \text{profit}_{\text{Heatle}} = (11,910 \times 0.70) - (11,910 \times 0.21) - 5,820 = $15.90 \]

\[ \text{profit}_{\text{WalCo}} = (8,230 \times 3.00) - (8,230 \times 0.70) - 19,500 = $571.00 \]

\[ \text{profit}_{\text{Bidwell}} = (7,610 \times 3.75) - (7,610 \times 0.70) - 23,000 = $210.50 \]

Thus the order from highest to lowest operating profit is JNS Inc., Bidwell, Hartle Corp., WalCo.

25. A

Begin by calculating the breakeven quantity of sales for each company as follows:
Hartle Corp. and WalCo are the only two companies that are forecasted to have a 2005 level of sales greater than their breakeven level and are thus the only acceptable investments.

26. B

If the positive cash flows from a project end before they are expected or are less than originally expected, then the NPV of a project will decrease since there is less overall cash benefit from undertaking the project. The IRR will also decrease for the same reason. Fewer cash flows or smaller cash flows than expected translates into smaller returns.

27. C

Management can only effectively deal with high fixed costs over a longer-term time horizon.

28. D

As the risk of a project increases, the cost of capital (the interest rate used to discount the project’s cash flows to their present value) should increase to reflect the additional return required for the increased risk. An increased cost of capital would necessitate a decreased NPV. Discounting the project’s cash flows at a higher rate decreases the present value of each cash flow and thus the NPV as well.

29. B

How a firm chooses to finance a project is theoretically independent from the decision to accept or reject a project. The decision to accept a project should be based on an objective measure that takes into account all of a project’s cash flows, the project’s risk, and the time value of money.

30. C

\[ k_s = R_F + \beta (R_M - R_F) \]

where:

\[ R_F = 2.0\% \]
\[ \beta = 1.35 \]
\[ (R_M - R_F) = \text{known as the risk premium 7.0\%} \]
ks = 0.02 + 1.35(0.07) = 0.1145 or 11.5%

31. C

\[ k_e = \frac{D_t}{P_0(1-F)} + g \]

\[ D_t = 1 + g \]

\[ g = (ROE)(1 - \text{payout ratio}) \]

\[ \text{payout ratio} = \frac{\text{dividends per share}}{\text{earnings per share}} \]

where:
ROE = 12%
F = 10%
P0 = $35
Dividends per share = $1
Earnings per share = $4
Payout ratio = $1/$4 or 24%
g = 0.12(1 - 0.25) = 0.09

\[ k_e = \frac{P_0}{P_0 - F} + g \]

\[ k_e = \frac{S1(1.09)}{S35(1-0.10)} + 0.09 = 0.1246 \text{ or } 12.5\% \]

32. A

\[ \text{Price}_{\text{preferred}} = \frac{\text{dividend}}{k_{ps}} \implies 18.75 = \frac{1.50}{k_{ps}} \implies k_{ps} = \frac{1.50}{18.75} = 8.0\% \]

33. B

\[ \text{WACC} = (w_d)[k_d(1 - t)] + (w_{ps})(k_{ps}) + (w_{ce})(ks) \]

in this problem:
\[ w_d = 25\% \]
\[ w_{ps} = 5\% \]
\[ w_{ce} = 70\% \]
\[ k_d = 6\% \]
\[ k_{ps} = 8\% \]
\[ k_s = 11.5\% \]
\[ t = 40\% \]

\[ \text{WACC} = 0.25[0.06(1 - 0.4)] + (0.05)(0.08) + (0.7)(0.115) \]
\[ \text{WACC} = 0.009 + 0.0036 + 0.0802 \]
\[ \text{WACC} = 0.0932 \text{ or } 9.3\% \]

34. B

The board of directors has control over dividends but must have shareholder approval for a stock split,
eliminating choice D as a correct answer. If 20% of the proxy votes are not sent in, management has a right to cast the votes. Therefore 20% + 10% of the votes could be cast by management for proposals not favored by non-management shareholders.

35. A

<table>
<thead>
<tr>
<th>Year</th>
<th>Net Cash Flow</th>
<th>PV @ 10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>−$1,500,000</td>
<td>−$1,500,000</td>
</tr>
<tr>
<td>1</td>
<td>400,000</td>
<td>363,636</td>
</tr>
<tr>
<td>2</td>
<td>400,000</td>
<td>330,579</td>
</tr>
<tr>
<td>3</td>
<td>400,000</td>
<td>300,526</td>
</tr>
<tr>
<td>4</td>
<td>400,000</td>
<td>273,205</td>
</tr>
<tr>
<td>5</td>
<td>400,000</td>
<td>248,369</td>
</tr>
</tbody>
</table>

NPV = PV inflows – cost = $1,516,315 – $1,500,000 = $16,315

Note: The cash inflows could be treated as an annuity of $400,000 for five years:

\[-400,000 \text{ PMT}\]
\[5 \text{ N}\]
\[10 \text{ I/Y}\]

CPT PV $1,516,315

36. D

Since the cash inflows are an annuity, solving for the IRR is fairly simple:

\[-400,000 \text{ PMT}\]
\[5 \text{ N}\]
\[1,500,000 \text{ PV}\]

CPT I/Y 10.42%

37. C

The WACC is the weighted average of the capital costs.

\[WACC = (0.40 \times 5.5\%) + (0.60 \times 8.0\%) = 2.2\% + 4.8\% = 7.0\%\]

38. B

In order to calculate the payback period, we must first calculate the cumulative cash flows for each project.
The table shows that for Project A, the PBP will be between one and two years since the cumulative cash flow turns positive in Year 2. For Project B, the PBP will be between 3 and 4 years. More specifically:

\[
PBP_A = 1 + \frac{75,000}{90,000} = 1 + 0.83 = 1.83 \text{ years}
\]

\[
PBP_B = 1 + \frac{60,000}{105,000} = 3 + 0.57 = 3.57 \text{ years}
\]

39. C

To calculate the NPV of each project, discount each project’s cash flows using the 7.0% WACC as the discount rate. The cash flows (undiscounted and discounted) are presented in the following tables.

<table>
<thead>
<tr>
<th>Year</th>
<th>Project A</th>
<th>Project B</th>
<th>Year</th>
<th>Project A</th>
<th>Project B</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>–$175,000</td>
<td>–$120,000</td>
<td>0</td>
<td>–$175,000</td>
<td>–$120,000</td>
</tr>
<tr>
<td>1</td>
<td>100,000</td>
<td>10,000</td>
<td>1</td>
<td>93,458</td>
<td>9,346</td>
</tr>
<tr>
<td>2</td>
<td>90,000</td>
<td>10,000</td>
<td>2</td>
<td>78,609</td>
<td>8,734</td>
</tr>
<tr>
<td>3</td>
<td>10,000</td>
<td>40,000</td>
<td>3</td>
<td>8,163</td>
<td>32,652</td>
</tr>
<tr>
<td>4</td>
<td>5,000</td>
<td>105,000</td>
<td>4</td>
<td>3,814</td>
<td>80,104</td>
</tr>
<tr>
<td>Total</td>
<td>$30,000</td>
<td>$45,000</td>
<td>NPV</td>
<td>$9,045</td>
<td>$10,836</td>
</tr>
</tbody>
</table>

Each cash flow gets discounted as a lump sum. As an example, the year one cash flow for Project A would get discounted as follows:

\[
PV_A = \frac{100,000}{(1 + 0.07)^1} = 93,458
\]

The NPV of each project is simply the sum of the present values minus the net investment. The net
investment is represented in these tables as the negative cash flow in Year 0.

40. D

Although any project with a positive NPV will increase the value of the firm, Jamestown only needs to replace one machine and thus can only choose one project. Since Project B has a greater NPV than Project A, the firm should choose Project B. Project B will increase the value of the firm by the greatest amount.

41. B

The IRR is the discount rate that makes the NPV of the project equal zero. For example, for Project A, the IRR is the discount rate that, when substituted into the NPV formula below, makes the equation true:

\[
0 = \frac{100,000}{(1+IRR)^1} + \frac{90,000}{(1+IRR)^2} + \frac{10,000}{(1+IRR)^3} + \frac{5,000}{(1+IRR)^4} - 175,000
\]

The IRR can be found by trial and error or by using a calculator such as the TI BA II+. In order to find the IRR using the TI BA II+, use the following keystrokes:

- CF 2ND CLR WORK clears the cash flow worksheet
- 175,000 +/- ENTER enters the net investment
- ↓ 100,000 ENTER enters 1\textsuperscript{st} year’s cash flow
- ↓ ↓ 90,000 ENTER enters 2\textsuperscript{nd} year’s cash flow
- ↓ ↓ 10,000 ENTER enters 3\textsuperscript{rd} year’s cash flow
- ↓ ↓ 5,000 ENTER enters 4\textsuperscript{th} year’s cash flow
- IRR CPT computes the IRR

Using the method detailed above, the IRR for Project A is 10.5%, and the IRR for Project B is 9.8%. Both projects are acceptable, since they both have an IRR above the 7.0% cost of capital. However, Project A has the highest IRR and should be preferred over Project B.

42. A

\[
Q_{BE} = \frac{60,000}{(25 - 20)} = 12,000
\]

43. B

\[
Q_{BE} = \frac{120,000}{(25 - 10)} = 8,000
\]

44. C

Project B has the highest breakeven level of sales (12,000) and therefore adds the most operating leverage. Project A and Project C both have a breakeven quantity of 8,000 and therefore have the same operating risk. Project B does have the lowest contribution margin ($25 - 20 = 5$), but this does not indicate that it has the lowest operating leverage.
45. B

Calculate the operating profit or loss as follows:

operating profit = sales – variable cost – fixed cost

Profit_A = (10,000 x 25) - (10,000 x 15) - 80,000 = $20,000
Profit_B = (10,000 x 25) - (10,000 x 20) - 60,000 = - $10,000
Profit_C = (10,000 x 25) - (10,000 x 10) - 120,000 = $30,000
Chapter Five: Capital Markets

Overview

Markets provide the means for buyers and sellers to exchange goods and services. Exchange can be for money or for other goods and services (as in a barter system). Markets can have physical locations, where buyers and sellers actually meet, or they can be channels through which goods and services flow. In the latter case it is possible that neither the buyer nor the seller knows who is on the other end of the transaction.

If you take notice of the various forms of markets, you will no doubt see a marketplace for food where vendors sell their various products for cash or on credit. Buyers make their selections from piles of fruits and vegetables as well as shelf after shelf of various packaged goods. Marketplaces range from very large supermarkets to very small stores specializing in imported products or naturally grown foods. They can even be vending machines in which you deposit coins and receive a canned drink or other product.

There are also markets for money, which provide the means for transferring funds from those with an excess of money to those with a shortage. These capital markets provide individuals, businesses, and governments with a way to get the capital they need for operating and expanding.

Section 1 of this chapter discusses the different forms of markets. Sections 2 and 3 cover primary and secondary capital markets, respectively. Section 4 focuses on the money market. Section 5 describes markets for alternative investment vehicles. Section 6 discusses various market indices and how they are derived.

Section 1: Markets

Chapter Objective: Discuss the differences between direct, broker, and dealer markets and between spot and forward markets.

There are actually three basic types of markets. First there is the direct market, in which the buyer and seller must actually contact one another directly. When you visit a farmer’s market, you are participating in a direct market. You see the items you want, and you purchase them directly from the seller. The obvious benefit with direct markets is the ability to inspect the item before you purchase it. Of course, this also presents a potentially large problem for both you and the vendor. You had to travel to the market, and the vendor can only sell to those who make the trip.

The second type of market is the broker market. In this case, a broker facilitates the transaction by bringing the buyer and seller together. Consider a real estate transaction. You may choose to sell your home by yourself (i.e., “by owner”). To be successful, you must be able to actively market your property, meet prospects at your home, and negotiate the sale terms. You can advertise your house in newspapers or other publications, but that can be expensive.

If you have a real estate broker handling the sale for you, she will advertise the sale through specialized real estate networks. The broker will help you establish a fair offering price, give you ideas on how to improve the appearance of the house, show the house to prospects, and even act as the go between during negotiations. In other words, the broker, in exchange for a commission on the sale, acts as your agent in presenting the home to a wide range of prospective buyers.

Notice that the real estate broker does not actually take ownership of the home being sold. Rather, the function of the broker is to bring the buyer and seller together. In the third type of market, a dealer market, the dealer actually buys goods and then sells them. The dealer actually takes ownership of the product
before reselling it to the final user. The dealer can sell his products at a central location, such as a grocery store, or he can sell them through a network or even over the Internet.

All three forms of markets exist today. You see cars by the side of the road or in parking lots with for sale signs in the windows. You see apartments for rent or houses for sale by owner. These are obvious examples of the direct market at work. Possibly next door to the “For Sale By Owner” sign in one front yard you will see a real estate company sign, an example of the broker market. And you have visited a grocery store or any of thousands of other retail stores, which are examples of the dealer market.

Money markets and capital markets are primarily broker markets, although there are instances of both direct and dealer market situations as well. The vast majority of trading in stocks and bonds happens either on organized exchanges such as the New York Stock Exchange (NYSE) or in the over-the-counter market. In either case, buy or sell orders are placed with a broker, who takes the orders into the marketplace and tries to find a willing party to take the opposite side of the transaction. For the most part, this matching is done through computer systems, and trading happens almost instantly. For some stocks or bonds that are traded less frequently, it might take longer to find a willing buyer or seller, and there may be some amount of price negotiation.

Brokers are paid a commission to compensate them for their service. For bonds, this commission is captured entirely in the bid/ask spread on the security being traded—the spread is the broker’s commission. For stocks, commissions are typically based on the size or number of shares being traded. For large institutions, typical commissions would be three to seven cents per share. For smaller trades, the commission may be a flat rate plus some per share adjustment. Brokers usually have a minimum commission fee for small trades.

The typical stock or bond has a bid and ask price any time the market is open for business. Assume that the stock of Ford Motor Company has a bid price of $15.000 and an ask price of $15.125. This indicates that there are sellers willing to sell Ford stock for $15.125 per share, and buyers willing to buy Ford stock for $15.000 per share. If an investor enters an order to buy Ford at the market price, the broker will enter the order and it will be executed at the ask price of $15.125. The investor in this case was willing to pay the market price of the seller, which is $15.125. Similarly, an investor who enters an order to sell Ford at market would receive $15.000 per share for his stock—the market price of buyers. The difference between the bid and ask price is called the spread. Large stocks (or bonds) with high trading volumes will have very small spreads. Stocks and bonds that trade less frequently will have wider spreads.

A spot market can be “cash and carry,” where the buyer actually pays for the product and takes it. In financial spot markets, the buyer usually receives the security or other financial instrument in two to three days.

**Spot And Forward Markets**

A spot market is a market where securities, commodities, and other goods are traded for immediate delivery. The price you receive in a spot market is the current market value determined by the supply of and demand for the product. The most common spot market is the retail store (e.g., shoe store or a grocery store). In this case, the customer selects the desired product and takes it home. In financial spot markets, investors buy currencies, securities, and commodities for immediate delivery of two to three days. This is equivalent to calling your broker and buying common stock or other securities. When a farmer sells corn in the spot market, he delivers it to his local grain elevator.

Forward markets were developed because of the uncertainty associated with future spot market prices. For instance, suppose the farmer above has planted corn, which he will harvest and deliver to the elevator in three months. He sees the price of corn today but isn’t sure what it will be when he harvests. The price of
corn when it is harvested will depend upon the demand for corn compared to the quantity harvested worldwide. If farmers produce surplus crops, the price of corn may fall due to its abundance.

Regardless, the farmer would like an idea of the price he will receive before he determines how much corn to plant. To lock in a selling price for his corn, the farmer can enter into a forward contract to deliver a set amount of corn at a predetermined price. In this way, the farmer knows in advance the price he will receive. If he waits until delivery to find out the price he will receive, the price per bushel may have dropped significantly.

As the forward contract moves toward maturity, the forward price of corn will move towards the spot price. Obviously, at maturity the forward price will equal the spot price because the corn will be immediately deliverable at that time. This movement of the forward price toward the spot price is called convergence. We will have more to say about spot and forward prices as well as the concept of convergence in chapter on Securities Analysis.

**Section 2: Primary Capital Markets**

There are many different financial and nonfinancial forward market products, but currency forwards are probably the most important for the CFA program. By buying or selling currencies in the forward markets, traders and investors can reduce exchange rate risk. Thus, international trade is made easier by forward markets for foreign currency.

**Chapter Objective:** Describe primary markets and the role of the investment banker.

Firms obtain long-term capital by selling their securities in the primary markets. They typically utilize the services of an investment-banking firm to either privately place their securities or sell them publicly. In a public offering, securities are offered to the general investing public through investment bankers. If the stock offering is the first time the company has made its shares available to the public, the offering is referred to as an initial public offering (IPO). If the company has issued stock previously but is now raising additional capital through selling new shares, the sale is referred to as a secondary stock offering. In either case, the transaction is said to be in the primary market because the securities being sold have never been available before.

All securities sold publicly in the U.S. must be registered with the Securities and Exchange Commission (SEC). To register their securities, firms must publish a prospectus, which discloses information as specified by the SEC. The process can be costly both in terms of time and money, and a good deal of information about the firm must be disclosed to the general public. A syndicate of investment banking firms, with a few lead banks, will help the firm through the process. The lead banks actually meet with management to decide what type of security to issue, when to issue the security, how much to issue, and at what price.

The investment banks will advertise the sale in a tombstone ad in the Wall Street Journal and other financial publications. The tombstone contains the names of the investment banking firms involved in the sale, the main characteristics of the security, and the date of the sale. The tombstone will direct interested investors to the prospectus, which is available through any of the listed investment banking firms.

The lead banks and others listed on the tombstone are part of the underwriting syndicate. When an issue of securities is underwritten, the investment banks guarantee the proceeds of the issue to the firm before the securities are offered publicly. A fully underwritten issue transfers risk to the underwriter since the price and quantity of securities being issued has been fully guaranteed by the underwriter. The prospectus lists all
involved investment banks along with the extent of their underwriting obligation. Often, investment bankers will visit large institutional investors, such as pension funds, mutual funds, and insurance companies to determine their interest and get pricing advice.

For their efforts, investment banks charge a fee known as the underwriter spread. This spread is the difference between the price investment bankers pay for the securities and the price at which they sell them to investors. The total costs of selling securities publicly (the spread, legal fees, accounting and financial costs, and printing costs) are known as flotation costs. The magnitude of the investment banks’ fees will depend upon the work the banks have to do to sell the securities as well as the risk associated with selling them. For example, if a very large, well-known firm sells securities, total flotation costs are minimal (as a percentage of the proceeds). For a smaller, less well-known firm, the spread alone can be as high as 20-30 percent of the proceeds. This is mostly due to the extra effort the banks must expend to sell these securities as well as the risk that they might not sell their total allocation.

To speed up the process of issuing securities and maintaining a certain degree of privacy, many firms place their securities privately. A private placement is restricted to a limited number of very large investors, and the issue does not have to be registered with the SEC. This avoids the necessity of disclosing great amounts of information about the firm and its owners.

An investment banking firm, acting as a broker, facilitates the meeting of representatives of the firm and the investors to discuss the details of the issue. In this fashion, only those investors actually involved in the private placement get the inside information that would be disclosed in a prospectus for a public offering. Most privately placed securities are bonds. Private placement investors take large positions (i.e., buy a large amount of the debt) in the offering and typically hold these positions to maturity. The interest rate (coupon) on the bonds is usually slightly higher than if the bonds were sold publicly because the investors cannot sell their bonds to the public. However, due to the flotation cost savings and the lack of publicly disclosed information, private placements are the method of choice for selling corporate bonds.

There are fairly well-developed markets for trading large blocks of exchange-listed stocks without going through the exchange. The third market refers to exchange-listed stocks that are traded over the counter. The fourth market is a direct market, where institutions trade stocks directly without going through any brokerage intermediary. Trying to sell 100,000 shares of a company on the NYSE, for example, could cause a significant downward price impact on the stock, as investors might perceive the seller as “in the know” and trying to unload her stock.

1. A discussion on selling securities publicly can be found in the Securities Analysis Chapter.
2. The number of shares or bonds each investment bank agrees to guarantee.
3. In effect the investment bankers buy the securities at wholesale and sell them at retail.
4. A quick glance at the Wall Street Journal confirms this. You will see a very limited number of bonds are publicly traded.

Section 3: Secondary Capital Markets

Chapter Objective: Describe secondary markets and the securities traded there.
In secondary markets, investors buy and sell securities that have already been issued by firms through primary market transactions. In a primary market transaction, the firm receives the net proceeds from the sale of new securities. Although firms will occasionally buy their own stock in secondary market transactions, the vast majority of secondary market transactions involve investors trading among themselves. In this section we discuss the types and basic characteristics of equity, debt, and derivative securities that are commonly traded in the secondary markets. In-depth discussion of each of these securities is provided in the Securities Analysis chapter.

**Chapter Objective:** Discuss the basic features of domestic and international equity securities.

### Equity Markets

Many investors immediately think of the equity market when discussing investment opportunities. This comes as no surprise given the widely available information and relative ease of trading that characterize shares of common stock.

*Common stockholders* are the owners of the issuing firm. When you own the common shares of a company, you share in the company’s successes and failures. Relative to fixed-income securities, common stock investing is considered to be more risky since there is no guarantee of receiving any sort of payment in the future. Even though they are not guaranteed, some companies pay cash dividends to holders of their common stock. These dividends are typically paid quarterly.

*Common stock* may be classified according to the industry group in which they operate (i.e., industrial, utilities, transportation, and financial institutions) and/or they may be classified according to the region in which the firm is domiciled (i.e., domestic versus foreign). With increasing globalization, industry groups are more relevant in portfolio construction than the country where the firm is domiciled.

The common stock and other equity securities of U.S. corporations are traded on various exchanges, the best known of which is the New York Stock Exchange (NYSE). The NYSE traces its origins back more than 200 years to the signing of the Buttonwood Agreement by 24 New York City stockbrokers and merchants in 1792. Only NYSE-listed securities are bought and sold on the NYSE and only by its more than 1,300 members. About 3,000 stocks valued at nearly $12.5 trillion are traded weekdays from 9:30 A.M. to 4:00 P.M (EST). To have their common stock and other securities listed on the NYSE, firms must meet the following criteria:

#### NYSE Listing Criteria:

**Minimum Quantitative Standards: Distribution and Size Criteria:**

- **Round-lot** holders totaling 2,000, or total shareholders totaling 2,200, and average monthly trading volume of 100,000 shares or total shareholders of 500 and average monthly trading volume of 1,000,000 shares.
- Public shares outstanding totaling 1,100,000.
- Market value of public shares of $100,000,000.

**Minimum Quantitative Standards: Financial Criteria**

Aggregate pretax earnings over the last three years of $10,000,000 achievable in one of the following ways:

- Most Recent Year positive and each of two preceding years of $2,000,000.
- For companies with at least $500,000,000 in Global market capitalization and $100,000,000 in revenues in the last twelve months, aggregate Operating Cash Flow for the past three years of $25,000,000. Each individual year must be profitable.
Global Market Capitalization:

- Revenues for the last fiscal year: $75,000,000.
- Average Global Market Capitalization: $750,000,000.

As illustrated above, firms listed on the NYSE tend to be very large. Some of the best-known companies in the world are listed on the NYSE, including almost all the firms listed in the Dow Jones Industrial Average (DJIA), by far the best-known and most widely followed stock index.

Other physical exchanges in the United States include the American Stock Exchange, the Arizona Stock Exchange, the Boston Stock Exchange, the Chicago Stock Exchange, the Cincinnati Stock Exchange, the Pacific Exchange, the Philadelphia Stock Exchange, and the San Diego Stock Exchange. International exchanges include the Australian Stock Exchange, the Budapest Stock Exchange, the London Stock Exchange, the Tokyo Stock Exchange, and many others throughout the world.

The National Association of Securities Dealers Automated Quotation System (NASDAQ) was the world’s first cyber-trading floor. NASDAQ, once referred to as the over-the-counter market, is actually a network of over 350,000 computers linked worldwide. Where listing on one of the national exchanges (e.g., NYSE or AMEX) was once considered a mark of distinction, many companies are now choosing to list on NASDAQ’s National Market System (NMS) instead. The importance of NASDAQ is becoming evident also in the DJIA, where two NASDAQ-listed stocks (Microsoft and Intel) are now among the thirty stocks in the average.

Rather than purchasing memberships to trade on the NASDAQ, membership is achieved by subscription. Level 1 subscription is information only. The subscriber member receives only representative prices of listed stocks, not bid and ask prices, which are typically delayed by 15 minutes. Level 2 members act as brokers. They receive information and can trade at live bid-ask quotes, but they are not allowed to enter their own quotes. Level 3 subscribers are market makers.

Making the market means the subscriber/member is required to post bid and ask prices on the network. A bid, also called an offer, is the price the market maker (dealer) will pay for the security. The market maker sells at the ask price. The difference between the two prices, referred to as the bid-ask spread, represents the market maker’s profit.

By standing ready to take the other side of any buy or sell order, the market maker ensures a smooth-running market for their stocks. For example, if the market maker receives many buy orders and there are few or no corresponding sell orders, he will deliver stocks from his inventory to fill the orders. The market maker is required to post the transaction on the network so the investing public and other members know of it. Trading on the NASDAQ system can take place almost instantaneously. Often the broker will know the price at which the trade took place while the investor is still on the telephone.

The NYSE utilizes a specialist system, in which each stock is allocated to one specialist. Members acting as specialists can trade only in their assigned stocks at a specific location on the trading floor called a trading post, where floor brokers come to present orders for their customers.

The most common type of trade is known as a market order, an order from a customer to trade at the best possible price. Brokers present bids to buy and offer to sell by open outcry to any interested party at the trading post. In this fashion, floor brokers and others among the trading crowd have the opportunity to participate, thus facilitating the competitive pricing of stocks. When the highest bid (buy) meets the lowest ask (sell), a trade is executed and the customer’s order is filled.

Specialists manage this auction process by electronically quoting and recording current bid and ask prices for the stocks assigned to them. This enables current price information to be transmitted worldwide, keeping all market participants informed of the total supply and demand for any particular NYSE-listed stock.

According to the NYSE, the role of the specialist can be divided into five vital functions: specialists can act as agents, catalysts, and auctioneers; stabilize prices, and provide capital.
Act as Agents. One of the specialist’s jobs is to execute orders for floor brokers. A floor broker may get an order from a customer who only wants to buy a stock at a price lower than the current market price or sell it at a price higher than the current market price. In such cases, the broker may ask the specialist to hold the order, known as a limit order, and execute it if and when the price of the stock reaches the level specified by the customer. Limit orders are considered aggressive because they will be filled only at the specified price, which is always better than the market price when the order is placed. By holding limit orders, the specialist acts as an agent for the floor broker.

Likewise, the specialist acts as an agent by holding more defensive orders called stop-loss orders. These are orders to sell below the current market price. Let’s assume you hold a stock, which has appreciated greatly while you’ve held it. To protect your profit, you can submit an order to sell the stock if it drops below a certain price. Once the stock falls to the stop price, the order is executed. The stop loss order is considered a defensive trade, since it is used for protection rather than for aggressive trading.

Act as Catalysts. Specialists serve as the contact point between brokers with buy and sell orders in the NYSE’s two-way auction market. In this respect, the specialists act as catalysts, bringing buyers and sellers together.

Act as Auctioneers. At the start of each trading day, specialists establish a fair market price for each of their stocks. They base that price on the supply and demand for the stock as indicated by the number of buy and sell limit orders and the limit prices. A large number of limit orders grouped around a certain price indicate what the market anticipates for that stock. For example, many sell orders at a price below the market would indicate the market (investors) feel the stock is overpriced. Throughout the day, specialists quote the current bids and offers on their stocks to other brokers.

Stabilize Prices. Specialists are also called upon to maintain "orderly markets" in their assigned stocks. That is, they ensure that trading in their stocks moves smoothly throughout the day, with minimal price fluctuations between trades. Large gaps in trading prices create uncertainty around the stock’s true value, so the specialist will trade intermittently at prices in between those of the limit orders.

Provide Capital. Specialists act as a market maker. If buy orders temporarily outnumber sell orders, or if sell orders outnumber buy orders, the specialist is required to use his firm’s own capital to minimize the imbalance. This is accomplished by buying or selling against the trend of the market until a price is reached at which public supply and demand are once again in balance. Specialists act as dealers in this capacity. However, specialists actually participate in only about 10 percent of all shares traded. The rest of the time, orders clear without the participation of specialists.

International Equity Investment

U.S. investors often desire to gain exposure to international equity markets in hopes of offsetting domestic risk factors or capitalizing on international equity opportunities. Whatever the motivation, international equity investing may be accomplished in a number of ways.

For investors willing to accept the risks of investing directly in foreign markets, they can attempt a direct purchase of foreign shares. Here you buy the shares in the country where the firm is listed. This requires making payment in the foreign currency and transferring the certificates to your own country. Obtaining exposure to foreign markets in this manner is slightly more complicated than domestic investing.

Investors who do not wish to incur the additional complexities of direct purchases of foreign securities may gain international exposure in three ways. First, an investor may purchase American Depository Receipts (ADRs). ADRs are shares issued by U.S. banks representing an ownership interest in the actual shares of foreign entities, which are held in deposit at a bank in the issuing firm’s country. As an alternative to ADRs, an investor may purchase American shares (if they are available for the firm of interest). American shares are issued in the U.S., on behalf of a foreign company, by a transfer agent. Lastly, U.S. investors have the option to purchase international mutual funds. Many U.S. investment companies invest in stocks throughout the world. These funds include global funds, which invest in both U.S. and foreign stocks, and international
funds, which hold stock portfolios with almost no U.S. equity representation. For U.S. investors, international mutual funds serve as a convenient method to gain significant international exposure, particularly for small investors.

Chapter Objective: Discuss the basic features of domestic and international fixed-income securities.

Debt Markets

In addition to the markets for equity capital, there is an extensive secondary market for various types of debt securities (also referred to as fixed-income securities), which are issued by corporations, states, municipalities, and federal governments. Fixed-income securities have a contractual repayment schedule. By purchasing a fixed-income security, you are lending money (called the principal) to the issuer. In return, the borrower promises to make periodic interest payments and, at maturity, pay back the principal.

Perhaps the simplest form of fixed-income investing is a savings account. Savings accounts offer convenience and liquidity with very low-risk because most are insured by the Federal Deposit Insurance Corporation (FDIC). Consequently, savings accounts pay rates that are usually lower than other investments. There are different types of savings accounts available to meet the investor’s objectives.

- **Passbook savings** accounts do not have a minimum balance, and funds may be withdrawn at any time with little or no loss of interest. Due to this flexibility, passbook accounts’ interest rates are at the low end of the investment spectrum.

- **Certificates of deposit** (CDs) usually require a minimum investment of $500 to $100,000 and require that the funds remain invested for anywhere from 30 days to five years. Thus, CD investors must be willing to sacrifice some of their liquidity. CDs offer higher rates than passbook savings accounts. The CD rate increases with the size and maturity of the deposit. Liquidation of a CD prior to its expiration date will require the investor to pay a penalty in the form of lower interest rates.

**U.S. Treasury securities** include bills (T-bills\(^{[14]}\)), notes, and bonds. Treasury obligations are considered to be risk-free due to their low probability of default, and they are extremely liquid. Long-term borrowing by the U.S. Treasury\(^{[18]}\) is conducted through Treasury notes (T-notes) with original maturities from one to ten years and Treasury bonds (T-bonds) with original maturities from ten to thirty years.\(^{[16]}\) They are issued in denominations starting at $1,000, pay interest semiannually, and return the principal at the stated maturity.

Due to their unusual cash flow pattern, strips (and other zeros) are an important component of risk management for the institutional portfolio manager. Unlike the typical corporate bond, there are no interest payments during the life of the zero, and the timing and amount of the final cash flow to a U.S. Treasury zero are known with certainty (i.e., there is no risk).

Notes and bonds are quoted in the *Wall Street Journal* and other financial publications at a percentage of par or face value. For instance, you might see a 20-year T-Bond quoted at 97.27. The numbers to the left of the decimal (a dash may be used in place of the decimal) represent percent, in this case 97 percent. The numbers to the right of the decimal (or dash) are 32nds of a percent. This bond is therefore quoted at 97 and 27/32 percent of par (97.84375 percent). Thus a Treasury bond with a $1,000 face value would sell for $978.44 (0.9784375 \times $1,000 = $978.44).

A fairly new concept in the debt market is the Treasury strip.\(^{[17]}\) If you visualize the cash flows associated with T-notes and T-bonds, you will see a stream of coupon payments and a relatively large payment (the principal) at the end. For example, a six percent, 20-year T-bond would pay $60.00 per year ($30 every six months) and return the $1,000 principal (face value) in twenty years. With strips, all the payments are “stripped” apart and sold separately. Investors can buy individual coupons, a specified set of coupons, or
even the principal payment. Each individual cash flow, whether coupon or principal, becomes a zero coupon bond. Zero coupon bonds (zeros) are pure discount instruments. You buy the zero at a discount from the face value and receive the face value at maturity, with no interest payments between the purchase and maturity dates.

**U.S. Agency Securities** are fixed-income securities issued by U.S. government agencies to support their lending and/or mortgage buying operations. In 1938 the U.S. government established the **Federal National Mortgage Association**, (FNMA or “Fannie Mae”) to increase the availability of mortgage money by creating a secondary market for home mortgage loans. In 1954 Fannie Mae became a “mixed-ownership” corporation owned partly by private stockholders. In 1968 U.S. President Lyndon Johnson signed legislation amending Fannie Mae’s Charter, which established Fannie Mae as a private, shareholder-owned company. Fannie Mae stock was listed on the New York and Pacific Exchanges in 1970.

In 1968 Fannie Mae was partitioned into two separate entities, the **Government National Mortgage Association** (GNMA or “Ginnie Mae”), and Fannie Mae. Ginnie Mae remains a wholly owned government association catering to low- and moderate-income buyers. The **Federal Home Loan Mortgage Corporation** (FHLMC or “Freddie Mac”) is a stockholder-owned corporation, created in 1970 and chartered by the U.S. Congress to increase the supply of funds to homebuyers. GNMA and FHLMC accomplish this task by purchasing mortgages from lenders, packaging them into securities, and selling them to investors.

The single largest supplier of home mortgage credit in the U.S. is the partnership of the **Federal Home Loan Banks** (FHL Banks). FHL Banks are privately capitalized, government-sponsored agencies created by Congress in 1932. The FHL Bank System consists of twelve regional banks and is regulated by the Federal Housing Finance Board. The mission of the FHL Banks is to support residential mortgage lending by their members/stockholders. Eligible members include commercial banks, savings institutions, credit unions, and insurance companies.

Since they are not the direct obligations of the U.S. Treasury and not “officially” guaranteed by the Treasury, Agency securities are not considered riskless although they do have very low risk. They are also not as liquid as Treasury bonds (T-bonds), so they offer slightly higher returns than Treasury issues.

**Municipal bonds** (munis) are issued by local governments. Munis may be either **general obligation bonds** (GOB) or **revenue bonds**. Payments to GOB holders come from the full taxing authority of the municipal issuer. Revenue bonds are serviced with the revenues from the project financed with the bond proceeds (e.g., highway bonds). Munis are generally exempt from federal income taxes, and in some cases they are exempt from state and local income taxes. For example, a municipal bond issued by a city in Wisconsin is typically exempt from Wisconsin state income taxes as well as federal income taxes. Because of differences in tax treatment between municipal bonds and other bonds, comparing such investments should be done on an after-tax basis.

Let’s consider an investor trying to decide between a fully taxable corporate bond and a totally tax-free muni. If the corporate bond pays 10 percent and the muni pays 7.5 percent, the investor might actually be better off with the muni. Assume the investor is in the 33 percent marginal tax bracket. His after-tax yield on the corporate bond is 6.7 percent [i.e., 10% – 0.33(10%) = 6.7%]. His after tax yield on the muni is 7.5 percent, since it is tax free. If the muni is otherwise equivalent to the corporate bond, it is actually a better investment for this particular investor. Of course the after-tax yield is dependent upon both the before-tax yield and the investor’s tax rate.

**Corporate bonds** represent the public debt of businesses. Even though most long-term debt is sold privately, there are bond issues listed on the NYSE and the AMEX as well as a small number of NASDAQ-listed bonds. Most corporate bond trading in the secondary market, however, takes place in the over-the-counter market through dealers who buy and sell the securities for their own accounts. Publicly traded corporate debt securities represent a much smaller proportion of the overall bond market than the government or government sponsored sectors represent. Corporate debt securities range in maturity from short-term to long-term and are rated according to their credit quality. Higher credit quality issues carry a
lower required return, and low credit quality issues carry a higher required return. The corporate debt sector is much less liquid than the government debt sector.

The bond’s indenture lists the terms of the loan, which include the payment schedule and any call or refunding provisions that allow the bond to be redeemed prior to maturity. The indenture also specifies sinking fund provisions. These require the issuer to redeem a given percentage of the outstanding issue prior to maturity to protect the bondholders. Bonds are generally categorized by the type of security (i.e., assurance of repayment) they offer their holders.

- **Senior secured bonds** are low risk with a low default probability such as mortgage bonds, collateral trust bonds, and equipment trust certificates. Mortgage bonds are backed by a lien against as specific asset. If necessary, bankruptcy proceeds from the sale of the collateral assets are used to pay off the bondholders. **Collateral trust bonds** have financial assets as collateral. **Equipment trust certificates** are bonds that are backed by the equipment that they financed; these are typical in the transportation industry.

- **Debentures** are simply corporate promises to pay interest and principal. No specific assets are pledged, so the bondholder is dependent on the issuer’s ability to generate the cash flows necessary to make the promised payments. Debenture holders typically have first call on a firm’s earnings and any unpledged assets.

- **Subordinated debenture bonds** have the same general features as debentures but have a secondary claim against the assets of the company in case of default.

- **Income bonds** pay interest only if the issuer earns enough income to make the payment. If the company has no income, it does not have to make the interest payment, and it cannot be declared bankrupt. Unpaid interest is classified as interest in arrears, which means it must be paid out of future earnings.

- **Convertible bonds** allow the holder to convert them into a set number of shares of common stock. Convertibles are attractive to some investors because they combine the features of a debt security with the capital gain potential of common equity. Consequently, convertible bonds generally offer lower interest rates than nonconvertible debentures of equivalent risk.

- **Debenture bonds with warrants attached** provide investors with the right to purchase the firm’s common stock at a specified price over a stated period of time. The warrant is said to be a “sweetener” because it makes the debenture more attractive. This sweetener results in a lower required yield. The warrant also provides issuing firms with a potential for future equity capital should the warrants be exercised.

**Preferred stock** is usually classified as a fixed-income security because it pays a fixed dividend. Unlike pure fixed-income securities, the fixed payments from preferred stock (dividends) are not legally binding. In reality, however, preferred dividends are indirectly binding because of the adverse credit implications of missing a dividend. From the company’s point of view, preferred dividends come out of after-tax earnings, while interest payments come out of pre-tax earnings.

In the U.S, 70 percent of preferred dividends paid to corporate buyers are tax free when ownership is less than 20 percent. The dividend exclusion is 80 percent if ownership is equal to or greater than 20 percent but less than 80 percent. This is why preferred stocks are attractive investments for financial corporations.

**International bonds** are fixed-income instruments issued by firms outside the U.S. These types of securities represent over half of all fixed-income securities available to U.S. investors. There are three basic types of international bonds: Eurobonds, Yankee bonds, and International domestic bonds.

- A **Eurobond** is a bond denominated in a currency that is different than the home currency of the issuer. **Eurodollar bonds** and **Euroyen bonds** are examples of Eurobonds. The **Eurodollar bond** is a U.S. dollar- denominated bond that is issued outside the U.S.

- **Yankee bonds** are U.S. dollar-denominated bonds issued in the U.S. by non-U.S. companies and governments. Yankee bonds enable U.S. investors to buy the bonds of foreign companies but receive U.S. dollar-denominated payments, thus eliminating currency risk.

- **International domestic bonds** are bonds issued by firms within their home country, denominated in the local currency. For example, a Canadian corporate bond issued in Canada in Canadian dollars is
Derivatives markets were born out of a need to manage the uncertainty associated with the cash flows from and future values of assets. A derivative is any instrument that derives its value from the value of some other asset. Derivatives trading occurs on a number of U.S. and international exchanges including the Chicago Mercantile Exchange, Chicago Board of Trade, and American Stock Exchange. Among the more common securities traded in the derivatives markets are options, forwards, and futures.

Options

Warrants are options that give the holder the right to purchase a firm’s common stock at a stated price over a stated time period. Warrants are issued by corporations but do not constitute ownership of the firm’s stock, just the right to buy the stock in the future.

Call options are similar to warrants but are created by exchanges and not issued by the firm. The buyer of a call option on a stock has the right to buy stock at a stated price on or before a stated date. Usually, options have shorter lives than warrants. Call options must generally be exercised within a year, whereas warrants may extend for over five years.

The buyer of a put option on a stock has the right to sell the stock on or before a given date at a stated price to the put seller, who is called the writer. Puts may be used by investors who expect a stock price to decline or by investors who already own the stock but want to protect against a drop in the stock’s price.

The common thread between all types of options contracts is that the holder (i.e., the buyer) has the right but not the obligation to either buy or sell the underlying asset (in our examples the underlying asset has been common stock).

Forwards and Futures

For simplicity, we refer to both forward and futures contracts as futures contracts. The two instruments have some distinct characteristics which will be fully explored in the Securities Analysis chapter, but for now it is enough to treat them as one type of derivative security.

Commodity futures contracts are contracts for the delivery of a commodity at some future date. The current price of the futures contract is determined by the participants’ beliefs about the future price of the commodity. If an investor expects the price of a commodity to go up, she will buy a futures contract today. She is now obligated to accept delivery of the commodity in the future, paying the price she agrees to today. If she sells a similar contract before the delivery date, she can cancel her obligation without accepting delivery of the commodity. If the investor expects the price to decline, she may sell a futures contract, expecting to buy a similar contract to cover her obligation after the price has dropped.

There are several differences between buying a futures contract and buying the asset itself. One is leverage. When you buy a futures contract, you only have to put up a small proportion of the value of the contract (called the margin). For example, when commodity prices change, the value of commodity futures contracts change by a lot relative to the amount invested. Another futures investment consideration is the term of the contract. While stocks have infinite maturities, futures contracts typically expire within a year.
Financial futures are futures contracts that are available on financial instruments. T-bills, T-bonds, and Eurobonds futures contracts are quite active. These contracts provide tools to protect fixed income portfolios from adverse interest rate changes. This is called hedging. Similarly, currency futures may be used to speculate on or to protect currency positions against adverse changes in exchange rates. Futures contracts on stock market indexes such as the S&P 500, the Value Line, and the Nikkei indexes may also be used by portfolio managers and individual investors.

Treasury Direct is the Internet site maintained by the U.S. Treasury to facilitate trading in U.S. government securities. See http://www.TreasuryDirect.gov.

The common thread between all futures contracts is that both counterparties to the futures contract are obligated to enter into the stated transaction on the expiration date of the contract.

Some foreign equity securities are also traded on the U.S. exchanges. We discuss these types of securities later in this section.

Memberships on the NYSE are referred to as "seats," which have sold for as much as $1,500,000.

Source: NYSE.com

A round lot is typically 100 shares.

By physical exchange, we mean an exchange with a physical location and a trading floor.

For a complete listing of the more than 100 exchanges worldwide, see http://dir.yahoo.com/business_and_economy/business_to_business/financial_services/exchanges/stock_exchanges/

For complete information on NASDAQ and the NMS, visit www.NASDAQ.com.

In addition to the floor brokers who handle public orders, there are floor traders. These members trade their own accounts and help the floor brokers when asked.


We will discuss T-bills more thoroughly in the money markets section of this chapter as well as in the Securities Analysis chapter.

The Treasury actually auctions its debt securities. On the Internet, see www.TreasuryDirect.gov for more information.

The U.S. Treasury has suspended sales of the 30-year T-Bond.

U.S. Treasury strips were introduced in January, 1985.

"Otherwise equivalent" means that from a maturity, risk, and cash flow perspective the two investments are roughly equivalent.

Section 4: Money Markets
Chapter Objective: Describe money markets and some of the instruments traded in them.

Short-term, low-risk debt securities are traded in the money market. As the name implies, securities traded in the money market are nearly “money” or cash. They are extremely liquid (i.e., they can be bought or sold very quickly at their fair market value). Because of their short-term nature, they are not as susceptible to interest rate risk as longer-lived debt securities. The biggest “players” in the money market are institutional investors because money market securities are typically traded in very large denominations. Individuals can invest in the money market by buying money market mutual funds.

The prices of T-bills are quoted in the financial media using the bank discount yield method. The quoted bank discount yield differs from the true yield on the T-bills because it represents a discount from face value and it assumes a 360-day year. The true yield on any investment should be based upon price paid and a 365-day year.

U.S. T-bills are by far the most actively traded money market instrument. Individual investors can buy T-bills from government securities dealers, at auction, from Federal Reserve Banks, brokers, or financial institutions, or through Treasury Direct in $1,000 denominations up to $1,000,000. Institutional investors can purchase T-bills in much larger denominations through government securities dealers or government auctions.

The following is a representative T-bill quote as it might appear in the Wall Street Journal. (Data in the quote would be closing figures for the previous trading day.)

<table>
<thead>
<tr>
<th>Open table as spreadsheet</th>
<th>Maturity</th>
<th>Days to Maturity</th>
<th>Bid</th>
<th>Asked</th>
<th>Chg.</th>
<th>Ask Yld.</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 15, ’05</td>
<td>120</td>
<td>3.73</td>
<td>3.71</td>
<td>+ 0.01</td>
<td>3.81</td>
<td></td>
</tr>
</tbody>
</table>

The maturity of the bill is the day the bill matures or expires (i.e., the date the Treasury sends holders the face value of the bill through Treasury Direct or through a commercial book entry). Treasury Direct also allows the holder to reinvest or roll over the principal via the Internet. If a holder lives near a government securities dealer or Federal Reserve Bank, he or she can simply take it there for redemption.

Due to the skip day settlement process, it is assumed transactions will clear two business days later. The T-bill quoted above matures in 120 days. If you compared the actual date of the quote with the maturity date, it would appear two days longer than the stated maturity in days.

As with other dealer-handled securities, T-bill prices are quoted in bid and ask prices. These quotes differ from conventional price-based bid and ask quotes and are stated as a percentage discount, the bank discount, from face value. Also, the number of days in one year is assumed to be 360. Of course, the bid represents the price dealers will pay for a bill, and the ask is the price at which they will sell to you. Note that the bid exceeds the ask due to the inverse relationship between price and yield. In the quotes above, the bid price is lower than the ask price.

The bond-equivalent yield is the expected yield on a T-bill, based upon price paid (instead of face value) and a 365-day year. It is also sometimes used to compare the annual yields on bonds with different interest patterns (e.g., annual versus semiannual).
Chg. is the change from the previous day’s bid discount. The closing bid discount for this bill on the previous day was 3.72 percent.

Ask Yld. (ask yield) is the bond-equivalent yield or the annual, uncompounded yield on the T-bill if purchased at the quoted ask discount, based on a 365-day year.

Let’s assume you can actually trade at the closing figures in the quote above. Prices are calculated as follows:

price = face value – dollar discount

Dollar discount is the discount off the face value based upon the stated bank discount rate. This is represented by:

\[
dollar \text{ discount} = \frac{r_b \times (FV)}{360}
\]

where:

- \( r_b \) = the bank discount rate (bid or ask) stated on an annual basis (i.e., the discount from face value if the bill was to be held for a year)
- \( FV \) = the face value of the bill (we will assume $1,000)
- \( n \) = the number of days until maturity (360 is the number of days in a year for pricing T-Bills)

\[
\frac{n}{360} = \text{the holding period stated as a fraction of one year. It is the portion of the bank discount received based upon the actual holding period.}
\]

If you want to purchase the bill, the price you pay is based upon the portion received of the ask discount, which in our example is equal to 3.71 percent off the face value of the bill. Since the bill has 120 days remaining, you receive 1/3 of the full (annual) bank discount, calculated as follows:

\[
\text{price} = \text{face value} - \text{dollar discount (ask)}
\]

\[
= \frac{120}{360} (1,000 - 0.0371(1,000))
\]

\[
= 37.10(0.3333)
\]

\[
= $1,000 - $12.37 = $987.63
\]

A holding period can be any length of time (e.g., one day, one month, 1½ years). The holding period yield is typically converted to an annual yield for comparison to other investments’ returns.

You would receive a dollar discount of $12.37 and pay $987.63 for the bill. When the bill matures in 120 days, you would redeem it or receive electronically the $1,000 face value, and your return will be:
You have probably noticed this is the Ask Yld. (i.e., bond-equivalent yield) from the quote. It is different from the ask discount for two primary reasons. First, the ask discount is a percentage of face value, while the ask yield is a percentage of price paid. Next, the actual yield is based upon a calendar of 365 days.\(^{[21]}\) Let's take a closer look at how we calculated the ask yield.

The return on any investment can be calculated as:

\[
\text{holding period return} = \frac{V_1 - V_0}{V_0}
\]

\(V_0\) and \(V_1\) are the values of the investment at the beginning and end of the holding period, respectively. The holding period yield is the change in value over the period of time the investment was held expressed as a percentage of the original value (i.e., the price you paid for the investment).

The change in the T-bill's value over the holding period is the face value minus the price you paid (i.e., the dollar discount). By dividing the dollar discount by the original price, we obtain the return for the holding period, which in this case is 120 days. By convention, we state the returns in annual terms. In this example, we multiply the 120-day return by the number of 120-day periods in one year, which in this case equals \(\frac{365}{120}\) or 3.042 periods.

Let's now assume you already hold the T-bill and want to sell it to a dealer. The price the dealer will pay you for the T-bill is based upon the bid discount, but otherwise the price calculation is identical.

\[
\text{price} = \text{face value} - \text{dollar discount (bid)}
\]

\[
= \frac{120}{360} = \frac{0.0373(1,000)}{1,000}
\]

\[
= 0.373(0.3333)
\]

\[
= 0.1243 = \$987.57
\]

Liquidity, low risk, and short maturity are characteristics of all money market instruments. Some other popular money market instruments include certificates of deposit (CDs), commercial paper, banker's acceptances, Eurodollars, Repos, and Federal Funds. Most of these are listed daily in the *Wall Street Journal* in a column called “Money Rates.”

CDs are short-term time deposits with commercial banks. They are available in almost any denomination and usually have maturities from 90 days to one year.\(^{[22]}\) There is typically a penalty for early withdrawal of the funds in a CD.

Commercial paper is a short-term security issued by a strong, creditworthy corporation with a short-term funding requirement. Since they are short term (270 days or less), very liquid, and very low risk, there is an extensive market for commercial paper. Often a firm will find itself with a temporary excess amount of cash. The firm can buy commercial paper issued by another firm, hold it for the desired time period, and resell it in
the commercial paper market. The holding period can be anywhere from a few days to several months. In the same fashion, a firm with a short-term need for cash can sell commercial paper. Commercial paper is generally not collateralized (i.e., no assets support the issue) and is not registered with the SEC.

Repos are used extensively by securities dealers in financing security purchases. The “haircut” (repo margin) describes the discount charged by the repo dealer. For example, the repo dealer might charge a 2 percent haircut, which means the dealer would lend 98 percent of the value of the securities and the securities dealer would have to supply the other 2 percent of the purchase price.

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Bankers’ acceptances are utilized in international trade. They are short-term agreements with an importer’s bank that guarantee payment of the exporter’s invoice. For example, if a U.S. company wants to do business with a company in a less-developed nation, the U.S. firm (the exporter) would have the other firm (the importer) procure a guarantee in the form of a banker’s acceptance. This eliminates the credit risk associated with the transaction. Of course, the exporter and importer also have to agree on exchange terms (such as whether the importer must pay in U.S. dollars or local currency).

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Repo is short for repurchase agreement, which is a short-term loan collateralized by marketable securities, such as common or preferred stock, money market instruments, or Treasury securities. Institutional investors, states, and local governments use the Repo market as a means to invest short-term excess cash at very low risk. Rather than liquidate inventories of short-term marketable securities and repurchase them later, firms with a short-term need for cash use the securities as collateral to borrow in the Repo market. As with commercial paper, there is an extensive secondary Repo market.

Federal funds are cash reserves a financial institution must keep on deposit at its regional U.S. Federal Reserve Bank. Larger banks also maintain federal funds deposits at correspondent banks throughout the world to facilitate the immediate transfer of funds among banks for very large transactions. Banks with short-term excess federal funds can also loan (i.e., transfer by journal entry) federal funds to banks with a short-term deficit. Due to its nature of being immediate money, there is an extensive federal funds market and trillions of dollars may change hands in a given day.

Section 5: Alternative Investments

Chapter Objective: Describe the basic features of alternative investments including investment funds, real estate, and limited liquidity assets.

Investment Funds

Instead of direct investment, many investors choose to acquire their investments indirectly by purchasing shares in investment companies or funds. Investment funds pool together many investors’ funds in order
to purchase a large diversified portfolio that would otherwise be unavailable to the individuals. There are many types of investment funds including the following:

- **Money market funds** offer investors alternatives to bank savings accounts and provide access to money market instruments that are normally only available to large institutional investors. These funds often offer check-writing privileges.
- **Bond funds** invest in various categories of fixed-income securities: governments, corporates, and municipal bonds.
- **Common stock funds** invest in equities based on the fund’s stated investment goals. Stock funds provide investors with limited financial resources access to the benefits of diversification and professional management. There are international funds that allow investors global access to foreign markets.
- **Balanced funds** represent investment combinations of the above based on the fund’s stated investment objectives.

**Real Estate**

Real Estate is an important investment option that can greatly improve the diversity of a portfolio, since real estate returns have a low correlation with stock and bond returns.

The easiest form of real estate investment is the purchase of shares in a **real estate investment trust (REIT)**. REITs are investment pools specializing in one of a variety of real estate assets. They are similar to mutual funds. An investor can purchase an interest in construction and development REITs, mortgage pool REITs, or REITs that own and manage properties. The major advantage of investing in an REIT is that the investor is not involved with the actual control and management of properties. In addition, REITs are traded like other securities, offering the investor more liquidity than a direct investment in real estate.

REITs are required by law to pay out 90 percent of their income as dividends, which leaves little to invest in new acquisitions. Furthermore, they must keep at least 75 percent of their assets in real estate investments and hold each investment for at least four years. Like any investment fund, each REIT has certain stated investment objectives, which the individual or institutional investor should carefully consider before acquiring shares. There are three basic types of REITs:

1. **Equity REITs.** Invest in properties such as shopping centers, hotels, apartments, and office buildings.
2. **Mortgage REITs.** Make construction and mortgage loans to real estate investors.
3. **Hybrid REITs.** Invest in both properties (like equity REITs) and construction and real estate mortgage loans (like mortgage REITs).

REITs are traded like common stock in the secondary markets on the NYSE, AMEX, and OTC markets. The appeal of REIT's is that they provide an easy way to participate in the real estate market without all the headaches of property management and constrained liquidity.

A less liquid and more hands-on approach is to invest directly in real estate. This can be done through the purchase of raw land, land development, or rental property.

**Limited Liquidity Assets**

Investing in low-liquidity assets (e.g., art, antiques, stamps, and coins) is generally considered to be a hobby rather than an investment. This viewpoint comes from the fact that most of these investments require a great deal of specialized knowledge and expertise to be truly profitable. These investments usually offer very low market liquidity, high transactions costs, and high price variability. They also generally require substantial storage costs and offer no dividends or cash flows during the time the investor holds them. One view of this type of investment is that rather than in cash, the investor’s dividends come from the joy of ownership and ability to view the objects on a day-to-day basis.
Section 6: Market Indicators

Since higher-priced stocks have a greater weight in the price-weighted index, equal percentage movements in higher-priced stocks have more impact on the value of the index than those of lower-priced stocks.

Chapter Objective: Describe price-weighted, value-weighted, and unweighted market indexes.

A market indicator (index) is used to estimate and monitor the performance of the stock market or a segment of the market. In this section we discuss the three primary methodologies utilized in constructing stock market indexes: price-weighted, market value-weighted, and un-weighted.

Price-Weighted Index

A *price-weighted index* is simply an arithmetic average of the prices of the securities included in the index.

Computationally, a price-weighted index adds together the market price of each stock in the index and then divides this total by the number of stocks in the index. The price-weighted index assumes you purchase one share of each stock represented in the index.

\[
\text{price-weighted index} = \frac{\sum \text{of stock prices}}{\text{number of stocks in index adjusted for splits}}
\]

The divisor of a price-weighted index must be adjusted for stock splits and changes in the composition of the index (i.e., adding or deleting stocks) so that the value of the index is unaffected by the change. For example, if a stock split occurs, the divisor must be adjusted before calculating the next value of the index.

The best known price-weighted index is the Dow Jones Industrial Average (DJIA), developed by Charles H. Dow in 1896. Since determining the overall movement in the market is difficult due to frequent and varied changes in the prices of stocks, he collected trading data on twelve stocks, which served as a sample of the overall stock market. He used movements in the average price of his sample as an indicator of movements of the stock market as a whole. If the average price in his sample increased, for example, the market was up. In the same fashion, if the average price decreased, the market was down. Figure 1 shows the original twelve stocks in the DJIA.

| American Cotton | Oil Laclede Gas |
| American Sugar  | National Lead   |
| American Tobacco| North American  |
| Chicago Gas     | Tennessee Coal and Iron |
| Distilling and Cattle Feeding | U.S. Leather Preferred |
| General Electric | U.S. Rubber |

Figure 1: Original Twelve Stocks in the Dow Jones Industrial Average

Figure 2 shows the current composition of the DJIA. The list has changed significantly since its inception, primarily because most of the original companies no longer exist. General Electric is the only one of the original firms that is still in the DJIA. Today, the number of firms has increased to thirty, twenty-eight of which are NYSE-listed stocks with the remaining two coming from the NASDAQ. The Dow Jones Company publishes several other indexes, including its Transportation and Utilities Averages.
Originally, the DJIA was calculated by adding the stock prices of the original twelve firms and dividing by 12 (the number of stocks). This calculation took place each day and gave interested parties the ability to compare stock market performance over time. However, adjustments had to be made periodically for non-economic events (e.g., stock splits) that change a firm’s stock price without affecting its overall value. Without this adjustment after a stock split, the price of the affected firm’s stock would drop precipitously causing an unwarranted decrease in the DJIA. The drop in the average would give the impression that the market was falling, when there was actually no change in value.

To be an effective indicator, changes in the DJIA have to represent true economic changes (i.e., changes in value). To ensure this, Mr. Dow devised a method of adjusting the divisor (i.e., the denominator) to account for non-economic events, such as stock splits and stock dividends.

Let’s look at a very simplified example of this approach. We will assume there are only four stocks in the DJIA, and their price histories are as follows:

<table>
<thead>
<tr>
<th>Stocks</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>20.00</td>
<td>15.00</td>
<td>20.00</td>
<td>30.00</td>
<td>21.25</td>
</tr>
<tr>
<td>Day 2</td>
<td>21.00</td>
<td>16.00</td>
<td>18.00</td>
<td>29.00</td>
<td>21.00</td>
</tr>
<tr>
<td>Day 3</td>
<td>12.00</td>
<td>17.00</td>
<td>19.00</td>
<td>31.00</td>
<td>22.57</td>
</tr>
</tbody>
</table>

\[
\text{DJIA}_1 = \frac{20 + 15 + 20 + 30}{4} = 21.25
\]

\[
\text{DJIA}_2 = \frac{21 + 16 + 18 + 29}{4} = 21.00
\]
Stocks

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
</tr>
</thead>
</table>

Stock A had a 2:1 stock split after the close of the market on day 2.

\[
\frac{12}{3.5} + \frac{17}{3.5} + \frac{19}{3.5} + \frac{31}{3.5} = 22.57
\]

At the end of day one, the closing prices of the four stocks are added together and divided by four, resulting in a DJIA of 21.25. This figure represents the average price of the stocks at the end of day one. At the end of day two we see mixed results. Stock A is up $1.00, B is up $1.00, C is down $2.00, and D is down $1.00. By simply looking at the individual price movements it is very difficult to determine the general movement of the market, if any. Since a non-economic event has not occurred, the DJIA is calculated using the same denominator as for day one. The DJIA at the end of day two is 21.00, indicating a minor downward movement in the market.

On day three, we observe that stock B has increased $1.00, C has increased $1.00, and D has increased $2.00. Stock A appears to have dropped $9.00, but A has experienced a 2:1 stock split. Theoretically, the stock split should affect only the market price and par value of the stock, not the value of the firm. However, if we calculate the DJIA without adjusting for the split we get:

\[
\frac{12}{3.5} + \frac{17}{3.5} + \frac{19}{3.5} + \frac{31}{3.5} = 19.75
\]

When observing a value of 19.75 for the DJIA, a casual observer would think the market is down. However, upon closer scrutiny, he would be somewhat perplexed. All the stocks in the average have increased in price except stock A, and the split caused the drop in A, not a drop in the market value of the firm. In fact, with a 2:1 split, the theoretical post-split price for A should be half of $21.00, or $10.50. Since A closed at $12.00, it actually closed up along with the other stocks!

To account for the split in stock A, we have to adjust the divisor before calculating the DJIA. First, we use the day two DJIA value of 21.00 and adjust the price of A to its theoretically correct post-split price. Leaving the other stocks unchanged, we solve for the denominator that would leave the DJIA unchanged. This is done in the following way:

\[
\frac{10.50 + 16.00 + 18.00 + 29.00}{d_{new}} = 21.00
\]

\[d_{new} = 3.50\]

Using the closing prices for day three and the adjusted divisor, the true value of the DJIA at the end of day three is:
DJIA_3 = \frac{12 + 17 + 19 + 31}{3.5} = 22.57

After adjusting the denominator to account for the split in Stock A, we confirm that the DJIA has actually increased, as we had expected.

At the end of 2004, the DJIA was at 10,783 and the divisor was 0.13532775. Obviously, there have been many adjustments made to the divisor over the years to account for stock splits and dividends as well as replacement of companies when they are acquired or removed from the index. The divisor is listed every day in the third section of the Wall Street Journal in the headings for the Dow Jones Industrial, Transportation, and Utilities Averages.

The criticisms of the DJIA include:
- The limited number of stocks in the index (30). Considering that there are thousands of stocks traded in the U.S. markets, 30 does not appear to be a fully representative sample.
- The fact that the 30 stocks represent some of the largest firms listed on the NYSE and NASDAQ. Thus small firms and their effect on the market are not represented in the DJIA.
- The downward bias in the computation of the index. This is a result of the decline in relative weighting within the index that occurs when a high price stock splits (which they are prone to do).

Another price-weighted index is the Nikkei Dow Jones Stock Average. The Nikkei Dow is an arithmetic average of 225 stocks listed on the Tokyo Stock Exchange. It is calculated the same way as the Dow. The Nikkei Dow represents only 15 percent of the first section (i.e., largest capitalization) stocks.

You may detect what appears to be a similarity in the market value- weighted and price- weighted indexes (i.e., both assume a proportional investment in each firm in the index). However, the proportion of each firm invested is not the same because the price-weighted index uses stock price, and value-weighted uses total market value. In other words, just because a firm’s stock price is high (low) does not mean it has a high (low) market value.

### Market Value-Weighted Index

A market value-weighted index (or simply “value-weighted”) is calculated by summing the total market value (current stock price times the number of shares outstanding) of all the stocks in the index. This sum is then divided by a similar sum calculated during the selected base period. This ratio is then multiplied by the index’s beginning base value.

The value-weighted index assumes you make a proportional market value investment in each company in the index. The major problem with a value-weighted index is that firms with greater market capitalizations have a greater impact on the index than do firms with lower market capitalizations.

\[
\text{MV index} = \frac{\text{current total market value}}{\text{base total market value}} \times \text{base total market value}
\]

where:
- current total market value = the total market value of the stocks in the index today
- base total market value = the total market value of the stocks in the index on the day the index was formed
beginning index value = the (arbitrary) starting value of the index

Most well-known market indexes are in fact market value weighted. The following are major *market value-weighted indexes*:

- Standard & Poor’s 500 Composite Index (500 firms).
- New York Stock Exchange Index considers all NYSE stocks in one of five value-weighted indexes: industrial, utility, transportation, financial, and the composite index.
- Other U.S. Series are the NASDAQ Series, the AMEX Market Value Index, the Dow Jones Equity Market Index, the Wilshire 5000 Equity Index, and the Russell 3,000 Index.
- International indexes are the Morgan Stanley Capital International Indexes, the Dow Jones World Stock Index, and the Salomon-Russell World Equity Index.
- Non-U.S. indexes include the Financial Times Actuaries Share Indexes, which represents stocks on the London Stock Exchange, and the Tokyo Stock Exchange Price Index, which represents stocks listed on the first section of the Tokyo Stock exchange.

### Unweighted (Equal-Weighted) Price Index

Unweighted index computations are based on returns rather than stock prices. In an unweighted index all stocks are equally weighted (i.e., the index is computed as if an investor maintains an *equal dollar investment* in each stock in the index), and changes in the index are calculated as the (either geometric or arithmetic) average percentage price change in the listed stocks.

The fundamental equation to compute the *arithmetic average* is:

$$R_A = \frac{R_1 + R_2 + \ldots + R_N}{N}$$

where:

- $R_A =$ arithmetic average return
- $R_i =$ price relatives for stock $i$, $i = 1$ to $N$
- $N =$ number of stocks included

The fundamental equation to compute the *geometric average*:

$$R_G = \left[ (1 + R_1)(1 + R_2) \ldots (1 + R_N) \right]^{\frac{1}{N}} - 1$$

where:

- $R_G =$ time-weighted return
- $R_i =$ price relative for stock $i$, $i = 1$ to $N$
- $N =$ number of stocks included

A geometric average is almost always less than an arithmetic average, so using the geometric rather than the arithmetic average causes a downward bias in an un-weighted market index.

Two equal weighted indexes:
The Value Line (VL) Composite Average is an equally weighted average, where VL’s 1,695 stock returns are averaged using the geometric mean.

The Financial Times Ordinary Share Index is a geometric average of 30 major stocks on the London Stock Exchange.

Debt Market Indicators

The most widely used debt market indicators are established and monitored by large investment firms, such as Merrill Lynch or Lehman Brothers. These indexes are market value-weighted indexes that track specific types of bonds, such as Government issues, or bonds in certain maturity ranges. For example, the Lehman Brothers U.S. Government index will be comprised of U.S. government bonds maturing in the next five to seven years, on average. Obviously, as the component bonds mature, they must be replaced in the index. This ongoing process makes bond indexes dynamic, but at any given point in time these indices are good benchmarks to gauge the performance of a portfolio of bonds with similar characteristics.

Calculating And Comparing Price-Weighted, Un-Weighted And Market Value-Weighted Indexes

Example: Price-Weighted, Un-Weighted, and Value-Weighted Indexes

Given the following information in Figures 3 and 4, calculate a price-weighted, un-weighted, and value-weighted index.

Answer: Price-Weighted Index

<table>
<thead>
<tr>
<th></th>
<th>As of December 31, 2004</th>
<th>As of January 31, 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Share Price</td>
<td>Number of Shares</td>
</tr>
<tr>
<td>Stock W</td>
<td>$30</td>
<td>1,000</td>
</tr>
<tr>
<td>Stock X</td>
<td>$10</td>
<td>3,000</td>
</tr>
<tr>
<td>Stock Y</td>
<td>$20</td>
<td>1,000</td>
</tr>
<tr>
<td>Stock Z</td>
<td>$60</td>
<td>500</td>
</tr>
<tr>
<td>Total</td>
<td>Total</td>
<td>$110,000</td>
</tr>
</tbody>
</table>

Note: Firm W has a split in this scenario (Figure 3) only.

Figure 3: Price/Market Value Data to Calculate a Price-Weighted Index

December 31, 2004:

\[
PW_0 = \frac{30 + 10 + 20 + 60}{4} = 30
\]

Since Stock W has experienced a 2:1 split (note doubling of shares) between the two points in time, the divisor (denominator) must be adjusted before calculating the value of the index on January 31, 2005.
To adjust the divisor, go back to the previous day and halve stock W’s price to adjust for the 2:1 split and calculate the divisor that would have left the average unchanged:

\[
\frac{15 + 10 + 20 + 60}{30} = \text{new divisor}
\]

\[
\frac{15 + 10 + 20 + 60}{30} = 3.5
\]

**January 31, 2005:**

Using the new divisor and the prices for January 31, 2005:

\[
\frac{18 + 12 + 25 + 58}{3.5} = \text{PW1}
\]

\[
\frac{18 + 12 + 25 + 58}{3.5} = 32.29
\]

A return relative is the ratio of today’s price to the previous price and amounts to 1.0 plus the percentage change in price.

The change in the price-weighted index from 12/31/2004 to 1/31/2005 represents a 1-month return of \([ \frac{(32.29 - 30)}{30} ] \) = 7.63%.

**Answer: Unweighted Index**

**Figure 4: Price/Market Value Data to Calculate an Unweighted Index**

<table>
<thead>
<tr>
<th>Stock</th>
<th>Share Price</th>
<th>Number of Shares</th>
<th>Market Value</th>
<th>Share Price</th>
<th>Number of Shares</th>
<th>Market Value</th>
<th>Return Relative</th>
</tr>
</thead>
<tbody>
<tr>
<td>W</td>
<td>$30</td>
<td>1,000</td>
<td>$30,000</td>
<td>$32</td>
<td>1,000</td>
<td>$32,000</td>
<td>1.0667</td>
</tr>
<tr>
<td>X</td>
<td>$10</td>
<td>3,000</td>
<td>$30,000</td>
<td>$12</td>
<td>3,000</td>
<td>$36,000</td>
<td>1.2000</td>
</tr>
<tr>
<td>Y</td>
<td>$20</td>
<td>1,000</td>
<td>$20,000</td>
<td>$25</td>
<td>1,000</td>
<td>$25,000</td>
<td>1.2500</td>
</tr>
<tr>
<td>Z</td>
<td>$60</td>
<td>500</td>
<td>$30,000</td>
<td>$58</td>
<td>500</td>
<td>$29,000</td>
<td>0.9667</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>Total</strong></td>
<td><strong>$110,000</strong></td>
<td></td>
<td></td>
<td><strong>$122,000</strong></td>
<td></td>
</tr>
</tbody>
</table>

Arithmetic return:
\[
\frac{R_1 + R_2 + \ldots + R_N}{N}
\]

\[R_A = \frac{0.0667 + 0.2000 + 0.2500 - 0.0333}{4} = 0.1208 = 12.08\%
\]

Geometric return:
\[R_G = \left[ (1 + R_1)(1 + R_2) \ldots (1 + R_N) \right]^{1/N} - 1
\]
\[R_G = \left[ (1.0667)(1.2000)(1.2500)(0.9667) \right]^{1/4} - 1
\]
\[R_G = (1.5468)^{1/4} - 1 = 1.1152 - 1 = 0.1152 = 11.52\%
\]

Assuming a value of 100 for the index on December 31st, the value of the index on January 31st is:

\[100(1.1208) = 112.09 \text{ (arithmetic) or } 100(1.1152) = 111.52 \text{ (geometric)}
\]

**Answer: Value-Weighted Index** (Note that this answer uses data from Figure 4)

\[
\text{MV index} = \frac{\text{current total market value}}{\text{base total market value}} \times \text{beginning index value}
\]

To calculate the level of a market value-weighted index, you must have the total market value of the index at its inception and its assumed value at that point. We will assume the base total market value of the stocks in the index was $50,000, at which time the value of the index was set at 100.

\[
\text{MV index} = \frac{\text{current total market value}}{\text{base total market value}} \times \text{beginning index value}
\]

\[
\text{MV index}_{12/31/04} = \frac{\$110,000}{\$50,000} \times 100 = 220
\]

\[
\text{MV index}_{1/31/05} = \frac{\$122,000}{\$50,000} \times 100 = 244
\]

\[
\text{index return January} = \frac{244}{220} - 1 = 10.91\%
\]

\[23\] Trading data include prices, the number of shares traded, and the number of shares per trade.

\[24\] Information on all the Dow Jones Company averages is available on the Internet at http://averages.dowjones.com.
A 2:1 (2 for 1) stock split means you receive two new shares to replace every old share you hold. For example, if you hold 100 shares with a market value of $50.00 each, your shares were worth a total of $5,000. After the split you will hold 200 shares, but their price will be halved to account for the split. They will each be worth $25.00, so your wealth has not changed. Before the split you held 100 shares of stock worth $50 per share; now you hold 200 shares of stock worth $25 per share. In each case you hold $5,000 in stock.

In the absence of a split or stock dividend, changes in the price of a stock indicate changes in the market value of the company.

Remember, Stock A split during the day, so its price halved and then increased somewhat by the end (close) of the day.

Adjusting the divisor for replacing a stock is done exactly as it is for splits. In this case the divisor is calculated for the previous day with the new stock’s price in place of the stock being removed. The divisor typically gets smaller with each adjustment, but it will get larger if a stock is replaced with a higher-priced stock.

Summary

Section 1: Markets
A. In a direct market, the buyer and seller contact one another directly.
B. In a broker market, the broker facilitates the meeting of the buyer and seller. The broker does not take an ownership interest in the product being sold.
C. In a dealer market, a dealer facilitates the transaction by purchasing ownership in the product and reselling.
D. In spot markets, securities, commodities, and other goods are traded for immediate delivery.
E. In forward markets, traders agree to transact at a future date at a specified price.

Section 2: Primary Capital Markets
A. Corporations, governments, and municipalities raise capital in primary markets. Primary markets are where new securities are issued. The issuing firm or organization receives the net proceeds from the sale.
B. In a public offering, organizations sell securities to the general public.
C. In a private placement, the investment banking firm acts as a broker. The issue (usually bonds) is sold to a small number of large investors.

Section 3: Secondary Capital Markets
A. In secondary markets investors trade securities among themselves.
B. Proceeds from the sale of securities in the secondary market go to investors, not the original issuer of the security.
C. Common stock represents ownership in the issuing corporation.
D. Common stock is categorized by the industry and country in which the issuer operates.
E. The best-known secondary markets deal in equity securities. They are traded over the counter and on over 100 floor exchanges worldwide.
F. The New York Stock Exchange (NYSE) is the most famous floor exchange. The NYSE utilizes a specialist system. Specialists have the following responsibilities:
   1. Act as agents by executing orders for floor brokers and taking limit and stop-loss orders.
   2. Act as catalysts by bringing together buyers and sellers.
   3. Act as auctioneers by establishing a fair price when the market opens each day.
   4. Stabilize prices by trading intermittently to minimize price gaps.
   5. Provide capital by using company assets to eliminate order imbalances.
G. NASDAQ, the over-the-counter market, is the most famous “cyber trading floor.” Market makers, similar to specialists on the NYSE, enter their own bid and ask price quotes to ensure smooth functioning and liquid markets.

H. International equity investments allow investors to gain exposure to non-domestic markets. Investors can gain international exposure through direct purchase of foreign stocks, purchase of ADRs, purchase of American shares, or purchase of international mutual funds.

I. There is an extensive secondary market for debt securities issued by corporations, states, municipalities, and federal governments.

J. Savings accounts are a simple, low-risk method of fixed-income investing and can be carried out through passbook savings accounts and certificates of deposit.

K. The U.S. Treasury issues T-bills, T-notes, and T-bonds with maturities of less than one year, one to ten years, and ten to thirty years, respectively. T-bills are discount securities, while T-notes and T-bonds are interest bearing.

L. Strips are T-note and T-bond interest and principal payments, which have been stripped apart and sold separately. Each payment becomes a zero-coupon bond.

M. There is also an extensive market for U.S. federal agency debt instruments issued by such entities as Fannie Mae, Ginnie Mae, and Freddy Mac. These are not explicitly backed by the U.S. government but are nonetheless low risk.

N. Munis are issued by local governments and can be backed by revenues generated from a public works project or by the government’s taxing authority. Munis are exempt from federal income tax.

O. Corporations also issue debt securities. Most corporate debt is sold privately.

P. Corporate debt is categorized according to the security provided to investors and includes senior secured bonds, debentures, subordinated debentures, income bonds, convertible bonds, and debentures with attached warrants.

Q. Preferred stock is technically an equity security but behaves more like a fixed-income security since it pays a fixed dividend.

R. International bonds are fixed-income securities issued outside of the U.S. and include Eurobonds, Yankee bonds, and International domestic bonds.

S. Derivatives derive their value from some underlying asset. The derivatives market allows investors to manage the uncertainty of future events.

T. Options convey the right but not the obligation to purchase or sell the underlying asset in the future. Types of options are warrants, call options, and put options.

U. Futures are contracts that obligate both parties to transact in the future. Futures exist on both commodities and financial instruments. The relatively low margin requirements on futures allow the investor to leverage his investment.

Section 4: Money Markets

A. Money market securities are short-lived, low risk, very liquid instruments.

B. U.S. T-bills are the most heavily traded money market instruments.

C. T-bills are pure discount instruments. They are purchased at a discount from face value and pay face value at maturity. T-bills are priced using the bank discount method.

D. Commercial paper is uncollateralized, short-term (up to 270 days) borrowing by very large, creditworthy firms.

E. Bankers’ acceptances are used in international trade. They are short agreements with an importer’s bank, which guarantee payment of an exporter’s invoice.

F. Repurchase agreements (repos) are short-term loans collateralized by marketable securities.

G. Federal funds represent the amount of money banks must keep at the Federal Reserve Bank in their region.

Section 5: Alternative Investments

A. Investment funds pool the funds of many investors together to purchase a diversified portfolio of securities. Investment funds can be structured in many ways, but some of the most common are money market funds, bond funds, common stock funds, and balanced funds.

B. REITs invest in various types of real estate properties and/or real estate mortgages. REITs sell shares of stock to the investing public and have the following characteristics:
1. REITs must use the proceeds, along with borrowed funds, to invest in a portfolio of real estate investments.
2. Required by law to pay out 90 percent of their income.
3. REITs must keep at least 75 percent of their assets in real estate and must hold each investment for at least four years.

C. Equity REITs invest in real properties such as shopping centers, hotels, apartments, and office buildings.

D. Mortgage REITs make construction and mortgage loans to real estate investors.

E. Hybrid REITs invest in both properties (like equity REITs) and construction and real estate mortgage loans (like mortgage REITs).

F. REITs are traded in the secondary markets much like a common stock and provide investors with an accessible, highly liquid method of gaining exposure to the real estate market.

G. Limited liquidity assets such as art, antiques, stamps, etc. are generally not suggested for investors without specialized knowledge of the asset under consideration. Prices and markets for these assets are not always readily available.

Section 6: Market Indicators

A. A price-weighted index is simply an arithmetic average of the prices of the securities included in the index. Computationally, a price-weighted index adds together the market price of each stock in the index and then divides this total by the number of stocks in the index.

B. The value-weighted index assumes you make a proportional market value investment in each company in the index. The major problem with a value-weighted index is that firms with greater market capitalization have a greater impact on the index than do firms with lower market capitalization.

C. Unweighted index computations are based on returns rather than stock prices. In an unweighted index all stocks are equally weighted (i.e., the index is computed as if an investor maintains an equal dollar investment in each stock in the index), and changes in the index are calculated as the (either geometric or arithmetic) average percentage price change in the listed stocks.

D. Bond indexes are generally market value weighted and indicate the average return of certain types of bonds, such as investment grade or high yield securities. These indexes often are limited to certain maturity ranges.

Practice Questions: Capital Markets

1. All of the following are advantages of private placements for the issuing entity EXCEPT that private placements:
   A. do not require a prospectus.
   B. are issued in the third market.
   C. do not require SEC approval.
   D. have lower flotation costs.

2. Which of the following fixed-income securities would NOT be considered an Agency security?
   B. A 20-year 4.5% semiannual coupon bond issued by the Treasury.
   C. A 5-year 5.0% semiannual debenture issued by the Federal Home Loan Mortgage Corporation.
   D. A 15-year asset-backed security issued by Ginnie Mae.

3. Consider the following 4 stocks, all of which are included in the S&P 500 index:

<table>
<thead>
<tr>
<th>stock</th>
<th>Price Per share</th>
<th>Number of shares (in millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$8.00</td>
<td>100</td>
</tr>
</tbody>
</table>
The return on the S&P 500 index would be most affected by a 10 percent change in the price of which stock?

A. Stock A.
B. Stock B.
C. Stock C.
D. Stock D.

4. Which of the following is the primary difference between a broker market and a dealer market?

A. In a broker market, the buyer and seller must meet face to face.
B. In the dealer market, dealers are legally prevented from taking possession of the product.
C. In a broker market, the broker actually takes ownership of the product.
D. In the dealer market, the dealer actually takes ownership of the product.

5. Frances Russell expects to harvest her wheat crop in six months. In total she expects to harvest 10,000 bushels. If Russell wants to sell her bushels of wheat now, in which of the following markets would she most likely sell her wheat?

A. Money market.
B. Spot market.
C. Forward market.
D. Farmer’s market.

6. Which of the following is TRUE concerning primary and secondary markets?

A. Stocks of larger, more established firms are traded only in primary markets.
B. Stocks of newer, smaller firms are traded only in secondary markets.
C. Bonds are traded only in secondary markets.
D. Firms issue new securities in primary markets.

7. Miller & Company, a large clothing retailer, is preparing to make a secondary public offering of its common stock. The company’s investment banking firm has sent a detailed list of the flotation costs the company can expect to incur. Which of the following items included in the investment banker’s list is NOT an example of flotation costs?

A. The costs of printing stock certificates.
B. The underwriter spread.
C. Legal and accounting fees.
D. Product advertising costs.

8. Which of the following have initial maturities of less than one year?

A. U.S. Treasury notes.
B. U.S. Treasury bonds.
C. U.S. Treasury bills.
D. All can be issued with an initial life less than one year.

9. A large manufacturing firm often has short-term excesses of cash. The firm’s CFO has mentioned several times that the firm should invest the excess cash in the money market to pick up a little extra return. In which of the following securities would the CFO NOT want to invest?

A. U.S. Treasury bill.
B. Corporate bond.
C. Commercial paper.
10. Terrel Sporting Goods (TSG) is planning to make an initial public offering next month. The investment bank for TSG’s IPO is planning to fully underwrite the issuance. Which of the following is true of the underwriter in this situation?
   A. The underwriter faces the most risk.
   B. The underwriter only promises best efforts in selling the issue.
   C. The underwriter spread is the difference between the price the investors pay for the stock and the flotation costs.
   D. The underwriter guarantees all the shares will be sold but not the price the issuing firm will receive.

11. Which of the following types of stock orders would be considered the most aggressive?
   A. Market order.
   B. Stop order.
   C. Limit order.
   D. Stop-loss order.

Use the following information to answer Questions 12 through 14:

<table>
<thead>
<tr>
<th>Days to Maturity</th>
<th>Bid</th>
<th>Asked</th>
<th>Chg.</th>
<th>Ask Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>June 15 ’05</td>
<td>140</td>
<td>3.73</td>
<td>3.71</td>
<td>+0.01</td>
</tr>
</tbody>
</table>

12. Assuming an investor could trade at the discounts in the quote, what would he have to pay for the T-bill?
   A. $962.70.
   B. $962.90.
   C. $985.49.
   D. $985.57.

13. Assuming an investor could trade at the discounts in the quote, what would he receive from selling the T-bill?
   A. $985.49.
   B. $985.57.
   C. $962.70.
   D. $962.90.

14. What is the ask yield (bond-equivalent yield) for the T-bill in the quote?
   A. 3.71%.
   B. 3.73%.
   C. 3.82%.
   D. 3.91%.

15. Jared Keyes strongly believes that the price of SCF Inc. will increase rapidly in the next several months. He has decided to invest a significant amount of his personal assets into the stock of SCF which he currently does not own. If Keyes submits a market order, which of the following best describes how the order should be executed?
   A. Highest ask available.
   B. Lowest ask available.
   C. Highest bid available.
   D. Lowest bid available.
16. HMB Inc. wishes to issue long-term fixed-income securities to finance an expansion project but does not have specific assets to pledge to the issue. In addition, the company is concerned that future cash flow may become constrained, preventing the company from making any required interest payments. Given HMB Inc.’s situation, which of the following would be the least attractive financing alternative?

A. Preferred stock.
B. Income bonds
C. Subordinated debentures.
D. Zero coupon debentures.

17. Henrietta Higgins is a U.S. investor with a portfolio worth over $1 million. Recently, Higgins decided to decrease her exposure to the domestic equity market by reallocating her current portfolio. Which of the following would NOT help Higgins accomplish her goal?

A. American depository receipts.
B. Long S&P 500 index futures.
C. U.S. real estate investment trusts.
D. Yankee bonds.

18. As a newly hired specialist for the New York Stock Exchange, Terry Quince will be expected to perform all of the following tasks EXCEPT:

A. monitor and execute unfilled limit orders.
B. monitor compliance of margin requirements.
C. provide liquidity to the market.
D. act as a dealer for her company’s account.

19. A United States government bond is selling in the market at 91-28. The dollar value of this bond is:

A. $910.87.
B. $912.80.
C. $918.75.
D. $9,128.00.

20. Which of the following statements regarding Treasury bills is FALSE?

A. They are safe, easily marketable securities.
B. They account for the largest amount of short-term money market instruments sold.
C. They are issued with three-, six-, or nine-month maturities.
D. They are initially sold at a discount.

21. A 9 percent corporate bond is selling for an 8 percent yield. To be equivalent, an investor in a 30 percent tax bracket would need a municipal bond with a yield of:

A. 2.4%.
B. 5.6%.
C. 6.3%.
D. 7.2%.

22. On January 15th Perry Smith signed an agreement to take possession of 1,000 ounces of gold on March 15th. The price Smith will pay for the gold is $284 per ounce. After taking possession of the gold, Smith plans to sell 10 ounce lots to individuals at a retail price. In what kind of market is Smith operating?

A. Dealer market.
B. Broker market.
C. Direct market.
D. Spot market.

23. The value of an index based on the geometric average of five stocks, where the returns on the five stocks during the given period were 15 percent, 5 percent, –10 percent, –8 percent, and 23 percent is closest to:

A. 4%.
B. 5%.
C. 23%.
D. 25%.

24. An investor has a portfolio with a market value of $1,000,000 at the end of December. The market value of the portfolio is $893,000 at the end of January. The holding period yield on the investor's portfolio for January is closest to:

A. –10.7%.
B. –8.9%.
C. –2.3%.
D. 12.0%.

25. Which of the following indices maintains an equal dollar in each stock in the index (equal-weighted price index)?

A. Dow Jones Industrial Average (DJIA).
B. Standard and Poor’s 500 Index.

C. Wilshire 5000 Equity Index.

D. Value Line Composite Average.

Answers

1. B

Private placements are transactions where securities are issued to a small group of large investors. They do not require any prospectus or SEC approval, and therefore the flotation costs are less. The third market refers to the trading of exchange-listed securities on over-the-counter markets.

2. B

The U.S. Treasury is not an agency. Treasury securities are backed explicitly by the full faith and credit of the United States government whereas agency securities are not. The other answer choices are securities that are issued by agencies.

3. A

The S&P 500, a market value-weighted index, will be most affected by the stock with the largest market capitalization (price x shares). Stock A has a market cap of $8 \times 100,000,000 = $800 million. The other stocks’ market caps are lower.

4. D

Brokers do not take possession of the product, but dealers do.

5. C

Since Russell will not physically have the wheat for six months, she cannot sell in the spot market. She must therefore use the forward market to lock in a price today for her future harvest.

6. D

Firms sell new securities in primary markets and actually receive the net proceeds from the sale. Seasoned securities (previously issued) are traded in secondary markets by investors.

7. D

Flotation costs are all the costs associated with selling securities. This includes printing costs, legal and accounting fees, underwriter’s spread, and any other cost the firm might experience.

8. C

T-bills have maturities of 90 to 360 days.

9. B

Money market securities are very liquid, very low risk securities with original lives of up to one year.
10. A

When a new issue of securities is fully underwritten, the underwriter guarantees both the price and number of shares to be sold. The underwriter accepts all the risk: price and selling risk.

11. C

A market order, which is the most common type of stock order, is simply an order to trade at the best price. A stop order is a defensive order used to protect profits or limit losses. A limit order is aggressive because the trade will take place only at the limit price.

12. D

Use the asked discount to determine the price you would have to pay.

\[
P = \frac{140}{360} \times 1000 = \$985.57
\]

13. A

Use the bid discount to determine the price you would receive.

\[
P = \frac{140}{360} \times 1000 = \$985.49
\]

14. C

Use the ask price to determine the ask yield.

\[
\text{ask yield (BEY)} = \frac{140}{360} \times 1000 = \$985.57
\]

15. B

A market order to buy should be executed at the lowest ask price available. A market order to sell should be executed at the highest bid price available.

16. C

Subordinated debentures do not require collateral to be pledged specifically to the issue that meets the first of HMB’s financing requirements. Subordinated debentures do, however, require that regular interest payments be met in order to avoid defaulting on the bonds. Since HMB is concerned about its future ability to pay interest payments, this is not an attractive financing alternative. The other choices meet both of the company’s requirements.

17. B

Because the underlying asset for an S&P 500 Index future is the U.S. equity market, this security will increase the investor’s exposure to the U.S. equity market. All of the other choices are either non-
domestic or non-equity investments that would decrease the investor’s exposure to U.S. equities.

18. B

In the securities markets, federal regulators normally set margin requirements, with maintenance margin requirements set by the securities exchanges and the NASDAQ. The clearinghouse conducts the daily settlement of margin accounts. The specialist performs five duties: act as an agent for floor brokers by holding limit orders; act as a catalyst by bringing buyers and sellers together; act as auctioneer by providing a location for trading by the open outcry method; stabilize prices by preventing large jumps in trading prices; provide capital by acting as a market maker to take the other side of orders during temporary imbalances in trading.

19. C

United States government bonds are quoted in 32nds. 91.28 would be equivalent to \( \frac{28}{32} \) which is 91\( \frac{7}{8} \). This is equivalent to 91.875 percent of the par value of $1,000, which is $918.75.

20. C

Treasury bills mature in three months, six months, and one year. They do not have 9-month maturities. All other statements are true.

21. B

\[ \text{Taxable equivalent yield} = \frac{\text{tax-exempt yield}}{(1 - \text{marginal tax rate})} \]

Taxable equivalent yield = tax-exempt yield taxable equivalent yield \((1 - \text{tax rate})\)

tax-exempt yield 8% (1 0.3)
tax-exempt yield 5.6%

22. A

Since Smith is taking possession of the commodity and bearing the risk of reselling the gold, he is functioning as a gold dealer and operating in a dealer market.

23. \( R_o = \left[ (1 + R_1)(1 + R_2)(1 + R_3)(1 + R_4)....(1 + R_N) \right]^{\frac{1}{N}} - 1 \)

where:

\( R_o \) = time - weighted return

\( R_i \) = price relative for stock i, i 1 to N

\( N \) = number of stocks included

Therefore:

\( R_o = \left[ (1 +0.15)(1 + 0.05)(1 - 0.1)(1 - 0.08)(1 + 0.23) \right]^{\frac{1}{5}} - 1 \)
\[ \left[ (1.15)(1.05)(0.9)(0.92)(1.23) \right]^{\frac{1}{5}} - 1 = 4.23\% \]

24. **A**

Holding period return is given by

\[ \frac{V_1 - V_0}{V_0} \]

\[
\begin{align*}
\text{HPR} &= \frac{893,000 - 1,000,000}{1,000,000} \\
\text{HPR} &= -10.7\%
\end{align*}
\]

25. **D**

Dow Jones Industrial Average (DJIA) is a price-weighted index. Standard and Poor’s 500 Index is a market value-weighted index. Wilshire 5000 Equity Index is a market value-weighted index. Value Line Composite Average is an equal-weighted index.
Chapter Six: Portfolio Theory

Overview

Investors must determine the best risk/return opportunities available in the marketplace. In fact, portfolio theory assumes that investors prefer higher return for a given level of risk and lower risk for a given level of return. However, it is not as simple as finding a set of “good” or even “best” individual investments that meet the investor's criteria. The investor has to consider the relationship between the investments. Investors must also consider all of their investments, not just their stocks and bonds. Houses, antiques, art, and other less liquid assets must also be considered.

This chapter will discuss the basics of portfolio theory starting with the fundamental concept of diversification. In Section 1, we begin with a discussion of the meaning and importance of diversification. In Section 2, we discuss risk aversion and the logic underlying it. In Sections 3 and 4, we present theory underlying the very practical concept of asset allocation decisions for clients. Sections 5 and 6 provide the basics of the mathematics of risk and return. Section 7 illustrates how the capital asset pricing model is used as a portfolio benchmark and as a tool for identifying mispriced securities. Section 8 discusses the investment policy statement, and Section 9 offers brief remarks about portfolio performance evaluation.

Section 1: Diversification

Chapter Objective: Explain the concept of diversification and the importance of correlation.

When choosing investments, the old saying “don’t put all your eggs in one basket” is quite appropriate. The investing equivalent of this expression is that you should not use all your money to buy the common stock of only one firm. The success or failure of this investment strategy depends upon the fortunes of only that one firm. However, if you purchase the common stock of several firms, the fate of any one company has far less impact on the value of your portfolio.

Diversification refers to the reduction of risk resulting from adding different sources of revenue to a business or from adding different assets to a portfolio of securities.

Consider the classic example of an entrepreneur, Sally Smith, living in a seaside resort. If Sally sells nothing but sunscreen, her sales and profits will experience wide swings through the seasons. In particular, when the weather is hot and sunny, she will sell great amounts of sunscreen, but when the weather is mild and cloudy, she won’t sell much at all. Sally is following a high-risk feast or famine strategy. Instead, she could expand her product line to also include umbrellas. When the weather is cloudy and rainy, her sales of sunscreen will be down, but her sales of umbrellas will be up. When the weather is hot and sunny, her sales of umbrellas will be down, but her sales of sunscreen will be up. Sally now has diversified her product portfolio by adding umbrellas to her product mix. The end result is that her sales and profits will avoid the dramatic swings that would result from a single product line. She now will have sales both when the weather is sunny and when it’s rainy.

The following graph illustrates the time trend for Sally’s sales during sunny and stormy weather. Notice the large swings in sales for the single product portfolios of either sunscreen (the solid black curve) or umbrellas (the dashed black curve). But, once she diversifies equally into a two product portfolio, her company sales are smoothed out (the solid blue) line.
In Figure 1, sales for the two products exactly counter each other. Assume the time axis covers a period in which the weather starts progressively sunny, then becomes progressively cloudy, and finally becomes progressively sunny. During the first time period as the weather becomes progressively sunny, sales of sunscreen rise and sales of umbrellas fall. During the subsequent cloudier period, sunscreen sales fall and umbrella sales rise. The third time period repeats the first.

Using mathematical terminology, we say that sunscreen and umbrella sales are perfectly negatively correlated. Correlation is a statistic, ranging from $-1$ to $+1$, that measures the strength of relationship between two assets. In the graph above, the correlation between sales of sunscreen and sales of umbrellas is $-1$.

In his Nobel Prize-winning work of 1959, Harry Markowitz\(^1\), the father of modern portfolio theory, proved mathematically what investors had assumed for decades. Using variance to measure risk, Markowitz demonstrated that the correlation between securities is a more important component of portfolio risk than individual security’s variances, especially for portfolios comprising a large number of assets. By combining securities that exhibit low correlation with each other, you can significantly reduce the risk of your portfolio. In other words, the lower the correlation between assets, the greater the diversification potential becomes.

Risk aversion refers to the degree to which an investor dislikes risk. All investors are assumed to be risk averse, but each investor will differ in her individual degree of risk aversion. Highly risk averse investors will prefer safer, more-liquid investments.


**Section 2: Risk Aversion**

**Chapter Objective:** Define risk aversion and show how indifference curves can be used to portray the degree of risk aversion for an investor.
Portfolio theory assumes that investors seek to maximize the utility (i.e., contentment or satisfaction) of their portfolios. However, investors differ in how they view risk. Consequently, the optimal portfolio for one investor will be different from that of another investor.

For example, consider two investors: Derek King, a young executive, and Aaron Burk, a retiree. We would expect that Derek is willing to accept large amounts of risk in exchange for a high expected return on his portfolio. Derek is willing to accept higher risk now because he won’t need withdrawals from his investment portfolio for a long time. As a result, Derek is willing to live with greater ups and downs in his portfolio right now. We say that Derek has low risk aversion (or, alternatively, high risk tolerance).

On the other hand, Aaron is not willing to accept high levels of risk because he needs withdrawals from the portfolio immediately. For instance, Aaron might need $50,000 from his portfolio every year simply to meet his most basic needs and expenses. He is retired, so he has no income coming from work-related activities. Therefore, any drop in his portfolio value might jeopardize the amount he can withdraw. We say that Aaron has high risk aversion (or, alternatively, low risk tolerance).

As a result of their differing attitudes toward risk, Derek and Aaron will select different portfolios. Derek’s portfolio will be tilted toward less-liquid, higher-risk assets, while Aaron’s portfolio will be tilted toward more-liquid, safe assets.

We typically assume that all investors are risk averse but differ in their degree of risk aversion. By definition, a risk-averse investor prefers:

- Higher returns to lower returns for a given level of expected risk.
- Lower risk to higher risk for a given level of expected returns.

The assumption of risk aversion is very rational. It makes perfect sense that an investor will want a higher return in exchange for higher risk. We assume that risk is bad and return is good. In order to accept more of what is considered bad (i.e., risk), the investor requires more of what is considered good (i.e., rate of return). The additional rate of return can be viewed as the compensation that the investor requires as payment for the additional risk that he is willing to accept. An investor with low risk aversion (e.g., Derek King) will require only a small compensation in exchange for additional risk. In contrast, the investor with high risk aversion (Aaron Burk) requires a large compensation in exchange for additional risk. The additional return that an investor requires is related to his degree of risk aversion.

Visual representation of our two investors is provided below. The curves in the graphs are called indifference curves. An indifference curve represents the set of investments, or risk-return combinations, over which the investor is indifferent or equally satisfied. That is, the added return for one of the investments exactly compensates for its additional risk.

![Figure 2: High Risk Aversion](image-url)
Figure 3: Low Risk Aversion

An investor will find investments that lie along each indifference curve equally attractive. As the investor moves to higher indifference curves towards the upper left corner, his welfare is increased (i.e., more return and less risk).

Let's first look at the lowest indifference curve for Aaron Burk, our highly risk-averse investor. Aaron will be equally happy with any return/risk combination on this curve. Notice that as risk increases, Aaron demands an increasingly higher rate of return as compensation. Notice also that required return increases quickly for small increases in expected risk, so the indifference curves are quite steep for the highly risk-averse investor. Steep indifference curves indicate a high level of risk aversion (i.e., a conservative investor who will demand a much higher return for a small increase in risk). On the other hand, note that the indifference curves for our less risk-averse investor are less steep (i.e., an aggressive investor who will demand relatively little extra return for a small increase in risk). For our more aggressive investor, Derek King, required return increases more slowly as expected risk increases. Flatter indifference curves indicate a less risk-averse investor.

It is important to recall that both Derek and Aaron are risk averse. They merely differ in degree of risk aversion. Graphically, risk aversion is depicted by an indifference curve that slopes upward and to the right, which implies that additional return is required whenever risk rises in order to keep the investor as satisfied as he was prior to the change in risk.

As a final comment on indifference curves, note that either investor prefers investments that lie on higher indifference curves. For example, investments lying along the highest indifference curve represent investments that have higher return at the same risk level as investments lying on lower indifference curves. Therefore, indifference curves lying farthest to the upper left are preferred. It is the responsibility of the portfolio manager to find investment combinations that are most preferred by the client.

The major implication of risk aversion is that investors demand higher return in exchange for higher risk. For example, BB-rated bonds (i.e., below-investment grade or "junk" bonds) will always offer higher yields than BBB and higher rated bonds. BB-rated bonds are riskier than BBB rated bonds. Also, investors will require higher expected returns from higher-risk stocks. This is the major rationale underlying asset pricing models such as the capital asset pricing model, which will be discussed later in this chapter.

Section 3: The Efficient Frontier

Chapter Objective: Identify the optimal portfolio using the efficient frontier and indifference curves.
In his Nobel Prize-winning work, Professor Harry Markowitz developed mathematical procedures that would produce the set of theoretically best portfolios. While the mathematics needed to explain Markowitz’ theory are beyond the scope of this book, simple intuition will illustrate the big picture. Assume we could line up on a table all the portfolios that have the exact same level of risk. While the portfolio risks are identical, the expected returns are not. Since all the portfolios have the exact same level of risk, the choice of best portfolio is simple: The rational investor will select the portfolio on the table that has the highest expected return. Conversely, assume we line up all the portfolios that have the same expected return, but different levels of risk. Once again, the choice of best portfolio is simple: The rational investor would select the portfolio that has the smallest risk.

Markowitz translated the actions of a rational investor into mathematical formulas that are used to derive the best set of portfolios. Using optimization theory, he derived formulas for the set of weightings that would produce portfolios that satisfied two important conditions. The theoretical best portfolio will have both of the following:

1. The least risk for a given expected return level.
2. The highest expected return for a given risk level.

Each portfolio that satisfies these two conditions is called an **efficient portfolio**. No other portfolio has a higher return within an efficient portfolio’s risk class, and no other portfolio has less risk within an efficient portfolio’s return class. A plot of the risk-return combinations of all efficient portfolios is called the **efficient frontier**. The figure below depicts the efficient frontier.

![Figure 4: The Efficient Frontier](image)

As illustrated in **Figure 4**, there are no portfolios that lie above the efficient frontier, and all portfolios that lie beneath the efficient frontier are inferior to those that lie on the frontier. Each different point along the efficient frontier represents a different yet still efficient portfolio. As we move from bottom left to upper right, the portfolio expected returns (denoted $E(r)$) and risks rise.

A natural question then becomes: Which efficient portfolio is best for a particular client? The answer lies in finding the portfolio that best matches the client’s risk/return preferences. If our client has high risk aversion (i.e., low risk tolerance), we would recommend a portfolio toward the lower end of the efficient frontier. If our client has low risk aversion (i.e., high risk tolerance), we would recommend a portfolio toward the higher end of the efficient frontier. By using optimization methods, we can find the exact appropriate portfolio for the client.

A graphical illustration of the optimization principle is provided in **Figure 5**. First recall that an indifference curve represents the risk/return combinations over which the investor is indifferent. Also recall that the investor is better off with investments that lie on indifference curves that lie farther to the upper left in risk/return space (the dashed curves below).
Based on Figure 5, you should note two conclusions regarding the portfolio management process:

- The optimal portfolio for an investor is the one that lies on the highest possible indifference curve that is just tangent to the efficient frontier.
- The more risk averse an investor is, the lower the optimal portfolio on the efficient frontier.

The optimal portfolio is the tangency point between the indifference curve and the efficient frontier.

Note that our highly risk-averse investor (the one with steeper indifference curves) will select portfolio X, while our less risk-averse investor (the one with flatter indifference curves) will select portfolio Y. The investors’ respective choices make perfect sense—the highly risk-averse investor selects an efficient portfolio with relatively low risk (and relatively low return), while the less risk-averse investor selects an efficient portfolio with relatively high risk (and relatively high return).

**Section 4: The Capital Market Line**

**Chapter Objective:** Construct the capital market line.

Suppose you serve as an advisor for Jane Jones, who needs help allocating her money across three major asset classes: stocks, bonds, and cash. We know what stocks and bonds are, but what is meant by the third asset class, cash? A cash investment is a risk-free, short-term security such as 30-day Treasury bills. Treasury bills or “T-bills” are short-term debt obligations issued by the U.S. Treasury and are considered to be as close to default free as any debt obligation gets. Therefore, a risk-free asset exists in which there is no uncertainty about its future value. This risk-free asset will have a standard deviation equal to zero, and its correlation with any other asset will also equal zero.

Markowitz’ efficient frontier discussed in the previous section did not consider the existence of a risk-free asset. The introduction of a risk-free asset changes the efficient frontier from a curve into a straight line called the capital market line (also referred to as the CML). As illustrated in Figure 6, the capital market line begins at the risk-free rate and extends on a line tangent to the Markowitz frontier. The line represents all risk/return combinations of portfolios that combine risky and risk-free assets in an optimal manner.
Figure 6: The Capital Market Line

Notice that the risk/return combinations lying on the capital market line dominate all risk/return combinations lying on the Markowitz efficient frontier (the dashed curve). There is only one point in which the capital market line and the Markowitz frontier meet. This point of tangency is very important in portfolio theory. It represents the portfolio, called the market portfolio, that has the best risk/return tradeoff. Formally, the market portfolio maximizes the Sharpe ratio:

\[
\text{Sharpe ratio} = \frac{E(R_p) - r_f}{\sigma_p}
\]  

(1)

where:

- \(E(R_p)\) = expected return for the portfolio
- \(r_f\) = risk-free rate of return
- \(\sigma_p\) = expected standard deviation for portfolio \(p\)

Sometimes, the numerator in Equation (1) is called the mean excess return for the portfolio. Therefore, the Sharpe ratio is a measure of the excess return per unit of risk for the portfolio. No other portfolio on the Markowitz curve or on the capital market line has a higher Sharpe ratio than the market portfolio.

**Chapter Objective:** Derive appropriate percentage allocations to stocks, bonds, and cash for a client.

**Bringing it all together.** Let’s now revisit our client, Jane Jones. Our task is to find the appropriate allocations to stocks, bonds, and cash for Jane. For simplicity, let’s assume that the market portfolio contains just stocks and bonds in a 70/30 mix (e.g., 70 percent stocks, 30 percent bonds). Further, assume that the market portfolio has an expected annual mean return of 10 percent and that the risk-free rate is expected to be 2 percent.

Let’s also assume that Jane is close to retirement and, therefore, is a conservative investor. Using our theory from the prior sections, this would mean that her indifference curve is rather steep as illustrated below.
As discussed in the previous section, the most desired or optimal investment is located at the point of tangency between the indifference curve and the efficient frontier, which in this case is the capital market line. The tangency point represents the investment that maximizes Jane’s risk/return preference. Notice that the tangency point is approximately halfway between the risk-free asset and the market portfolio. Therefore, Jane can maximize her risk/return preferences by allocating approximately 50 percent to the market portfolio and 50 percent to cash.

Now that we know how much to allocate to cash, how much of Jane’s money should be allocated to stocks and how much to bonds? The answer lies in knowing that the market portfolio is allocated 70 percent to stocks and 30 percent to bonds. Therefore, since 50 percent is allocated to the market portfolio, Jane’s final allocation becomes as follows:

Allocation to stocks: 0.50 × 0.70 = 0.35
Allocation to bonds: 0.50 × 0.30 = 0.15
Allocation to cash: 0.50

As her advisor, you should recommend that Jane allocate 35 percent to stocks, 15 percent to bonds, and 50 percent to cash. Notice that most of Jane’s investment is in safer investments (bonds and t-bills).

This illustration can be generalized easily to a market portfolio containing additional asset classes such as real estate, venture capital, commodities, etc. The process of allocating a client’s total portfolio across major asset classes is called asset allocation, and it is a very important determinant of the performance of the overall portfolio.

Section 5: Expected Return And Risk For An Individual Security

Chapter Objective: Calculate and interpret the expected return and standard deviation for an individual asset.

We will continue with our discussion of portfolio theory by first concentrating on expected returns for individual assets. The expected return for any investment depends upon the price you initially paid for it and
the promised cash flow(s) in the future. For instance, assume you pay $100 for an investment that promises to pay $110 in one year. Your expected return is 10 percent.

\[ \hat{R} = \frac{V_1 - V_0}{V_0} = \frac{110 - 100}{100} = 0.10 = 10\% \]  

(2)

where:

\[ \hat{R} \] = your expected return

\[ V_0 \] = your initial investment

\[ V_1 \] = the expected value of your investment in one year

Ten percent is the expected return because the $110 cash flow is due in one year, and many things could happen to interfere with receiving the cash flow exactly as expected. A change in how the $110 is received, such as receiving it sooner or later than promised, receiving it in installments, or receiving a larger or smaller amount, may make your actual return greater or less than the expected return.

Let’s define in greater detail the differences between the expected and the actual return. The expected return is estimated at the beginning of the investment period (i.e., looking into the future) and is based upon the price you paid, the cash flow(s) you expect to receive (i.e., dividends), and any price appreciation (i.e., capital gain) that occurs. Although you might be able to predict with some accuracy the amount of dividends you will receive, the amount of price appreciation is subject to the effects of many different factors. Depending upon the events that occur between the day you purchase the stock and the day you sell it, the price could increase, decrease, or stay the same.

In contrast to the expected return, the actual return, often referred to as the historical return, is the calculated return on the investment (i.e., looking back from the end of the investment period) based upon the price you paid and the cash flow(s) you actually received. The actual return on an investment can only be determined after the investment period has concluded. If the actual return is equal to or greater than the expected return estimated at the beginning of the investment period, the investor will be satisfied.

Figure 8 shows a probability distribution of possible one-year returns for Meyer’s Manufacturing (MM) common stock. We assume MM will operate without any unexpected firm-specific events, but we will allow different states of the economy over the period: boom, normal, and recession. In calculating the expected return for MM stock, we must estimate the probability of each state of the economy as well as the stock’s performance if that state occurs.

The expected return is the probability-weighted average of all possible future outcomes for an asset.
If a “normal” economy exists over the next year, we expect MM stock to earn 15 percent. If the economy goes into a recession, the expected return for MM drops to 10 percent. A boom economy will result in a 20 percent return for MM.

The formula for the expected return for any asset is:

$$E(R) = \sum_{t=1}^{T} P_t R_t$$

where:

- $E(R)$ = expected return for the asset
- $R_t$ = our estimate of the return on the asset if economic state $t$ occurs
- $P_t$ = the probability that economic state $t$ will occur
- $T$ = the number of possible states of the economy

Applying the formula for MM:

$$E(R) = 0.30(0.10) + 0.40(0.15) + 0.30(0.20) = 15\%$$

We have estimated the expected return for MM based upon our estimates of possible states of the economy and the return on MM for each state that could possibly occur. Now we will estimate the accompanying risk using the standard deviation of possible returns for MM.

$$\sigma_{MM} = \sqrt{\sum_{t=1}^{T} P_t (R_t - E(R))^2}$$

where:

- $\sigma_{MM}$ = standard deviation of the possible returns for MM stock

$$\sigma_{MM} = (0.30(0.20 - 0.15)^2 + 0.40(0.15 - 0.15)^2 + 0.30(0.10 - 0.15)^2)^{1/2}$$

$$= (0.0015)^{1/2} = 0.0387 = 3.87\%$$

We now have MM stock’s expected return and standard deviation. What does this tell us? From the Empirical Rule presented in Chapter 1 we know that approximately 68 percent of all possible returns lie within one standard deviation of the mean (i.e., expected return) and 95 percent lie within two standard deviations. In addition, 99 percent of all possible returns will lie within three standard deviations of the mean. Since one standard deviation for MM equals 3.87 percent, we calculate the following ranges:

- ± one standard deviation = 15% + 1(3.87%) = 11.13% to 18.87%
- ± two standard deviations = 15% + 2(3.87%) = 7.26% to 22.74%
- ± three standard deviations = 15% + 3(3.87%) = 3.39% to 26.61%

Given the ranges we calculated using the expected return and standard deviation, we can estimate the following probability distribution of possible returns for MM. At the beginning of the year we expect our actual return to be 15 percent for the year, but due to its risk (i.e., variability), we estimate there is:

1. A **68 percent probability** that the actual return for MM will be between 11.13 percent and 18.87 percent.
2. A **95 percent probability** that the actual return for MM will be between 7.26 percent and 22.74 percent.
3. A **99 percent probability** that the actual return for MM will be between 3.39 percent and 26.61 percent.

Based upon projections for MM, your expected return for the coming year is 15 percent, and you are 99 percent certain that the actual return will not be below 3.39 percent or above 26.61 percent.

[3] Of course, there are many degrees of boom and recession, creating infinite possible states of the economy. For simplicity, however, we assume only three possible, distinct states of the economy.

[4] This is the formula for the *ex ante* (expected) standard deviation. In the Quantitative Methods chapter we calculated the *ex post* (historical) standard deviation.

### Section 6: Expected Return And Risk For A Portfolio

**Chapter Objective:** Calculate the portfolio expected return.

**Portfolio Expected Return**

Let’s now assume MM is one of six different stocks you hold in a portfolio with a total value of $50,000. We’ll assume you have already estimated the expected return for all six of your stocks as shown in Figure 9. In a manner very similar to calculating the expected return for an individual stock, the expected return for your portfolio is a weighted average of the expected returns of the individual stocks in the portfolio:

\[
E(R_p) = \sum_{i=1}^{n} w_i E(R_i) \tag{5}
\]

where:

- \(E(R_p)\) = the expected return for the portfolio
- \(E(R_i)\) = the expected return for stock \(i\)
- \(w_i\) = the “weight” of stock \(i\) in the portfolio
- \(n\) = the number of stocks in the portfolio

<table>
<thead>
<tr>
<th>Stock</th>
<th>Expected Return</th>
<th>Investment</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>12%</td>
<td>$9,000</td>
<td>0.18</td>
</tr>
<tr>
<td>B</td>
<td>11%</td>
<td>6,000</td>
<td>0.12</td>
</tr>
<tr>
<td>C</td>
<td>10%</td>
<td>8,000</td>
<td>0.16</td>
</tr>
<tr>
<td>D</td>
<td>14%</td>
<td>9,000</td>
<td>0.18</td>
</tr>
<tr>
<td>E</td>
<td>13%</td>
<td>8,000</td>
<td>0.16</td>
</tr>
</tbody>
</table>
The weight of each stock is the amount invested in the stock as a percentage of the total value ($50,000) of the portfolio.

**Figure 9: Composition of a Portfolio of Six Stocks**

\[
E(R_p) = 0.18(0.12) + 0.12(0.11) + 0.16(0.10) + 0.18(0.14) + 0.16(0.13) + 0.20(0.15) = 12.68\%
\]

The expected return on your portfolio of six stocks is 12.68 percent. We know that estimating the expected return on any investment does not give us complete information. We must also estimate the associated risk. Unfortunately, from a mathematical standpoint, the risk (i.e., standard deviation) associated with the expected return of a portfolio is not simply a weighted average of the risk of the individual stocks.

**Chapter Objective:** Calculate the portfolio standard deviation.

### Risk

For simplicity, we will now assume a portfolio contains only two stocks. The expected return and standard deviations for the individual stocks are shown in **Figure 10**, as is the portfolio expected return.

\[
E(R_p) = 0.40(0.12) + 0.60(0.14) = 0.048 + 0.084 = 0.1320 = 13.2\%
\]

**Figure 10: Expected Returns, Standard Deviation, and Weights for a 2-Stock Portfolio**

As shown in **Figure 10**, the expected return for the portfolio, 13.2 percent, is a weighted average of the expected returns for the two stocks. In contrast, the standard deviation is based upon the standard deviations of each stock, the weight of each stock in the portfolio, and the correlation between the two stocks. Recall from **Section 1** that the correlation between two assets is the degree to which their returns move together and that the correlation ranges from a possible low of –1 (for perfectly negatively related assets) to a possible high of +1 (for perfectly positively related assets).

**Chapter Objective:** Interpret the effect of correlation on portfolio risk.
To demonstrate the effects of correlation on the standard deviation of the portfolio, we will assume values for the correlation (often shortened as $\rho$) and calculate the portfolio standard deviation at each value. The variance and standard deviation of the portfolio of two assets is measured by:

$$
\sigma_p^2 = w_a^2 \sigma_a^2 + w_b^2 \sigma_b^2 + 2w_a w_b \sigma_a \sigma_b \rho_{a,b} \tag{6}
$$

$$
\sigma_p^2 = (0.4)^2(0.04)^2 + (0.6)^2(0.055)^2 + 2(0.4)(0.6)(0.04)(0.055) \rho_{a,b}
$$

$$
\sigma_p = \left[0.001345 + 0.001056(\rho_{a,b})\right]^{1/2}
$$

We should point out that the correlation is related to a similar concept called **covariance**. Covariance is a measure of the degree to which two variables move together and can be negative or positive. Unlike correlation, covariance is not a standardized measure and has units that are difficult to interpret. Thus many practitioners and academics prefer to use correlation in discussions related to diversification since the magnitude of the correlation measure has a direct and meaningful interpretation.

By substituting different values for into Equation 6, we observe how the standard deviation of the portfolio is affected by the correlation of the stocks. Figure 11 shows the variance and standard deviation for the portfolio at different measures of correlation between stocks $a$ and $b$.

It is apparent from Figure 11 that the variance and standard deviation (our measure for total risk) decrease as correlation decreases. This is the mathematical phenomenon known as diversification, which we discussed at the start of this chapter. By combining stocks with less-than-perfect positive (+1.0) correlation, we can reduce the risk (standard deviation) of the portfolio below that of the weighted average of the individual stock's standard deviations.

<table>
<thead>
<tr>
<th>$\rho_{a,b}$</th>
<th>$\sigma_p^2$</th>
<th>$\sigma_p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>-1.0</td>
<td>0.000289</td>
<td>0.0170</td>
</tr>
<tr>
<td>-0.5</td>
<td>0.000817</td>
<td>0.0286</td>
</tr>
<tr>
<td>0.0</td>
<td>0.001345</td>
<td>0.0367</td>
</tr>
<tr>
<td>+0.5</td>
<td>0.001873</td>
<td>0.0433</td>
</tr>
<tr>
<td>+1.0</td>
<td>0.002401</td>
<td>0.0490</td>
</tr>
</tbody>
</table>

**Figure 11:** Variance and Standard Deviation of Portfolio $a,b$ Assuming Different Values of Correlation $\sigma_{a,b}$.

For example, when we assume the maximum correlation (+1.0), the standard deviation of the portfolio is a simple weighted average of the standard deviations of the two stocks (i.e., $0.4(0.04) + 0.6(0.055) = 0.049$). When we begin reducing the correlation, the portfolio standard deviation falls until, when correlation is −1.0, it reaches its minimum value. At the weights specified, 40 percent in stock $a$ and 60 percent in stock $b$, the minimum standard deviation for our portfolio is 0.0170, which is considerably less than the standard deviation of either stock on an individual basis.

Covariance and correlation are mathematically related as follows:

$$
\rho_{a,b} = \frac{\text{COV}_{a,b}}{\sigma_a \sigma_b} \Rightarrow \text{COV}_{a,b} = \rho_{a,b} \sigma_a \sigma_b
$$
Therefore the formula for the standard deviation of a two asset portfolio can be rewritten using covariance as follows:

\[ \sigma_p^2 = w_a^2 \sigma_a^2 + w_b^2 \sigma_b^2 + 2w_aw_bCOV_{a,b} \]

**Chapter Objective:** Define and contrast systematic and unsystematic risk.

The total risk for any asset consists of two components: **systematic risk** and **unsystematic risk**. Systematic risk (also called market risk) is that part of the asset’s total risk that cannot be reduced through diversification. Sources of systematic risk are macroeconomic factors such as interest rates and inflation. Unsystematic risk (also called diversifiable risk) is that part of the asset’s total risk that can be virtually eliminated through diversification. Examples of the sources of unsystematic risk are company-specific events such as strikes, product recalls, and CEO resignation.

On average, the portfolio standard deviation gets smaller as each additional stock is added to the portfolio. This is due to the statistical phenomenon known as diversification, which reduces the unsystematic risk in a portfolio. The portfolio standard deviation falls at a decreasing rate as more assets are added to the portfolio.

Figure 12 shows the relationship of portfolio risk, measured by standard deviation, and the number of different stocks in the portfolio. It demonstrates how the addition of each additional stock decreases the portfolio standard deviation, but the amount of the decrease in risk is less with each additional stock.\(^6\) It is clear, however, that when a large number of stocks are combined in a portfolio, the risk of the portfolio is dramatically reduced.

You will also notice there is a value below which we cannot drive the portfolio standard deviation, no matter how many different stocks we hold. At this point, virtually all the unsystematic risk has been eliminated, and we are left with only systematic risk, \(\sigma_m\), or market risk. The exact number of different stocks at that point is uncertain, but after about fifty stocks, the gain from adding more stocks is very small.

**Figure 12:** Reduction of Portfolio Standard Deviation (risk), \(\sigma_p\), From Increasing the Number of Stocks, \(n\), in the Portfolio.

\(^5\) Again, although a portfolio can contain any type of investment, we will concentrate on common stock portfolios.
To calculate the variance of the six-stock portfolio, the equation would have to consider the weight of each stock in the portfolio, its variance, plus the correlation between each pair of stocks:

\[
\sigma_p^2 = w_A \sigma_A^2 + w_B \sigma_B^2 + w_C \sigma_C^2 + w_D \sigma_D^2 + w_E \sigma_E^2 + w_{MM} \sigma_{MM}^2 + 2w_A w_B \text{Corr}(A,B) \sigma_A \sigma_B + 2w_A w_C \text{Corr}(A,C) \sigma_A \sigma_C + \ldots + 2w_{MM} w_{MM} \text{Corr}(MM,MM) \sigma_{MM} \sigma_{MM}
\]

Note that if the correlation between the two assets equal +1, then the portfolio standard deviation is simply the weighted average of the standard deviations of the two assets. Mathematically, if correlation equals +1, then

\[
\sigma_p^2 = w_A^2 \sigma_A^2 \cdot \sigma_B^2 = (w_A^2 + w_B^2)^2 \text{ which equals } \sigma_p^2 = (w_a a + w_b b)^2
\]

Therefore, the standard deviation equals \( sp = (w_a a + w_b b) \), which is the weighted average of the standard deviations of the two assets that comprise the portfolio. Therefore, the portfolio standard deviation is highest when the portfolio standard deviation equals the weighted average of the individual asset risks. This is the case of no diversification. If the correlation is less than +1, the portfolio standard deviation will be less than the weighted average of the individual asset risks.

The curve showing the portfolio standard deviation is a convex curve (i.e., sort of like a smile).

### Section 7: The Capital Asset Pricing Model

#### Chapter Objective:
Define the components of the capital asset pricing model.

### Intuition Underlying The Capm

Portfolios often are ranked based on risk-adjusted performance. A portfolio is highly ranked if it produces a superior rate of return within its risk class. Therefore, to be highly ranked, the portfolio must outperform a benchmark representing its risk class. Two questions arise: (1) how do we construct the appropriate risk-adjusted benchmark for a portfolio, and (2) what must the portfolio manager do to outperform the benchmark? This section addresses these questions by presenting and using the celebrated capital asset pricing model, or CAPM. The CAPM was developed by Professor William Sharpe in the 1960s. Because of his groundbreaking research, Sharpe was later awarded the Nobel Prize in Economics in 1990.

The CAPM is based on clear and simple logic: The rate of return that investors require for any risky asset depends on two factors:

1. The general level of interest rates (i.e., the risk-free rate).
2. Compensation for risk.

As discussed earlier, the yield on the T-bill can be used for the risk-free rate. The second factor, compensation for risk, equals the additional rate of return that investors require as compensation for the risk associated with the asset. The higher the risk, the higher the required compensation. Mathematically:

\[
\text{compensation for risk} = k_i - r_i,
\]

where:

- \( k_i \) = the required return for asset \( i \)
- \( r_i \) = the risk-free rate
The compensation for risk is the required return in excess of the risk-free rate and is also known as the **risk premium** for the asset.

**Derivation of the risk premium for an individual Stock**

From our previous discussions we know that as long as stock returns are not perfectly positively correlated, we can diversify away most, if not all, of the stock’s unsystematic risk. Therefore, unsystematic risk of a stock is irrelevant in a diversified portfolio. As a result, investors receive no compensation for unsystematic risk because it can be easily eliminated in a portfolio. The CAPM is based on the principle that only systematic risk matters when determining the fair price of an asset.

The CAPM defines systematic risk of an asset relative to all assets in the market. This measure is called the asset’s **beta**. The beta has a simple interpretation: Beta measures the degree to which returns on a stock and returns on the broad market move together. The stock with average systematic risk will have a beta equal to 1. A stock with higher-than-average systematic risk will have a beta greater than 1, and a stock with lower-than-average systematic risk will have a beta less than 1. The beta for a risk-free asset equals zero.

Recall that a **risk premium** equals the difference between the required return and the risk-free rate. For example, the risk premium for the broad market portfolio (the portfolio of all assets) equals:

\[
\text{market risk premium} = k_m - r_f
\]

where:
- \( k_m \) = the required return on the market portfolio, \( m \)
- \( r_f \) = the risk-free rate

*Also note that the beta for the market portfolio equals 1.*

If the individual stock has beta equal to one, its systematic risk equals that of the broad market and, according to the CAPM, its required return will equal that of the broad market. If, however, the beta is different from 1, the required return for the stock will differ from that of the broad market. The CAPM makes this adjustment as follows:

\[
k_i = r_f + i(k_m - r_f)
\]  

where:
- \( k_i \) = the required return for the individual stock, \( i \)

Therefore, the risk premium for an individual stock, \( k_i - r_f \), is:

\[
k_i - r_f = i(k_m - r_f)
\]

**Chapter Objective:** Explain how the historical beta is derived.

**Estimating Beta: The Characteristic Line**

To estimate historical beta for a stock, we run a simple linear regression of the stock returns against the broad market index:

\[
R_i = \alpha + \beta R_m + \varepsilon
\]  

where:
- \( R_i \) = dependent variable (i.e., the returns on stock \( i \))
Recall from the discussion in Chapter 1 that simple linear regression finds the straight line that best describes the relationship between the dependent and independent variables. It assumes movements in the independent variable affect movements of the dependent variable. Since we assume the return on the stock market is the independent variable, the regression line estimates the movement in the individual stock that is related to market movements. Since this regression equation is so vital to portfolio theory, it is given a special name called the characteristic line.

Beta measures the change in the return of a stock or portfolio given a change in the market return. It measures the asset’s sensitivity to the overall market. The beta for the overall market must be 1.0, and the beta of the risk-free asset must be 0.0.

To show how this regression works, we will assume we have calculated seven weekly returns for our stock and for the stock market. We line up the returns, week one for both, week two for both, week three for both, etc., and run the regression. Figure 13 shows the observations (the weekly returns) plotted on a graph and the regression line that best fits them.

Figure 13: Typical Regression Output Using the Characteristic Line

Point x on the graph is an individual observation, a combination of the returns on the market and on our stock for one of the seven weeks. The distance between it and the regression line is its error. A computer-based statistical application squares the error for each observation and sums (adds) them together. When it finds the line that creates the least sum of the squared errors, this result becomes the “best fit” line identifying the relationship between the variables.

Let’s assume the following equation from our regression analysis:

\[ R_i = 0.6 + 1.2R_m \]

The intercept for our estimated line is 0.6, and the slope coefficient is 1.2. The coefficient, referred to simply as beta, is by far the most important outcome from our regression. The beta tells us our stock changes 1.2 percentage points for every one-percentage point change in the market. Another way of saying this is our stock is 1.2 times or 20 percent more volatile than the market. As explained above, since the beta coefficient measures the influence of the market on our stock’s returns, it measures our stock’s systematic risk.
Equation (10) demonstrates the calculation for the regression coefficient, $\beta$. The equation can be used to find the beta for any asset by substituting in values for asset $i$ in the equation.

$$
\beta_i = \frac{\text{COV}_{i,m}}{\sigma_m^2}
$$

$$
\beta_i = \frac{\sigma_i \sigma_m \rho_{i,m}}{\sigma_m^2} = \frac{\sigma_i}{\sigma_m} \rho_{i,m}
$$

where:

- $\beta_i$ = the beta coefficient from regressing the returns from stock $i$ against the market
- $\sigma_i$ and $\sigma_m$ = the standard deviations of stock $i$ and the market
- $\rho_{i,m}$ = the correlation of stock $i$ with the market

Even without risk (i.e., where $\beta = 0$) investors will require the risk-free rate of return, which includes the real rate of return (RR) and a premium for inflation (IP). Since the risk-free asset has a beta of 0, we know $r_f$, the rate of return on the risk-free asset, must be the intercept term of the CAPM graph in Figure 14.

Thus, the beta of an asset is the ratio of its standard deviation to the standard deviation of the market, multiplied by the correlation between the asset and the market. If we substitute values for a risk-free asset and for the overall stock market, we obtain the following:

$$
\beta_{r_f} = 0.0
$$

$$
\beta_m = 1.0
$$

Beta for the risk-free asset must be zero because the standard deviation for the risk-free asset is zero, and its correlation with the market is zero. Beta for the market is defined as being 1.0 because the correlation of the market with itself is +1.0, and the ratio of its standard deviation to itself must also be one. Now that we know the beta values for the market and risk-free asset, we can move forward and define the properties of the line in Figure 14.

Chapter Objective: Construct the security market line, given the appropriate statistical inputs.

The Security Market Line

Once we estimate the beta for a stock, we can derive its required return using the CAPM equation. We could repeat this process for any number of stocks and could tabulate the required returns and betas as follows:

<table>
<thead>
<tr>
<th>stock</th>
<th>required return, $k$</th>
<th>beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$k_1$</td>
<td>1</td>
</tr>
</tbody>
</table>
The security market line is a graph of the capital asset pricing model.

Each \( k \) is derived using the CAPM: \( k_i = r_f + \beta_i (k_m - r_f) \). If we were to plot these paired observations (\( k \) and from the table), we would derive a line called the security market line (SML), which is merely a graph of the CAPM and is illustrated in Figure 14. Notice that the security market line starts at the risk-free rate and extends through the market portfolio coordinate. The slope (rise/run) of the SML equals the market risk premium, \( k_m - r_f \).

![Figure 14: Security Market Line](image)

Chapter Objective: Show how the security market line changes depending on inflation expectations and risk aversion.

Changes in Inflation. Both the independent variable and the intercept term in the CAPM include a premium for expected inflation. If inflation expectations should increase, we see that both \( r_f \) and \( k_m \) will increase. In the CAPM, the risk-free rate is a nominal rate defined as the real risk-free rate plus a premium for expected inflation:

\[
\begin{align*}
  r_f &= RR + IP \quad (11) \\
  k_m &= r_f + RP_m \quad (12)
\end{align*}
\]

where:

- \( RR \) = the real risk-free rate
IP = the inflation premium
RPM = the market risk premium

For example, if inflation expectations increase one percentage point, both $r_f$ and $R_m$ would increase by the same percentage point. Since the slope of the security market line, and both variables increase the same amount, the slope remains unchanged.

However, the intercept will increase (i.e., move up) by one percentage point, causing an upward shift in the CAPM as illustrated in Figure 15. With an increase in inflation expectations, investors will require higher returns on all stocks. Of course, a decrease in inflation expectations would lead to a downward shift in the CAPM, as investors require lower returns on all stocks.

![Image: Figure 15: An Upward Shift in the CAPM Caused by an Increase in Inflation Expectations]

**Changing Risk Aversion.** The slope of the CAPM ($k_m - r_f$) is referred to as the **market risk premium.** It measures the average degree of risk aversion in the market. If investors suddenly required more return per unit of risk, the risk premium would increase. The increased risk premium causes the slope of the CAPM to increase as illustrated in Figure 16.

![Image: Figure 16: An Upward Rotation of the CAPM Caused by an Increase in Risk Aversion]

As shown in the chapter on Securities Analysis, the CAPM required return is often used as the discount rate when finding the fair value for a stock. Therefore, changes in inflation expectations and risk aversion have important implications for stock prices. As inflation expectations rise, required returns (discount rates) rise, and therefore, stock prices fall. Likewise, as risk aversions rise, required returns (discount rates) rise, and therefore, stock prices fall. This is a direct result of the inverse relationship between present values and discount rates discussed in Chapter 1.
An Application Of The Capm

Assume you are assigned the task to make a buy or sell recommendation on XYZ Inc, which has a beta equal to 1.20. Assume the required market premium \((r_m - r_f)\) equals 5 percent and that the risk free rate, \(r_f\), equals 2 percent. Further assume you have predicted the future cash flows for XYZ, and predict that its stock will return 10 percent next year. Should you recommend a purchase or sale for XYZ stock?

To answer the question, first find the required return for XYZ using the CAPM:

\[
k_i = 0.02 + 1.2(0.05) = 8\%
\]

Based on the output from the CAPM, you will recommend a purchase of XYZ only if you think the future return on the stock will equal or exceed 8 percent. Your predicted return (10 percent) exceeds the required return (8 percent). Since your predicted return exceeds the stock’s required return, you should recommend a purchase. In other words, you think the stock is undervalued at today’s prices. You think the stock price for XYZ is under its fair value.

The difference between the investor’s expected return and required return for an asset is called the asset’s alpha. Alpha measures the degree to which an asset is over- or undervalued. For XYZ:

\[
alpha = 0.10 - 0.08 = 2\%
\]

Therefore, you think XYZ’s stock price is undervalued by 2 percent.

Our estimation of the expected return on XYZ stock (or any other stock) could just have easily been equal to or below the required return, in which case the stock would be considered fairly valued or overvalued, respectively.

We can also use graphical analysis to determine whether individual stocks (or portfolios) are priced correctly. For example, if a stock is priced correctly, such that its expected return is appropriate for its risk, it will fall directly on the SML. If not, the plot will fall above or below the SML. Let’s take a look at a few examples.

In Figure 17, three stocks are plotted against the SML. Since stock B falls directly on the SML, its required return is equal to its expected return, and the stock is priced correctly. Stock A, however, lands above the SML. Since the plots represent the combination of expected return and risk (measured by beta), we see that the expected return for stock A is greater than its required return, as denoted by the SML. Since its expected return is greater than its required return, Stock A must be underpriced. The exact opposite could be said for Stock C. Stock C plots below the SML, indicating that the stock is expected to realize a return less than its required return. Stock C must be overpriced.
Portfolio Betas

The beta for a portfolio is calculated much the same way as the beta for an individual stock. To find the beta for an individual stock, we employed the characteristic line in Equation 9. Recall that we regressed the returns of an individual stock against those of the market for the same period of time to obtain the beta value for a particular company. To use the characteristic line to estimate a portfolio beta, we use the same procedure. In this case, we regress the portfolio’s returns against market returns. (As with the estimation of an individual stock beta, we use historical returns.)

An alternative method of estimating a portfolio beta is to find the weighted average of the betas of the individual stocks using Equation 13.

\[
\beta_p = \sum_{i=1}^{n} w_i \beta_i
\]  

(13)

where:

- \( \beta_p \) = the portfolio beta
- \( \beta_i \) = the beta for stock \( i \)
- \( w_i \) = the weight of stock \( i \) in the portfolio
- \( n \) = the number of stocks in the portfolio

Assume you hold a portfolio comprised of three stocks as follows:

<table>
<thead>
<tr>
<th>Stock</th>
<th>Beta</th>
<th>$ Invested</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>1.3</td>
<td>1,000</td>
</tr>
<tr>
<td>B</td>
<td>0.8</td>
<td>2,000</td>
</tr>
<tr>
<td>C</td>
<td>1.7</td>
<td>2,000</td>
</tr>
</tbody>
</table>

\[
\beta_p = w_A \beta_A + w_B \beta_B + w_C \beta_C
\]

\[
\beta_p = 0.2(1.3) + 0.4(0.8) + 0.4(1.7)
\]

\[
\beta_p = 0.26 + 0.32 + 0.68 = 1.26
\]

If the risk-free rate is six percent and the market risk premium is four percent, we can use the CAPM to find the expected return on your portfolio.
\[
\hat{R}_p = r_f + (k_m - r_f)
\]  
(14)

\[
\hat{R}_p = 0.06 + 1.26(0.04) = 0.1104 = 11.04\%
\]

[9]. Regression concepts were discussed in the Quantitative Methods chapter.

[10]. We use past or historical returns in the regression.

[11]. Note that the plots could represent portfolios as well as individual stocks.

**Section 8: The Investment Policy Statement**

The goal of portfolio management is to combine securities and other assets into portfolios that fit an investor’s needs and to manage those portfolios to achieve investment goals. The investor’s needs are defined in terms of portfolio return and risk, and the portfolio manager seeks to enhance return based on the level of risk the investor is willing to assume.

Creating an investment policy statement is an essential part of the portfolio management process. The IPS provides transparency and accountability to the investment process.

The first step in the portfolio management process requires a portfolio manager to complete a detailed analysis of the investor whose funds are being managed. An investor can be classified as an individual investor or as an institutional investor.

**Chapter Objective:** Explain the key investment considerations for individual investors based upon the life cycle investment framework and the psychological profile framework.

**Individual Investors**

Individual investors structure their financial plans based on their age, financial status, future plans, and personal needs. The needs of individuals can be determined using many different frameworks. The life cycle framework utilizes the investor’s stage of life to determine the general needs of the portfolio. For instance, a relatively young investor will be able to tolerate more risk and will tend not to rely heavily on the portfolio to provide income. In contrast, an older investor who is close to retirement has few years to recover from losses in the portfolio and will have a much lower risk tolerance. An investor who is well into his retirement years will also have a low tolerance for risk in the portfolio but will also rely heavily on the portfolio for income. As you can see, the stage of life that an investor occupies could significantly influence his investment style. However, not every investor within a stage of life category is the same.

An alternative to the life cycle model is the psychological profile framework. A portfolio manager who uses a psychological profile will attempt to determine the relative risk-seeking or risk-avoidance behavior of the investor regardless of the investor’s age. For example, some relatively young investors may have an extreme aversion to risk. In this case, the portfolio manager should allocate a higher-than-average proportion of the investor’s portfolio to lower-risk assets. In addition, an older investor with large wealth may enjoy the thrill of investing in the high-technology market. Assuming that the investor has been educated on the implications of this investment style, it may be appropriate for the portfolio manager to allocate a higher-than-average proportion of the portfolio to risky securities.
Creating an investment policy statement is an essential part of the portfolio management process. The IPS provides transparency and accountability to the investment process.

The key point to remember is that a careful accounting of the investor's risk tolerance and return requirements is essential to properly manage the portfolio.

**Chapter Objective:** Explain the key investment considerations for institutional investors.

### Institutional Investors

Institutional investors include entities such as endowments, pension funds, insurance companies, banks, investment companies, and government agencies. The needs of institutional investors are very different depending on that entity’s reasons for existence. For example, a large pension fund will formulate investment goals and risk tolerance around the relative age of the workforce and the promised level of pension benefits. An endowment, on the other hand, does not need to support a retiring workforce but will have stated objectives that may include providing long-term or short-term funding for an arts program at a university. The important thing for a portfolio manager working with an institutional investor to remember is that, similar to individual investors, each institutional investor must be considered in isolation, and the portfolio should be designed to meet the investor’s needs and goals.

No matter whether a portfolio manager is working with an individual or institutional investor, it is essential that he or she create an investment policy statement to govern the portfolio.

**Chapter Objective:** Define the components of an Investment Policy Statement.

### The Investment Policy Statement

The *investment policy statement (IPS)* is the framework that provides structure to the investment process. It forces investors to *understand* their own needs and limitations and to *articulate* them within the construct of realistic goals. The policy statement helps investors understand the risks and costs of investing and also guides the actions of the portfolio manager. In essence, the purpose of the policy statement is to impose investment discipline on the client and the portfolio manager. Every investment policy statement should be a formal written document that explicitly details the risk tolerance and return requirements as well as the limitations that the individual or institutional investor faces.

The policy statement should also state the performance standards by which the portfolio’s performance will be judged and specify an appropriate *benchmark* that represents the investor’s risk preferences. The portfolio should be measured against the stated benchmark and not the portfolio’s raw overall performance. Also, the manager should be evaluated on how closely he or she adhered to the portfolio’s limitations related to attaining the required return.
Return Requirements And Risk Tolerance

Specifying investment goals in terms of just return may expose an investor to inappropriate high-risk investment strategies. Also, return-only objectives can lead to unacceptable behavior on the part of investment managers, such as excessive trading (churning) to generate abnormally large commissions.

Return requirements may be stated in absolute terms (dollar amounts) or percentages. The risk tolerance of the investor will play a role in setting the return requirements since a high return requirement will necessitate a high risk tolerance, and a low risk tolerance will necessitate a low return requirement.

Investors concerned primarily with capital preservation require a return on investment that is at least equal to the inflation rate. The primary concern of a capital preservation strategy is the maintenance of purchasing power. To achieve this goal, the real rate of return must be equal to or greater than the inflation rate.

Other investors will be focused on capital appreciation and as such will require the portfolio to earn a nominal return in excess of the inflation rate. Achieving this goal will require that the purchasing power of the initial investment increase over time.

Investors who have high cash flow needs will focus the investments in the portfolio towards generating current income. The current income goal is usually appropriate when an investor wants or needs to supplement other sources of income to meet living expenses or some other planned spending need.

A total return requirement entails growing the value of the portfolio to meet a future need through both capital gains and the reinvestment of current income. The total return goal is riskier than the current income goal, but less risky than the capital appreciation goal.

Limitations To Investment

The investor’s return requirements and risk tolerance will be restricted by and in some cases determined by the limitations unique to each investor. An investor’s portfolio is constrained by various factors which include cash flow requirements, the investor’s time horizon, tax concerns, and laws governing investment activity.

Cash flow requirements may cause the investor to sell off assets at unfavorable terms. Thus, if the investor will depend on the portfolio to meet certain cash requirements, the return requirement may need to be reduced.

Time horizon refers to the time between making an investment and needing the funds generated by the investment. Since losses are harder to overcome in a short time frame, investors with shorter time horizons usually prefer lower-risk investments.

Tax concerns play an important role in investment planning since taxes will reduce the gross returns on an investor’s portfolio. The tax code in the U.S. and most other countries is complex, and the tax considerations will be widely different for each individual and each institution.

Legal factors are more of a concern to institutional investors than individuals, but the investment strategies of both may be restricted due to these constraints. For example, certain institutions are prohibited by law from investing in derivative securities.

In summary, the key to creating a functional investment policy statement is to consider all aspects of an investor’s needs and limitations. The investment policy statement should clearly define the return requirements and risk tolerance of the investor so that an efficient portfolio can be selected to meet the investor’s goals. By taking these steps, a portfolio manager can add significant value and discipline to an investor’s portfolio.
Chapter Objective: Define portfolio performance evaluation and explain the purpose of a performance benchmark.

At the beginning of this chapter, we asked two questions: (1) how do we construct the appropriate risk-adjusted benchmark for a portfolio, and (2) what must the portfolio manager do to outperform the benchmark? This section provides answers to these questions.

For the first question, to construct an appropriate risk-adjusted benchmark for a portfolio, we can use the CAPM using historical data. For instance, if last year's portfolio beta equaled 1.5, if the market return was 10 percent, and if the risk-free rate was 2 percent, then the risk-adjusted benchmark return for the portfolio is the CAPM required return:

\[ k_p = 0.02 + 1.5(0.08) = 14\% \]

The portfolio manager beat his benchmark if his actual return exceeded 14 percent. Otherwise he did not beat his benchmark. This is an extremely important concept because portfolios should be compared against appropriate risk-adjusted benchmarks. Riskier portfolios should provide higher returns on average. Moreover, portfolio managers often receive extra compensation when they outperform their benchmarks.

For the second question, the portfolio manager will outperform the benchmark if he consistently selects assets whose actual returns exceed their respective required returns. Mathematically speaking, he performs well because he selects assets with positive alphas. The historical alpha equals the difference between the actual return and the required return. Since the portfolio is a weighted average of the assets comprising the portfolio, the portfolio alpha will equal the weighted average of the asset alphas:

\[ p = w_{i} \] (15)

Since the alpha equals the difference between the actual return and the benchmark required return, a positive alpha implies that the portfolio return exceeded its benchmark return.

Summary

Section 1: Diversification
A. Diversification refers to the reduction of risk resulting from adding assets to the portfolio.
B. Correlation is a statistic measuring the strength of relationship between two assets.
   1. The correlation ranges from –1 to +1.
   2. The lower the correlation between assets, the greater the diversification potential becomes.

Section 2: Risk Aversion
A. Risk aversion refers to the degree to which the investor dislikes risk.
   1. All rational investors are risk averse.
   2. Rational investors will demand a risk premium to compensate for risk.
   3. Rational investors will always consider both risk and return in evaluating investments.
      a. They will minimize risk for a given level of return.
      b. They will maximize return for a given level of risk.
B. An indifference curve maps out the set of risk/return combinations over which the investor is indifferent.
   1. Indifference curves portray the degree of risk aversion for an investor.
   2. Indifference curves slope upward and to the right in risk/return space.
   3. Indifference curves for a highly risk-averse investor have a very steep slope.
4. Indifference curves for a less risk-averse investor have a less steep slope.

**Section 3: The Efficient Frontier**
A. An efficient portfolio is one that has the smallest possible risk for a given expected return and has highest possible expected return for a given risk level.
B. The efficient frontier is a plot of the risk-return combinations for the set of efficient portfolios.
C. The optimal portfolio lies at the tangency point between indifference curve and efficient frontier.

**Section 4: The Capital Market Line**
A. The capital market line is the efficient frontier given the existence of a risk-free asset.
   1. A risk-free asset is one in which there is no uncertainty about its future value.
   2. The Treasury bill serves as a proxy for the risk-free asset.
   3. The standard deviation of the risk-free asset equals zero, and its correlation with any other asset also equals zero.
B. The capital market line is a plot of the risk-return values for portfolios that combine the risk-free asset with risky assets in an optimal manner.
   1. The capital market line starts at the risk-free rate and lies tangent to the Markowitz efficient frontier.
   2. The tangency point is risk/return coordinate for the market portfolio.
   3. The market portfolio is the portfolio that maximizes the excess return to risk ratio.
C. The point of tangency between the indifference curve and the capital market line identifies the appropriate allocation to the risk-free asset and to the market portfolio.

**Section 5: Expected Return And Risk For An Individual Security**
A. The expected return is based upon the purchase price and expected cash flows.
   1. The expected return on any investment is uncertain.
   2. Any change in the amount or timing of the expected cash flow(s) will make the actual (historical) return different from the expected return.
B. Whenever there is uncertainty in expected returns, there is a probability distribution of the different possible returns.
   1. The expected return is the weighted average of the possible returns.
   2. Using the Empirical Rule we know:
      a. A 68 percent probability exists that the actual return will fall within +1 standard deviation of the expected return.
      b. A 95 percent probability exists that the actual return will fall within +2 standard deviations from the expected return.
      c. A 99 percent probability exists that the actual return will fall within +3 standard deviations from the expected return.

**Section 6: Expected Return And Risk For A Portfolio**
A. The expected return for a portfolio equals the weighted average of the expected returns for the individual assets comprising the portfolio.
   1. Portfolio weights equal the percentages allocated to each asset.
   2. Portfolio weights sum to 100 percent.
B. Portfolio risk is measured by the standard deviation of the portfolio’s returns.
C. The standard deviation for a portfolio is not simply a weighted average of the individual stocks’ standard deviations. Portfolio standard deviation depends upon:
   1. The standard deviations of the individual stocks.
   2. The weights of the stocks in the portfolio.
   3. The correlations among the stocks.
D. The correlation between two stocks is a standardized measure of the tendency for two stocks to move together.
   1. Perfect positive correlation, +1.0, means they always move in the same direction.
2. Perfect negative correlation, –1.0, means they always move in the opposite direction.
3. A correlation of 0.0 means there is no statistical relationship between the movements of the stocks.

E. The lower the correlations, the lower the portfolio standard deviation.
F. When the correlation between two assets equals +1, no diversification takes place, and the portfolio standard deviation will equal the weighted average of the standard deviations of the individual assets.
G. If the correlation is less than 1, the portfolio standard deviation will be less than the weighted average of the standard deviations of the individual assets.
H. The total risk for any asset consists of two components: systematic risk and unsystematic risk.
I. Systematic risk is that part of the asset’s total risk that cannot be reduced through diversification.
J. Unsystematic risk is that part of the asset’s total risk that can be eliminated through diversification.

K. Portfolio risk falls at a decreasing rate as more stocks are added to the portfolio.

Section 7: The Capital Asset Pricing Model
A. The capital asset pricing model (CAPM) provides the means for determining the required return for any risky asset.
   1. Required return is based upon the risk of the investment.
   2. The greater the risk associated with an investment, the higher the required return.
B. The CAPM states that the required return equals the risk free rate plus appropriate compensation for risk.
   1. The only risk that matters in the CAPM is systematic risk.
   2. Investors get compensated for systematic risk because it cannot be diversified away.
   3. Investors do not get compensated for unsystematic risk because it can be diversified away.
   4. An individual stock’s risk premium is the stock’s beta multiplied by the market risk premium $(k_m - r_f)$.
   5. The equation for the CAPM is $k_i = r_f + \beta_i (k_m - r_f)$.
C. The beta measures the degree to which the returns on a stock and on the broad market move together.
   1. A stock with average systematic risk has a beta equal to 1.
   2. A stock with higher-than-average systematic risk has a beta greater than 1.
   3. A stock with less-than-average systematic risk has a beta less than 1.
   4. A stock with no systematic risk has a beta equal to zero.
D. The historical beta for any stock is estimated as the slope of a linear regression of the stock returns against the market index returns.
   1. The steeper the slope, the higher the beta.
   2. The regression line used to derive the beta is called the characteristic line.
   \[
   \beta_i = \frac{\text{COV}_{i,m}}{\sigma_m^2} = \frac{\sigma_i}{\sigma_m} \rho_{i,m}
   \]
   3. Beta is calculated as follows:
E. The security market line is a graph of the capital asset pricing model.
   1. The slope of the security market line equals the market risk premium.
   2. The starting point for the security market line is the risk-free rate.
F. The security market line uses beta as the relevant measure of risk.
G. The risk-free rate increases when inflation expectations rise, causing the security market line to shift upward. Required returns will rise and prices will fall.
H. The risk-free rate decreases when inflation expectations fall, causing the security market line to shift downward. Required returns will fall and prices will rise.
I. The slope of the security market line increases as risk aversions among investors rise. Required returns will rise and prices will fall.
J. The slope of the security market line decreases as risk aversions among investors fall. Required returns will fall and prices will rise.
K. The required return for a stock can be determined by knowing the stock’s beta, the risk-free rate, and the market risk premium.

L. Undervalued stocks (or portfolios) have an expected return greater than the required return and plot above the SML. Overvalued stocks (or portfolios) have an expected return less than the required return and plot below the SML.

M. The beta for a portfolio is a weighted average of the betas of the individual stocks in the portfolio. It can also be estimated through the use of regression analysis.

Section 8: The Investment Policy Statement

A. The life cycle framework utilizes the investor’s stage of life to determine the general needs of the portfolio.
   1. A relatively young investor will be able to tolerate more risk and will tend not to rely heavily on the portfolio to provide income.
   2. An older investor who is close to retirement has few years to recover from losses in the portfolio and will have a much lower risk tolerance.
   3. An investor who is well into her retirement years will also have a low tolerance for risk in the portfolio but will also rely heavily on the portfolio for income.

B. The psychological profile framework attempts to determine the general risk-seeking or risk-avoidance behavior of the client. The psychological profile is then used to determine which assets are appropriate for the investor’s portfolio.

C. Institutional investors encompass a wide variety of entities and include banks, endowments, insurance companies, and others. Institutional investment needs will vary widely depending on the reason for the institution’s existence.

D. The investment policy statement (IPS) is the framework that provides structure to the investment process.
   1. The purpose of the IPS is to impose investment discipline on the client and the portfolio manager.
   2. Every IPS should:
      a. Be a formal written document.
      b. Detail the risk tolerance and return requirements as well as the limitations that the individual or institutional investor faces.
      c. Detail limitations including those related to cash flow (liquidity), taxes, time horizon, and legal constraints.

Section 9: Portfolio Performance Evaluation

A. Portfolio performance evaluation compares the performance of a portfolio manager to a stated benchmark.

B. If a portfolio manager outperforms his benchmark, he has generated positive alpha. Portfolio alpha can be calculated as the weighted average of the individual asset alphas.

Practice Questions: Portfolio Theory

1. Consider the common stocks of two independent companies, DFI Construction (DFI) and BCS Financial Services (BCS). Every time DFI’s common stock posts a two percent gain, BCS’s common stock realizes a two percent loss. What, if any correlation exists between the two stocks?
   A. +1.
   B. –1.
   C. +2.
   D. 0.

2. A rational (i.e., risk-averse) investor would choose which of the following investments?
<table>
<thead>
<tr>
<th>Investment</th>
<th>Expected Return</th>
<th>Standard Deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>SpendCo</td>
<td>8%</td>
<td>22%</td>
</tr>
<tr>
<td>Thrift Inc.</td>
<td>10%</td>
<td>20%</td>
</tr>
<tr>
<td>Money Corp.</td>
<td>11%</td>
<td>50%</td>
</tr>
<tr>
<td>SaveCo</td>
<td>9%</td>
<td>22%</td>
</tr>
</tbody>
</table>

A. Thrift Inc.  
B. SaveCo.  
C. Money Corp.  
D. SpendCo.

**Use the following information for NorthCoast Oil Company to answer Questions 3 and 4.**

<table>
<thead>
<tr>
<th>State of the Economy</th>
<th>Probability of State Occurring</th>
<th>Expected Return</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid Expansion</td>
<td>20%</td>
<td>23%</td>
</tr>
<tr>
<td>Moderate Expansion</td>
<td>40%</td>
<td>11%</td>
</tr>
<tr>
<td>Moderate Recession</td>
<td>30%</td>
<td>-8%</td>
</tr>
<tr>
<td>Harsh Recession</td>
<td>10%</td>
<td>-12%</td>
</tr>
</tbody>
</table>

3. What is the expected return for NorthCoast Oil Company?  
   A. 4.8%.  
   B. 5.4%.  
   C. 11.0%.  
   D. 14.1%.

4. Which of the following is NorthCoast Oil Company’s expected standard deviation?  
   A. 7.2%.  
   B. 10.9%.  
   C. 11.2%.  
   D. 12.6%.

5. Find the standard deviation for a portfolio comprised of stocks a and b in the specified proportions. \( \rho_{a,b} = 0.40 \)

<table>
<thead>
<tr>
<th>Stock</th>
<th>Expected Return</th>
<th>Standard Deviation</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>0.12</td>
<td>0.040</td>
<td>0.40</td>
</tr>
<tr>
<td>b</td>
<td>0.14</td>
<td>0.055</td>
<td>0.60</td>
</tr>
</tbody>
</table>

A. 0.024.  
B. 0.039.  
C. 0.042.  
D. 0.051.
6. Harvey Cutler is estimating a characteristic line for the stock of Orion Auto Group (OAG). To facilitate his analysis, Cutler has performed a linear regression. The results of the regression for OAG indicate slope and intercept parameters of 1.7 and 0.02, respectively. Which of the following conclusions can be drawn from Cutler’s estimation of the characteristic line?

A. OAG has significantly above-average systematic risk.
B. OAG has 70% more unsystematic risk than the market.
C. OAG has a slightly positive correlation with the risk-free asset.
D. OAG’s total risk is 1.7 times greater than that of the aggregate market.

7. The correlations between four different stocks are presented in the following correlation matrix:

<table>
<thead>
<tr>
<th>Stock A</th>
<th>Stock B</th>
<th>Stock C</th>
<th>Stock D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock A</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock B</td>
<td>0.10</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Stock C</td>
<td>−0.80</td>
<td>0.05</td>
<td>1.00</td>
</tr>
<tr>
<td>Stock D</td>
<td>−0.20</td>
<td>0.95</td>
<td>0.00</td>
</tr>
</tbody>
</table>

Which combination of stocks would achieve the most diversification for an investor, and which combination would achieve the least diversification?

Most Diversification
A. Stock A and Stock C
B. Stock C and Stock D
C. Stock A and Stock D
D. Stock C and Stock D

Least Diversification
A. Stock B and Stock D
B. Stock B and Stock D
C. Stock A and Stock D
D. Stock A and Stock D

8. Jill Willshire is creating an equally weighted portfolio consisting of two assets. The portfolio has a beta of 0.5, and one of the assets has a beta of zero. Which of the following is TRUE of Willshire’s portfolio?

A. The systematic risk of the portfolio is greater than that of the market as a whole.
B. The portfolio consists entirely of the risk-free asset and the market portfolio.
C. The correlation coefficient between the two assets in the portfolio is equal to −1.
D. The expected return on the portfolio should be greater than the expected return on the aggregate market.

9. Estimate the beta for the following portfolio:

<table>
<thead>
<tr>
<th>Stock</th>
<th>Beta</th>
<th>$ Invested</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.90</td>
<td>2,500</td>
</tr>
<tr>
<td>B</td>
<td>1.50</td>
<td>3,000</td>
</tr>
<tr>
<td>C</td>
<td>0.70</td>
<td>3,500</td>
</tr>
<tr>
<td>D</td>
<td>0.50</td>
<td>1,000</td>
</tr>
</tbody>
</table>

A. 0.73.
10. An investor's portfolio has a beta of 1.1, financial analysts predict the market return for the coming year to be 10 percent, and U.S. Treasury bills were just auctioned to yield 3 percent. What is the market risk premium?
   A. 3%
   B. 7%
   C. 19%
   D. 13%

11. An investor's portfolio beta is 1.5 and has a required return of 14 percent. If the market risk premium is 6 percent and inflation expectations for the next year are increased from 2 percent to 4 percent, what will happen to the investor's required return? It will:
   A. remain the same because inflation impacts all assets equally.
   B. increase 2 percentage points to 16%.
   C. increase 1.5(2) = 3 percentage points to 17%.
   D. be indeterminable—without knowing the risk-free rate, the impact on my portfolio cannot be determined.

12. Investors often gain confidence in the stock market when economic activity improves after a long recession. This increase in confidence usually decreases investors’ aversion to risk. As investors’ risk aversion falls:
   A. their required return will decrease.
   B. a company’s beta will rise.
   C. a company’s beta will fall.
   D. their required return will increase.

13. Gretchen Freedman is explaining the attributes of the capital market line to a group of her firm’s institutional clients. Which of Freedman’s following comments made during the conference is incorrect?
   A. The capital market line is the efficient frontier when the risk-free asset exists.
   B. Portfolios on the capital market line will dominate portfolios on the efficient frontier.
   C. The capital market line demonstrates the tradeoff between expected return and beta for a set of efficient portfolios.
   D. An investor’s optimal portfolio will be the tangency point between her indifference curve and the capital market line.

Use the following data to answer Questions 14 and 15.

The market portfolio is represented by three assets: stocks, bonds, and real estate. Data on the percentage represented by each asset class in the market portfolio as well as the expected return on each asset class is presented in the following table:

<table>
<thead>
<tr>
<th>Asset</th>
<th>%</th>
<th>E(R)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stocks</td>
<td>60%</td>
<td>15%</td>
</tr>
<tr>
<td>Bonds</td>
<td>30%</td>
<td>7%</td>
</tr>
<tr>
<td>Real Estate</td>
<td>10%</td>
<td>8%</td>
</tr>
</tbody>
</table>

14. If an investor finds it optimal to invest 60 percent of his assets in the market portfolio and 40 percent of his assets in the risk-free asset, what percentage of the investor’s assets would be
invested in each asset class?

<table>
<thead>
<tr>
<th></th>
<th>Stocks</th>
<th>Bonds</th>
<th>Real Estate</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>36%</td>
<td>18%</td>
<td>6%</td>
</tr>
<tr>
<td>B.</td>
<td>60%</td>
<td>40%</td>
<td>0%</td>
</tr>
<tr>
<td>C.</td>
<td>40%</td>
<td>20%</td>
<td>15%</td>
</tr>
<tr>
<td>D.</td>
<td>24%</td>
<td>12%</td>
<td>4%</td>
</tr>
</tbody>
</table>

15. If an investor finds it optimal to invest 70 percent of his assets in the market portfolio and 30 percent of his assets in the risk-free asset, what is the expected return on the portfolio if the risk-free asset has an expected return of 3 percent?
   A. 7.8%.
   B. 8.3%.
   C. 8.9%.
   D. 9.1%.

16. Which of the following statements about the security market line is FALSE?
   A. The relevant risk measure in the security market line is the standard deviation.
   B. The security market line is a graph of the CAPM.
   C. The slope of the security market line equals the market risk premium.
   D. The security market line can be used to identify mispriced securities.

17. Assume your portfolio earned 10 percent with a standard deviation of 10 percent. Also assume the risk-free rate was 5 percent. What was your portfolio’s Sharpe ratio?
   A. 0.
   B. 0.20.
   C. 0.50.
   D. 2.0.

18. Using the CAPM, what is the required return for a stock with a beta of 2 if the market risk premium is 8 percent and if the risk-free rate is 3 percent?
   A. 8%.
   B. 13%.
   C. 19%.
   D. 22%.

19. Timothy McAllen is evaluating the common stock of Hillard Technology Group (HTG). McAllen has noted that the expected return on HTG is estimated by equity analysts to be 13 percent for the next year. McAllen further observes that HTG’s sensitivity to the aggregate market is approximately 1.2. Forecasts of the market return and the risk-free rate for the next year are 9 percent and 2.5 percent, respectively. Given these estimates, which of the following is correct?
   A. HTG stock is undervalued and has an alpha of positive 2.7%.
   B. HTG stock is overvalued and has an alpha of positive 2.7%.
   C. HTG stock is undervalued and has an alpha of negative 2.7%.
   D. HTG stock is overvalued and has an alpha of negative 2.7%.

20. A portfolio manager is responsible for ensuring his portfolio of 47 U.S. stocks mimics the returns of a broad market index. The manager has just hired an assistant who quickly recommends that twenty more stocks be added to the portfolio. The manager, however, disagrees with the assistant’s recommendation and adds no further stocks. Which of the following reasons best summarizes why the portfolio manager made no change to the portfolio?
   A. The level of risk aversion for the current portfolio’s investors had recently decreased.
   B. The current portfolio has a negligible amount of unsystematic risk and thus no need for
further diversification.
C. The current portfolio has an above-average level of systematic risk that will allow it to generate positive alpha.
D. The marginal utility of the current portfolio has already reached its theoretical minimum.

21. The Capital Asset Pricing Model (CAPM) states the risk premium for an individual security consists of:
   A. the product of the beta and the return on the market.
   B. the product of the risk-free rate and beta.
   C. the sum of the risk-free rate and the beta.
   D. the product of the beta and the market risk premium.

22. RFG Capital manages a $100 million portfolio invested equally in 60 different stocks. Half of the securities have a beta of 1.2 and a standard deviation of 20 percent. The other half of the securities have a beta of 0.8 and a standard deviation of 25 percent. Which of the following statements best describes RFG Capital's portfolio?
   A. RFG Capital's portfolio is not diversified.
   B. RFG Capital's portfolio has a standard deviation of 22.5%.
   C. RFG Capital's portfolio has an expected return of 22.5%.
   D. RFG Capital's portfolio has a beta equal to 1.0.

23. Peterson Tractors Inc. has an expected return of 15 percent over the upcoming twelve months. The company has a beta of approximately 1.4. Analysts estimate that the risk-free rate is currently at a level of 4.5 percent, and the expected return on the market as a whole is equal to 12 percent. Which of the following statements regarding Peterson is incorrect?
   A. A sudden increase in investor risk aversion would result in a market risk premium of less than 7.5%.
   B. A 1% increase in inflation expectations would lead to a 1% increase in Peterson's required return.
   C. An increase in the market risk premium of 1.5% would lead to an increase in Peterson's required return of more than 1.5%.
   D. Peterson's stock has an expected alpha of zero.

24. Sarah manages a $1,000,000 diversified portfolio consisting of 20 different equally weighted common stocks. The current portfolio has a beta of 0.8. She decides to sell a security that has a beta of 1.5. Sarah uses the proceeds to purchase another stock that has a beta of 0.5. Based on Sarah's changes, calculate the new beta of the portfolio:
   A. 0.65.
   B. 0.75.
   C. 0.85.
   D. 0.95.

25. As a senior manager at your investment management firm, you are expected to provide regular training to new employees. This month you are expected to discuss the slope of the characteristic line and the security market line. What should you tell the new employees that the slopes of these two lines equal?

   Use the following information to answer Questions 26 and 27:

**Characteristic Line** | **Security Market Line**
---|---
A. standard deviation | market risk premium
B. beta | market return
C. standard deviation | market return
D. beta | market risk premium

Chapter 6: Portfolio Theory
Suppose you invest $9,000 in the S&P 500 stock market index and $1,000 in Treasury bills. Assume the S&P 500 index has an expected return of 10 percent and a standard deviation of 20 percent. The T-bill rate is 2 percent.

26. What is the expected return on your portfolio?
   A. 6.0%.
   B. 9.0%.
   C. 9.2%.
   D. 10.0%.

27. What is the standard deviation on your portfolio?
   A. 9%.
   B. 12%.
   C. 15%.
   D. 18%.

28. A portfolio manager at 22nd Street Capital has just added 200 shares of EBN stock to his portfolio. The portfolio manager added EBN after considering the company and three of its primary competitors all offering the same expected return. Which of the following is most likely the reason the portfolio manager chose EBN over its competitors?
   A. EBN offered the largest level of alpha of the four stocks under consideration.
   B. EBN exhibited the lowest level of correlation with the manager’s existing portfolio of assets.
   C. EBN had the greatest increase in quantity of sales over the last six months.
   D. Of the four stocks under consideration, EBN was trading at the lowest price per share in the stock market.

29. If the investor’s risk aversion increases:
   A. the slope of the capital market line will fall.
   B. the tangency point between the investor’s indifference curve and the capital market line slides down the capital market line.
   C. the slope of the security market line rises.
   D. the investor’s indifference curve becomes less steep.

30. Another name for unsystematic risk is:
   A. non-diversifiable risk.
   B. diversifiable risk.
   C. market risk.
   D. beta.

31. According to the CAPM, the required return for an asset with a zero beta equals:
   A. zero.
   B. the market return.
   C. the market premium.
   D. the risk-free rate.

32. The expected return on CVJ stock is 14 percent for the coming year. Investors currently require a return of 12 percent on CVJ common stock. Holding all else constant, which of the following would lead to a decrease in the expected alpha on CVJ stock?
   A. Investor’s inflation expectations suddenly decrease.
   B. The general level of investor risk aversion increases in the marketplace.
   C. The risk-free rate of interest suddenly decreases by 1%.
   D. The distance between CVJ’s expected return and its position on the SML increases.
33. According to the life cycle approach to investing, for which of the following scenarios would a large allocation of the portfolio to risky assets be the most appropriate?

A. For a client who is newly retired, age 63.
B. For a client who is in the later stages of life, age 90.
C. For a client who is in earlier stage of his career, age 30.
D. For a client who is in the later stage of his career, age 55.

34. Jimmy Daniels has just been promoted to managing director of his asset management firm. Daniels will no longer manage individual accounts but will oversee all of the portfolio managers working for his firm. The manager taking over Daniels’ accounts should be able to meet Daniels’ former investors’ goals by reading their associated investment policy statements if Daniels has done which of the following?

A. Carefully defined the return requirements according to the national average for investors of the same age.
B. Carefully defined the risk tolerance and return requirements in light of the portfolio limitations.
C. Tracked the portfolio investment style using notes in the investors’ electronic accounts.
D. Maintained an investment style that tracks the benchmark stated in the investment policy statement.

35. Your high net-worth client states she is investing now for her daughter’s college education. Your client is 35 years old, and her daughter will attend college in 10 years. Select the most appropriate statement.

A. Your client has high short-term cash flow limitations.
B. Your client has high legal restrictions and low tax planning needs.
C. Your client’s most important limitations are time horizon and taxes.
D. Your client is highly risk averse.

Answers

1. B

When stocks move in exactly the opposite direction they are said to be perfectly negatively correlated and have a correlation coefficient of negative one.

2. A

A rational investor will always maximize return for a given level of risk. The standard deviations of SaveCo and SpendCo are equal, so the investor should choose SaveCo since the expected return is higher for the same risk level. Thrift Inc. should be preferred to SaveCo since it has both a higher expected return and a lower standard deviation. Money Corp. has a risk level (standard deviation) that is disproportionately higher than its higher level of expected return. By investing in Money Corp., the investor would need to more than double standard deviation in order to gain only one percentage point in expected return, which would not be a rational choice.

3. B

\[ E(R) = 0.2(23) + 0.4(11) + 0.3(-8) + 0.1(-12) = 5.4\% \]

4. D

\[ \sigma_p = \left[ \left(0.23 - 0.054\right)^2(0.2) + \left(0.11 - 0.054\right)^2(0.4) + \left(-0.08 - 0.054\right)^2(0.3) + \left(-0.12 - 0.054\right)^2(0.1) \right]^{1/2} = 12.6\% \]
5. C

\[ \sigma_P^2 = (0.4)^2(0.04)^2 + (0.6)^2(0.055)^2 + 2(0.4)(0.6)(0.055)(0.4) \]

\[ = 0.0017674 \]

\[ \sigma_P = (\sigma_P^2)^{\frac{1}{2}} = (0.0017674)^{\frac{1}{2}} = 0.042 \]

6. A

The characteristic line is used to estimate a stock’s or a portfolio’s beta, which is a measure of systematic risk. The market by definition has a beta of one. Therefore a stock with a beta greater than one has above-average systematic risk, and a stock with a beta less than one has below-average systematic risk.

7. A

To achieve the most diversification, you want to combine stocks with the least correlation. Stock A and Stock C have a correlation of –0.80, the lowest in the table. To achieve the least diversification, combine stocks with the highest correlation. Stock B and Stock D have the greatest level of correlation.

8. B

Portfolio beta is the weighted average of the betas within the portfolio. If an equally weighted portfolio of two assets has a beta of 0.5 and one asset in the portfolio has a beta of zero, the following equation must be true:

\[ 0.5 = 0.5(0) + 0.5(\beta) \Rightarrow \beta = \frac{0.5 - 0.5(0)}{0.5} = 1 \]

Since the standard deviation of the risk-free asset is 0.0, its beta must also be 0.0. Therefore one asset in the portfolio is the risk-free asset. Beta measures the volatility of an asset’s return relative to the market, so the beta for the market must be 1.0. Therefore the remaining asset in the portfolio must be the market portfolio.

9. C

\[ \beta_T = \sum_{i=1}^{n} w_i \beta_i = \frac{2.5}{10.0} + \frac{3.9}{10.0} \cdot 1.5 + \frac{3.5}{10.0} \cdot 0.7 + \frac{1.0}{10.0} \cdot 0.5 = 0.97 \]

10. B

The market risk premium is the slope of the CAPM, \((k_m - r_i)\). Since \(r_i = 3\%\) and \(k_m = 10\%\), the market premium is 7%.

11. B

When inflation expectations increase, the SML shifts up. The required return on all assets will increase two percentage points, so your portfolio’s required return will increase to 16%.

12. C

Modern Portfolio Theory (MPT) suggests that investors will demand higher return (higher risk premium) if risk aversion rises. The required return is used as the discount rate when valuing assets. Present
value (fair value) is inversely related to discount rates.

13. C

The capital market line uses total risk (standard deviation) as its measure of risk, not beta.

14. A

60% of the total available funds will be allocated to the market portfolio which consists of three asset classes. The available funds would be allocated to the three asset classes in the following percentages:

W_{stocks} = 0.60 \times 0.60 = 0.36 = 36%
W_{bonds} = 0.60 \times 0.30 = 0.18 = 18%
W_{real estate} = 0.60 \times 0.10 = 0.06 = 6%

15. D

To answer this question, we must first find the expected return on the market portfolio (which is the weighted average of the expected returns on the portfolio assets):

E(R_p) = 0.6(15\%) + 0.3(7\%) + 0.1(8\%) = 11.9\%

Next we find the weighted average of the expected returns on the market portfolio and the risk-free asset (70% is allocated to the market portfolio and 30% to the risk-free asset):

E(R_p) = 0.7(11.9\%) + 0.3(5\%) = 9.1\%

16. A

The security market line is a graph of the CAPM and as such uses the beta as the relevant measure of risk.

17. C

The Sharpe ratio equals the excess return (portfolio return minus the risk free rate) divided by the standard deviation of the portfolio:

(0.10 – 0.05) / 0.10 = 0.05 / 0.10 = 0.50

18. C

k = r_t + \times \text{market risk premium} = 0.03 + 2(0.08) = 0.19

19. A

Alpha equals the difference between the expected (predicted) return and the required return. HTG has an expected return of 13\% over the coming year. HTG’s required return can be calculated using the CAPM:

R_{HTG} = 2.5 +1.2(9.0 - 2.5) = 10.3\%

This means that the stock is attractive (undervalued today) by 13.0 – 10.3 = 2.7 percentage points.

20. B
Diversification reduces or eliminates only unsystematic risk. A portfolio of 47 stocks most likely contains little unsystematic risk. Therefore adding more stocks to the portfolio will not significantly increase the diversification benefits of the portfolio. Therefore the cost to add more stocks to the portfolio may not be worthwhile.

21. D

β (R_m - r_i) = company risk premium; (R_m - r_i) = market risk premium

22. D

\[
\beta_p = \sum_{i=1}^{n} w_i \beta_i
\]

\[
\beta_p = 0.5(1.2) + 0.5(0.8) = 1.0
\]

It is statistically incorrect to take the weighted-average standard deviation to create a portfolio standard deviation because of correlation of the individual assets.

23. A

An increase in investor risk aversion would tend to drive the market risk premium up. Since the current market risk premium is equal to 12% – 4.5% = 7.5%, an increase in risk aversion would lead to a market risk premium of greater than, not less than, 7.5%.

24. B

\[
\beta_p = \sum_{i=1}^{n} w_i \beta_i
\]

\[
\frac{1}{w_i} = \frac{20}{0.05} = 0.05
\]

portfolio beta = 0.8 - 0.05(1.5) + 0.05(0.5) = 0.75

25. D

The slope of the characteristic line is beta. It is an estimate of the sensitivity of a security’s returns to the returns on the aggregate market. The security market line starts at the risk-free rate and extends through the market portfolio, which has a beta equal to one. Slope equals rise over run: Rise = market return less risk free rate, and run = market beta = 1, so rise/run = market return less risk free rate, which is the market risk premium.

26. C

The portfolio expected return equals the weighted average of the two asset returns. You invest 90% in the market index and 10% in T-bills. The portfolio expected return therefore equals:

0.90(0.10) + 0.10(0.02) = 0.092
27. D

Note that the standard deviation for the risk-free asset equals zero. Also, the correlation of the risk-free asset with any risky asset equals zero. So the portfolio standard deviation formula simplifies to:

\[ \sigma_{p_{\text{m}}} = 0.90(0.20) = 0.18 \]

28. B

If all of the stocks under consideration are otherwise comparable in terms of expected return and risk, the stock with the lowest correlation with the existing portfolio will offer the greatest amount of diversification benefits.

29. B

As the investor’s risk aversion increases, his indifference curve will flatten out, causing the point of tangency to move closer to the risk-free point (slide down the capital market line).

30. B

Other names are diversifiable, firm-unique, or company-specific risk.

31. D

The equation for the CAPM is \[ k = r_f + (k_m - r_f). \] If beta equals zero, the required return equals the risk-free rate.

32. B

Alpha equals the difference between the predicted return and the required return. Graphically, it equals the vertical distance of the predicted return from the security market line (SML). If the alpha is positive, the predicted return exceeds the required return. The predicted return lies above the security market line, and the stock is attractive (currently undervalued). If the general level of investor risk aversion increases, the SML will rotate upwards, decreasing the distance between CVJ's expected return and its required return on the SML. This upward rotation of the SML would also decrease the expected alpha on CVJ stock.

33. C

Investors in the earlier stages of their career have higher risk tolerance and higher return requirements. They have a long time horizon and can withstand portfolio volatility. A higher allocation to stocks is more appropriate in this stage of life.

34. B

An investment policy statement should state clearly and carefully the risk tolerance, return requirements, and portfolio limitations so that the policy is portable to another manager should the need arise. These items should be defined according to the investor’s unique circumstances, not according to national averages or other rules of thumb.

35. C

Investor limitations typically include cash flow (liquidity) needs, investment time horizon, legal requirements, and taxes. Your client has a clear time horizon limitation of 10 years and will pay for her daughter’s education with after-tax dollars. As her advisor, you must emphasize these limitations. It
does not appear that your client will need any withdrawals from her investment portfolio until 10 years from now (low cash flow limitations), and there's nothing in the information to suggest that your client is highly risk averse.
Chapter Seven: Securities Analysis

Overview

The analysis of equity, debt, and derivative securities is a primary function of securities analysts and portfolio managers and is also part of the core curriculum for the CFA program. Understanding the features of these securities and the methods used to analyze and value them is essential to success as a CFA candidate. In this we present the foundation for the securities analysis material you will learn in the Level I curriculum. Section 1 presents the basic components of analyzing and valuing equity securities. Section 2 of this chapter focuses on fundamental concepts for analyzing and valuing debt securities. In Section 3, we present the basic features of derivatives that are necessary to understand and analyze such securities. However, the valuation of derivative instruments is complex and beyond the scope of this text.

Section 1: Equity Securities

Companies finance their operations primarily by issuing debt or by selling off ownership (equity) to the public. This section focuses on the analysis and valuation of the ownership equity issued by public corporations. The most common form of equity issued by corporations is common stock, which is a security that represents part ownership in a company.

We begin this section with an overview of the equity valuation framework. We then discuss key financial ratios that characterize the performance of the company. We conclude this section with accepted methods for calculating the intrinsic value of a share of common stock. The intrinsic value is also known as the fair value of the stock. Mathematically the intrinsic value equals the present value of the cash flows that are expected to materialize in the future.

The market value of a company equals its stock price times shares outstanding. The market value is also called the company's market capitalization. Generally speaking, companies with market capitalizations less than $1 billion in today's market are called "small cap" companies, and companies with market capitalization greater than $25 billion are called "large cap" companies.

Chapter Objective: Discuss the framework of and basic concepts related to the valuation of equity securities.

The Equity Valuation Framework

Before proceeding, it might be interesting to note that stock prices sometimes deviate significantly from their intrinsic value. Consider the case of Priceline.com Inc., the "name your own price" internet services company. The company first issued shares of stock in 1999 at a price of $69 per share, for a market value of approximately $9.8 billion, much larger than most successful companies that had been in business for decades. By the end of the first month of trading, the stock price soared to $162, and Priceline's market value jumped to $23 billion. Interestingly, the very largest companies in the market are identified as having market values of $25 billion and up in today's market. So within a month of issuing stock, Priceline.com became ranked among the giant companies in the world.

Did Priceline.com deserve a lofty ranking among the largest companies in the world? Consider that the company's earnings (net income) for 1998 through 2002 were negative $65 million, negative $79 million, negative $329 million, negative $18 million, and negative 20 million, respectively. The company did not turn
a profit until 2003. Eventually, Priceline.com’s stock price sank to $1.13 on December 26, 2000 and its market value plunged to $190 million.\(^1\) A chart of Priceline.com’s market value is provided below.

![Priceline.com Market Value](image)

**Figure 1: Priceline.com Market Value**

Investors in Priceline.com and similar dot.com companies got caught up in a classic **speculative bubble**, in which stock prices are driven more by emotion and fads than by discipline and facts. As we know, bubbles can grow to a nice large size and they’re great fun to watch, but eventually the bubble bursts. The bigger the bubble, the bigger the messy aftermath. Stock prices reached untenable levels in the late 1990s and then came crashing down with a resounding thud. For instance, the NASDAQ index of primarily smaller technology companies hit its peak in March 2000. By the end of the year 2000, the tech bubble burst and the index had plunged 40 percent from its high. Today, nearly 5 years later, the NASDAQ index isn’t even close to half of its March 2000 high.

Interestingly, or shall we say, ironically, sound methods for valuing companies and for avoiding speculative bubbles such as the dot.com craze were provided nearly 70 years earlier by Benjamin Graham and David Dodd in their seminal work *Security Analysis*.\(^2\) The authors provided sanity in the midst of the chaos of the depression market when asset prices deviated significantly from reasonable values. Graham and Dodd provided a systematic and disciplined approach to equity analysis. The two key components are **financial statement analysis** and **equity valuation**.

**Financial statement analysis** refers to extensive, unbiased examination of the company’s financial statements and key financial ratios. Analysts also must exercise care and due diligence with the numbers they examine. In particular, analysts should always perform checks on the **earnings quality** of the firm, identifying aggressive use of accounting policies that may underlie the earnings reported by the company. Two good examples of the use of aggressive accounting are recording revenues too quickly and recording expenses too slowly.

The capitalization of income method is useful not only for valuing equity securities but for other types of securities as well. Many investments can be valued by estimating the expected cash flows the instrument will produce and finding the present risk-adjusted value of those cash flows.

Second, after performing a clear and extensive examination of the financial statements, the analyst proceeds to the valuation component. The centerpiece of the valuation component is the **capitalization of income method**, which is used to calculate the intrinsic value of the company’s stock.

**Chapter Objective:** List the steps in the capitalization of income method for determining the intrinsic value of a stock.
Steps in the *capitalization of income method* are:

- Estimate the amount and timing of all future cash flows.
- Estimate the risk (uncertainty) associated with cash flows.
- Assign a required return based upon risk.
- Find the total present value (today) of all the expected future cash flows.

**Chapter Objective:** Classify ratios into as internal liquidity, operating performance, risk, growth, and external liquidity, and demonstrate how ratios can be used to analyze financial statements.

We refer to all current accounts collectively as working capital. When we compare current assets to current liabilities, we refer to the excess of current assets over current liabilities as Net Working Capital, or sometimes just working capital.

**Financial Statement Analysis Using Ratios**

**Ratio Analysis**

Ratios can be used to evaluate five different facets of a company’s performance and condition: 1) internal liquidity, 2) operating performance, 3) risk profile, 4) growth potential, and 5) external liquidity.

**Internal Liquidity**

In this context, liquidity refers to how quickly or even if the firm can meet its short-term obligations, such as accounts payable. Generally, more liquidity is preferred to less.

Some firms have very specialized inventory that is not readily utilized by many other firms. Also, the firm might have inventory that is undesirable, such as soon-to-be outdated semiconductors. In these cases liquidating inventory to meet current obligations is not a viable alternative.

3. The **current ratio**, calculated as the ratio of current assets (CA) to current liabilities (CL), is the best-known measure of liquidity:

\[
\text{current ratio, CR} = \frac{CA}{CL}
\]

The higher the current ratio (i.e., the more current assets as compared to current liabilities), the more likely it is that the company will be able to pay its short-term bills. A current ratio less than one means the company has negative net working capital (defined as current assets minus current liabilities), and it is probably facing a liquidity crisis. Generally, since current assets are used to pay current liabilities, the greater the current ratio the better the operational health of the firm.

- The **quick ratio** is a more stringent measure of liquidity than the current ratio because it does not include inventories, which might not be very liquid. That is, the more specialized the firm’s inventory (Inv), the less likely it can be liquidated to meet current obligations.
inv quick ratio = \[ \frac{CA - Inv}{CL} \]

The higher the quick ratio, sometimes called the acid test ratio, the more likely the company will be able to pay its short-term bills.

4. The **receivables turnover ratio** measures generally how quickly the company collects aggregate accounts receivable (A/R). In other words, it measures the rate of sales compared to the collection of sales revenues.

\[ \frac{sales}{receivables\ turnover} = \frac{A}{R} \]

It is considered desirable to have a receivables turnover figure close to the average receivables turnover of the other companies in the same industry.

3. The **average collection period** is the inverse of the receivables turnover multiplied by 365. It measures the average number of days it takes for the company’s credit customers (accounts receivable) to pay their bills:

\[ \frac{365}{receivables\ turnover} \]

Notice that if the company’s average collection period is 60 days, its receivables turnover will be 365/60, or approximately 6. Using the same logic, if its receivables turnover is approximately 6, the average collection period will be 60 days. It is considered desirable to have a collection period (and receivables turnover) close to that of the average company in the same industry.

C. The **inventory turnover ratio** measures the firm’s efficiency in processing and managing its inventory:

\[ \frac{COGS}{Inv} \]

The inventory turnover equals the number of times the company’s inventory can be sold (turned over) during the year. Generally, the higher the ratio, the better. If the ratio is low, it may indicate that the inventory is illiquid, obsolete, and is not being sold.

C. The **payables turnover ratio** measures generally how quickly the firm meets its accounts payables (A/P). In other words, it measures the rate of sales compared to rate of payment of trade credit:

\[ \frac{COGS}{AP} \]

The payables turnover equals the number of times the accounts payable turnover during the year. If the ratio is high, the time between purchase and payment by the company is short (generally considered good). A low ratio may indicate that the company does not have sufficient cash to pay its bills and is postponing payment.

D. The **payables payment period** is the inverse of the payables turnover ratio multiplied by 365. It measures the average amount of time it takes the company to pay its bills:
Operating Performance

Performance ratios can help to determine how well management operates the business. They can be divided into two categories: efficiency ratios, which deal with management’s efficient utilization of the firm’s assets, and profitability ratios, which measure how efficiently management manages costs in generating profits.

Efficiency Ratios

D. The total asset turnover ratio measures how efficiently management is utilizing all the firm’s assets considered together [i.e., total assets (TA)]:

\[
\text{total asset turnover, } \text{TAT} = \frac{\text{sales}}{TA}
\]

Different types of industries might have considerably different turnover ratios. Manufacturing businesses that are capital intensive might have total asset turnover ratios near one, while retail businesses might have total asset turnover ratios near ten. Again, it is desirable for the firm to have a total asset turnover ratio close to the average for the industry. A total asset turnover ratio less than the industry average might mean the company has too many assets for its level of production (i.e., it is not fully utilizing its assets). A total asset turnover ratio higher than the industry average could imply the firm has outdated (fully depreciated) and inefficient capital assets. Naturally, if the assets are not outdated, a high asset turnover is good.

C. The fixed asset turnover ratio measures how efficiently management is utilizing just the fixed assets (FA). Current assets are not included in the denominator:

\[
\text{fixed asset turnover, } \text{FAT} = \frac{\text{sales}}{FA}
\]

Again, it is desirable to have a ratio close to the industry norm. An FAT lower than the industry average could mean the company is not fully utilizing its fixed assets. An FAT higher than the industry average might imply the firm has obsolete equipment (fully depreciated). Once again, if the fixed assets are not obsolete, a high FAT is good.

Profitability Ratios

Profitability ratios measure how good management is at turning its efforts into profits. Basically, profitability ratios compare the top of the income statement (sales) to profits and measure how efficiently management is managing expenses. The different ratios are designed to isolate specific costs. Before we proceed to the profitability ratios, here are some important terms and their relation to the income statement:

<table>
<thead>
<tr>
<th>Important terms:</th>
</tr>
</thead>
</table>
Gross profits = net sales – COGS
Operating profits = earnings before interest and taxes (EBIT)
Net income = earnings after taxes (EAT)
Capital = long-term debt + short-term debt + equity

<table>
<thead>
<tr>
<th>How they relate in the income statement:</th>
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<tbody>
<tr>
<td>Sales</td>
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<tr>
<td>– COGS</td>
</tr>
<tr>
<td>Gross profit</td>
</tr>
<tr>
<td>– Operating expenses</td>
</tr>
<tr>
<td>Operating profit (EBIT)</td>
</tr>
<tr>
<td>– Interest</td>
</tr>
<tr>
<td>Earnings before taxes (EBT)</td>
</tr>
<tr>
<td>– Taxes</td>
</tr>
<tr>
<td>Earnings after taxes (EAT) = net income</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Also note that from the balance sheet:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liabilities + equity = assets, or</td>
</tr>
<tr>
<td>Equity = assets − liabilities</td>
</tr>
</tbody>
</table>

L. The **gross profit margin** is the ratio of gross profit (sales less cost of goods sold) to sales:

\[
gross \text{ profit margin} = \frac{\text{gross profit}}{\text{sales}}
\]

Obviously management wants this ratio, as well as any other profitability ratio, to be at least as great as the industry average. The gross profit margin indicates how well the company controls their cost of goods sold.

N. The **operating profit margin** is the ratio of operating profit (gross profit less expenses) to sales. Operating profit is also referred to as earnings before interest and taxes (EBIT): operating profit EBIT

\[
\text{operating profit margin} = \frac{\text{operating profit}}{\text{sales}} = \frac{\text{EBIT}}{\text{sales}}
\]

The operating profit margin indicates how well the company controls its selling and production costs (rents, salaries, utilities expenses, advertising, depreciation, etc.). In other words, the operating margin indicates if the company runs a tight ship.

E. The **net profit margin** is the ratio of net income (NI, also called “earnings”) to sales:

\[
\text{net profit margin} = \frac{\text{NI}}{\text{sales}}
\]

The net profit margin indicates how well the company controls all its expenses (including interest and taxes). A high net profit margin is desirable.

C. The **return on assets** is the ratio of net income to total assets:
return on assets = \[
\frac{NI}{TA}
\]

The analyst should be concerned if the ROA is too low relative to the company’s peers.

E. The **return on equity** is the ratio of net income to total equity:

\[
\text{return on total equity} = \frac{NI}{\text{total equity}}
\]

F. Analysts should be concerned if this ratio is too low relative to the company’s peers.

### Risk Analysis

Risk analysis calculations measure the *uncertainty* of the firm’s income flows. They can be divided into two groups, those that measure **business risk** and those that measure **financial risk**.

**Business risk** is the uncertainty regarding the operating income of a company (EBIT) and is a result of the variability of sales and production costs. The three calculations that measure business risk are business risk, sales volatility, and operating leverage.

**Financial risk** is the additional volatility of equity returns (ROE) caused by the firm’s use of debt. Financial risk can be measured using balance sheet ratios, which include the debt/equity ratio, the long-term debt/total capital ratio, and the total debt ratio; or earnings and cash flow ratios, which include the interest coverage ratio, the fixed financial charge ratio, the total fixed charge coverage ratio, the cash flow/interest expense ratio, the cash flow coverage ratio, the cash flow/long-term debt ratio, and the cash flow/total debt ratio.

E. The **coefficient of variation** is a general way of measuring risk of any data series. It is calculated as the standard deviation of the data series divided by its mean. **Business risk** is often measured as the coefficient of variation of a company’s operating income (EBIT) over several years:

\[
\text{business risk} = \frac{\sigma_{\text{EBIT}}}{\text{average EBIT}}
\]

where:

\( \sigma_{\text{EBIT}} \) = standard deviation of EBIT over the period

Between five and ten years of data should be used to calculate the coefficient of variation because using less data does not yield much statistical reliability, and data more than ten years old is likely not to be relevant to the company’s present situation. Analysts will be concerned if this ratio is too high (relative to the company’s peers).

E. One of the contributing sources of earnings variability is **sales volatility**. Sales volatility is the coefficient of variation of sales over several years:

\[
\text{sales volatility} = \frac{\sigma_{\text{sales}}}{\text{average sales}}
\]

As was the case for business risk, between five and ten years of data should be used in this calculation. Analysts should be concerned if this ratio is too high (relative to the company’s peers).

E. **Operating leverage** is a measure of the variability of operating earnings. A simple definition is:
operating leverage = \frac{FC}{TC}

where:

FC = fixed costs

TC = total costs (fixed plus variable costs)

The ratio measures how much of the company’s production costs are fixed (as opposed to variable). The greater the use of fixed costs, the more operating income (EBIT) will change when sales change. A high operating leverage indicates that the company’s EBIT will be ultra sensitive to changing business cycle conditions. EBIT will rise more than other companies during up periods and will fall more than other companies during down periods.

E. The debt-equity ratio measures management’s use of fixed-cost financing as opposed to equity in financing the firm’s assets:

\frac{\text{long-term debt}}{\text{total equity}}

debt-equity ratio =

Increases and decreases in this ratio suggest a greater or lesser reliance on debt as a source of financing.

E. The debt to assets, or simply debt ratio equals the ratio of total debt to total assets and is another way of measuring management’s use of debt to finance the firm’s assets:

\frac{TD}{TA}

debt to assets =

where

TD = total debt

TA = total assets

Increases and decreases in this ratio suggest a greater or lesser reliance on debt as a source of financing.

E. The interest coverage ratio, also known as the times-interest-earned ratio, measures the firm’s ability to meet its interest (debt) obligations from operating income (EBIT):

\frac{EBIT}{\text{interest expense}}

interest coverage =

The higher this ratio, the more likely it is that the firm will be able to meet its interest payments.

**Growth Analysis**

Owners and creditors are interested in the firm’s growth potential. Owners pay attention to growth because stock valuation is dependent on the future growth rate of the firm’s cash flows. The analysis of growth potential is important to creditors because the firm’s future prospects are crucial to its ability to pay existing debt obligations. If the company does not grow, it stands a much greater chance of defaulting on its loans. In theory, the growth rate of a firm is a function of the rate of return earned on its resources and the amount of resources (profits) retained and reinvested.
For many reasons, all firms go through periods of below- or above-average growth. Analysts are therefore interested in the firm’s long-run, sustainable growth rate. This is the rate of growth (increase in assets) the firm can maintain without having to sell new common stock. To calculate the sustainable growth rate for a firm, we must know its return on equity, ROE, and the proportion of earnings reinvested in the firm [i.e., the retention rate (RR)].

E. The **sustainable growth rate**, \( g \), is calculated as:

\[
g = RR \times ROE 
\]

where:

- \( RR \) = retention rate
- \( ROE \) = return on (common) equity

Debt is considered leverage because it lever (magnifies) both profits and losses. Whenever the firm has positive net income, it has positive ROE. If the firm is profitable and has used too much debt, its ROE might be very high compared to the rest of the industry, but its debt ratio will be out of line (too high). This is only one example of why you must look at more than just one ratio when you analyze a firm’s financial statements.

F. The **retention rate** is the percentage of net income that is retained as retained earnings and reinvested in the company. The dividend payout ratio is the percentage of net income paid out to the common stockholders as dividends. The sum of the two must equal 100%.

\[
\text{dividend payout ratio} = \frac{\text{dividends paid}}{\text{net income}}
\]

and

\[
\text{retention rate} = (1 - \text{dividend payout ratio}) = \left(1 - \frac{\text{dividends}}{\text{net income}}\right)
\]

**Example: Sustainable Growth Rate**

**Calculate** the sustainable growth rate for the following three firms:

<table>
<thead>
<tr>
<th>Company</th>
<th>A</th>
<th>B</th>
<th>C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earnings per share</td>
<td>3.00</td>
<td>4.00</td>
<td>5.00</td>
</tr>
<tr>
<td>Dividends per share</td>
<td>1.50</td>
<td>1.00</td>
<td>2.00</td>
</tr>
<tr>
<td>Return on equity</td>
<td>14%</td>
<td>12%</td>
<td>10%</td>
</tr>
</tbody>
</table>

**Relative Ratio Analysis**

The value of a single financial ratio is not meaningful by itself but must be interpreted relative to one of three factors: industry norms, overall economy norms, and the company’s own historical (past) performance.
E. Comparison to the industry norm (average) is the most common type of comparison. Industry comparisons are particularly valid when the products generated by all the firms in the industry are similar.

F. Comparing a company to the overall economy is particularly important when overall business conditions are changing. For example, a stable profit margin might be considered good if the economy is in recession and the economy-wide average profit margin is declining. On the other hand, it might be considered problematic if a stable profit margin occurs during an economic expansion, and overall average profit margins are increasing.

G. Comparing a firm with its history is very common. Typically the analyst will look at the current level of the ratio and then look to see if it has been declining over time, stable over time, or improving over time.

In most ratio comparisons it is considered desirable to be near the industry (or economy) average. For example, in all turnover ratios, a value could be considered too high or too low if it differs widely from the industry average. However, for some ratios, simply being high is considered good, even if it deviates from the industry average. This is true for most ratios involving income or cash flow. For example, most analysts would agree that having a high return on assets or high profit margin is good. An analyst would not suggest that a company with a return on assets of 15 percent when the industry average was 10 percent had an ROA that was too high.

Sometimes the “goodness” of a ratio depends on the context. A high ROE that results from high profit margins or asset turnover is typically looked upon favorably. However, high ROEs that result from the overuse of debt (leverage) are typically met with a great deal of skepticism.

**Chapter Objective:** Perform a comprehensive ratio analysis of a firm.

### Comprehensive Example Of A Ratio Analysis Of A Firm

The following table provides a company’s balance sheets for 2003 and 2004 and income statement for 2004.

**Balance Sheets**  
December 31, 2003 and 2004

<table>
<thead>
<tr>
<th>Year</th>
<th>2004</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>$105</td>
<td>$95</td>
</tr>
<tr>
<td>Receivables</td>
<td>205</td>
<td>195</td>
</tr>
<tr>
<td>Inventory</td>
<td>310</td>
<td>290</td>
</tr>
<tr>
<td>Total current assets</td>
<td>620</td>
<td>580</td>
</tr>
<tr>
<td>Gross property, plant, and equipment</td>
<td>1,800</td>
<td>1,700</td>
</tr>
<tr>
<td>Accumulated depreciation</td>
<td>360</td>
<td>340</td>
</tr>
<tr>
<td>Net property, plant, and equipment</td>
<td>1,440</td>
<td>1,360</td>
</tr>
<tr>
<td><strong>Total assets</strong></td>
<td>2,060</td>
<td>1,940</td>
</tr>
<tr>
<td>Payables</td>
<td>110</td>
<td>90</td>
</tr>
<tr>
<td>Short-term debt</td>
<td>160</td>
<td>140</td>
</tr>
<tr>
<td>Current portion of long-term debt</td>
<td>55</td>
<td>45</td>
</tr>
<tr>
<td>Current liabilities</td>
<td>325</td>
<td>275</td>
</tr>
<tr>
<td>---------------------</td>
<td>-----</td>
<td>-----</td>
</tr>
<tr>
<td>Deferred taxes</td>
<td>105</td>
<td>95</td>
</tr>
<tr>
<td>Long-term debt</td>
<td>610</td>
<td>690</td>
</tr>
<tr>
<td>Common stock</td>
<td>300</td>
<td>300</td>
</tr>
<tr>
<td>Additional paid in capital</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Retained earnings</td>
<td>320</td>
<td>180</td>
</tr>
<tr>
<td>Common shareholders equity</td>
<td>1,020</td>
<td>880</td>
</tr>
<tr>
<td><strong>Total liabilities and equity</strong></td>
<td><strong>$2,060</strong></td>
<td><strong>$1,940</strong></td>
</tr>
</tbody>
</table>

### Income Statement

**Year Ending December 31, 2004**

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales</td>
<td>$4,000</td>
</tr>
<tr>
<td>Cost of goods sold</td>
<td>3,000</td>
</tr>
<tr>
<td>Gross profit</td>
<td>1,000</td>
</tr>
<tr>
<td>Operating expenses</td>
<td>650</td>
</tr>
<tr>
<td>EBIT</td>
<td>350</td>
</tr>
<tr>
<td>Interest expense</td>
<td>50</td>
</tr>
<tr>
<td>Earnings before taxes</td>
<td>300</td>
</tr>
<tr>
<td>Taxes</td>
<td>100</td>
</tr>
<tr>
<td>Net income</td>
<td>200</td>
</tr>
<tr>
<td>Common dividends</td>
<td>60</td>
</tr>
</tbody>
</table>

Ratios for the industry and the 2003 ratios for the company are reported in the following table:

<table>
<thead>
<tr>
<th></th>
<th>2003</th>
<th>Industry</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current ratio</td>
<td>2.1</td>
<td>1.5</td>
</tr>
<tr>
<td>Quick ratio</td>
<td>1.00</td>
<td>0.90</td>
</tr>
<tr>
<td>Average collection period</td>
<td>18.9</td>
<td>18.0</td>
</tr>
<tr>
<td>Inventory turnover</td>
<td>10.7</td>
<td>12.0</td>
</tr>
<tr>
<td>Total asset turnover</td>
<td>2.30</td>
<td>2.40</td>
</tr>
<tr>
<td>Gross profit margin</td>
<td>27.4%</td>
<td>29.3%</td>
</tr>
<tr>
<td>Net profit margin</td>
<td>5.8%</td>
<td>6.5%</td>
</tr>
<tr>
<td>Return on assets</td>
<td>13.3%</td>
<td>15.6%</td>
</tr>
<tr>
<td>Return on equity</td>
<td>24.1%</td>
<td>19.8%</td>
</tr>
</tbody>
</table>
Using the company information, calculate the 2004 ratios, and discuss how these ratios compare with the company’s performance last year and with the industry’s performance.

**Answer:**

E. **Current ratio** = current assets / current liabilities
   
   Current ratio = 620 / 325 = 1.9
   
   The current ratio indicates lower liquidity levels when compared to last year and more liquidity than the industry average.

F. **Quick ratio** = (cash + receivables) / current liabilities
   
   Quick ratio = (105 + 205) / 325 = 0.95
   
   The quick ratio is lower than last year and is above the industry average.

G. **Average collection period** = 365 / (sales / receivables)
   
   Average collection period = 365 / (4,000 / 205) = 18.7
   
   The average collection period is a bit lower relative to the company’s past performance but slightly higher than the industry average.

H. **Inventory turnover** = cost of goods sold / inventory
   
   Inventory turnover = 3,000 / 310 = 9.7
   
   The inventory turnover is much lower than last year and the industry average. This suggests that the company is not managing inventory efficiently and may even have obsolete inventory.

The net profit margin and total asset turnover are as described above. The equity multiplier is the Du Pont system’s measure of leverage. The equity multiplier is also called financial leverage. The more leverage (debt) employed by management, the higher the equity multiplier and the more ROE is “leveraged” up. The higher (lower) the equity multiplier, the higher (lower) the debt ratio.

I. **Total asset turnover** = sales / assets
   
   Total asset turnover = 4,000 / 2,060 = 1.94
   
   The total asset turnover is lower than last year and the industry average. This might indicate the management is less efficient in the use of its assets, or perhaps there has been a broad market downturn negatively affecting sales.

J. **Gross profit margin** = gross profit / sales
   
   Gross profit margin = 1,000 / 4,000 = 25.0%
   
   The gross profit margin is lower than last year and much lower than the industry average. This might indicate that the cost of sales is not being controlled well.

K. **Net profit margin** = net income / sales
   
   Net profit margin = 200 / 4,000 = 5.0%
The net profit margin is lower than last year and much lower than the industry average. This might indicate that the cost of sales and production is not being controlled well.

L. Debt/equity ratio[^1] = long-term debt / total equity

\[
\text{Debt/equity ratio} = \frac{610}{1020} = 59.8\%
\]

The debt/equity ratio is lower than last year but still much higher than the industry average. This suggests the company is trying to get its debt level more in line with the industry.

M. Interest coverage = EBIT / interest expense

\[
\text{Interest coverage} = \frac{350}{50} = 7.0
\]

The interest coverage is better than last year but still worse than the industry average. This, along with the slip in profit margin and return on assets, might cause some concern.

N. Retention rate = 1 – (dividends / earnings)

\[
\text{Retention rate} = 1 – \left(\frac{60}{200}\right) = 70\%
\]

The retention rate is much higher than last year and much higher than the industry. This might suggest that the company is aware of its cash flow and earnings issues and is reinvesting cash into the company to improve the ratios. This is a wise decision as long as their profitability and performance ratios remain high.

O. ROA = net income / assets

\[
\text{ROA} = \frac{200}{2,060} = 0.097 = 9.7\%
\]

The return on assets is lower than last year and far below the industry average. While an ROA close to ten percent generally is quite good, the company’s ROA is lagging its industry competitors. Also, notice that the ROA dropped considerably from 2003 (when the ROA was 15.5 percent). The ROA also equals the product of the net profit margin and asset turnover \((0.05 \cdot 1.94 = 0.097)\)

P. ROE = net income / equity

\[
\text{ROE} = \frac{200}{1,020} = 0.196, \text{ or } 19.6\%
\]

The return on equity is lower than last year and slightly below the industry average.

Q. Sustainable growth rate, \(g = \text{retention rate} \cdot \text{ROE}\)

\[
\text{Sustainable growth rate} = 0.70 \cdot 0.196 = 0.137, \text{ or } 13.7\%
\]

With the high retention rate and good ROE, the company is positioned to grow at a faster rate than last year and faster than the rest of the industry. But note that actual growth (in earnings) can end up above or below the sustainable growth. Actual growth cannot exceed sustainable growth for long, however, because the company will run out of funds to finance its rapid growth. If actual growth consistently lags the sustainable growth, management is doing something wrong, and the company might get taken over, especially if the stock price is low.

Summary: The company’s liquidity, as measured by its current and quick ratios, is a little better than the industry as a whole. However, performance figures suggest that earnings continue to trail the industry, and turnover has worsened. The latter probably indicates the firm is employing too many assets to generate the level of sales. The interest coverage ratio has improved but still trails the industry. Although improving, it still might cause some concern for lenders.

The company’s debt-equity ratio is very high, indicating management is utilizing too much debt. Coupled with the very high retention rate (low dividend payout), this would indicate too much cash is being burned. That is, with the high retention of earnings, the company should have adequate cash for operations and investments, but it is borrowing heavily.

Chapter Objective: Perform a Du Pont system analysis of the company.


**Du Pont System**

The *Du Pont system* breaks down the components or drivers of the return on equity. Specifically, the ROE equals:

\[
\text{ROE} = \left( \frac{\text{net income}}{\text{sales}} \right) \left( \frac{\text{sales}}{\text{assets}} \right) \left( \frac{\text{assets}}{\text{equity}} \right)
\]

The genius of breaking ROE down into its component parts is that it indicates the firm’s weakness or strength in three separate areas:

E. **Operating efficiency.** The net profit margin catches all the efficiencies and inefficiencies of operating the firm. Poor efficiency produces low profit margins.

F. **Asset utilization.** The total asset turnover measures management’s efficient utilization of assets (i.e., higher or lower than industry average utilization). Under-utilization produces lower net income and return on assets due to excessive fixed costs relative to the level of sales.

G. **Leverage.** The equity multiplier captures management’s utilization of debt financing. Too much debt can mean too much risk, and too little signifies “debt capacity,” the ability to issue more debt without increasing risk or cost of capital. In other words, the company can improve profitability by borrowing when its performance more than offsets the interest costs of borrowing.

For our company:

\[
\text{ROE} = \left( \frac{0.05}{4,000} \right) \left( \frac{4,000}{2,060} \right) \left( \frac{2,060}{1,020} \right) = 0.196
\]

We again see that the company's ROE is about the same as the industry, so management’s first reaction may be to accept the number and carry on. Indeed, it should check the individual ratios in the Du Pont system to be sure that an average ROE isn’t masking some very poor and/or very good ratios.

We see that the firm’s total asset turnover (sales/assets) is about 1.94, while the industry average is 2.40. This would indicate an under-utilization of the firm’s assets, which should produce a lower-than-average return on assets (recall ROA = 9.7 percent, which is far below the industry average). Since its ROE is acceptable while its total asset turnover is low, the equity multiplier (assets/equity) must be high. Without even calculating the industry equity multiplier, we know that management is employing more debt than the industry average. This is confirmed by looking at the firm’s debt-to-equity ratio of 59.8% compared to 35.7% for the industry. So although the firm’s ROE is about average, it is masking a low profit margin and too much debt.

The cash flows associated with common stock are dividends and the selling price of the stock. Dividends are declared by the firm’s board of directors and are not contractual. Common stock is not a fixed income security.
Chapter Objective: List and discuss the limitations of ratios as a tool for financial statement analysis.

Limitations Of Financial Ratios

Although calculating and interpreting financial ratios might seem very straightforward, ratios can be very misleading, and the analyst must remember a few rules:

E. Financial ratios are not useful when viewed in isolation. They are only valid when compared to other similar firms and/or the company’s historical performance. All ratios must be viewed relative to one another over time. Conclusions cannot be made from viewing one set of ratios.

F. Comparisons with other companies can be difficult because of different accounting treatments (e.g., inventory). This is particularly important when analyzing non-U.S. firms.

G. It is difficult to find comparable industry ratios when analyzing companies that operate in multiple industries.

H. Determining the target or comparison value for a ratio is difficult, as the industry is often difficult to identify properly.

I. Ratios are used for internal analysis and comparisons and across firms. They are often most useful in identifying questions that need to be answered rather than answering questions directly. In conducting your analysis, you must always be aware of the limitations of ratios. Ask yourself these questions:
   A. Do the firms being compared have compatible accounting practices?
   B. Do the ratios give consistent readings? For example, if the debt ratio is too high, is the interest coverage ratio low?
   C. Do the ratios yield a reasonable figure for the industry?

Chapter Objective: Calculate and interpret the intrinsic value of a common stock.

Equity Valuation

Intrinsic Value

As with any other cash flow-producing asset, stocks can be valued using the capitalization of income method presented in the introduction to this section.

Step 1: Forecast the amount and timing of the cash flows that the investor expects to receive in the future. Ownership in common stock gives the owner the right to receive two forms of cash flows:

E. Income distributions in the form of dividends.
F. Selling price of the stock.

Dividends are declared by the board of directors of the company. Even though the exact amounts of the dividends are not known in advance, corporate boards usually favor a fairly consistent dividend pattern. So the chore of forecasting dividends might not be as laden with uncertainty as it seems. Therefore, most of the uncertainty surrounds the forecast of the future price of the stock.

Step 2: Estimate the risk (uncertainty) associated with the cash flows. A common statistic used to summarize the company’s risk is its beta. The stock’s beta measures the variability of the company’s stock return relative to a broad market index (such as the S&P 500 or the Wilshire 5000 stock market index). A
beta equal to 1.0 indicates a stock with average risk. Presumably, companies with highly volatile cash flows will have high betas. Refer to the Portfolio Theory chapter for a complete discussion of beta.

**Step 3:** Assign a required return based on the risk of the stock. The required return can be determined using the capital asset pricing model (CAPM), which also is described in detail in the Portfolio Theory chapter. The CAPM is the model that provides the minimum acceptable return for any asset. The required return is positively related to the stock’s beta. The required return will be used to discount the predicted cash flows when finding the present value.

**Step 4:** Find the total present value of all the cash flows.

A simple example: assume you are assigned to determine the intrinsic value (fair price) for Amazing Glass, Inc., a glass manufacturing firm, which is expected to pay the following dividend stream for the next 4 years:

<table>
<thead>
<tr>
<th>Year</th>
<th>Dividend</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>$2.40</td>
</tr>
<tr>
<td>2</td>
<td>$2.88</td>
</tr>
<tr>
<td>3</td>
<td>$3.46</td>
</tr>
<tr>
<td>4</td>
<td>$4.15</td>
</tr>
</tbody>
</table>

Moreover, assume you think the stock price four years from now will be $43.60. Your required return is 15 percent.

Solution: This is a simple present value problem covered in the Quantitative Methods chapter. To assist in the valuation of the stock under this scenario, we will illustrate our expected cash flows on a timeline as we did in the Quantitative Methods chapter:

![Figure 2: Expected Cash Flows](image)

The Gordon Growth Model is one of the most pervasive theories in modern financial theory and a heavily tested topic on the CFA exam.

The fair price or intrinsic value (today) equals the present value of the predicted cash flows:

\[
\frac{2.40}{1.15} + \frac{2.88}{(1.15)^2} + \frac{3.46}{(1.15)^3} + \frac{4.15}{(1.15)^4} + \frac{43.60}{(1.15)^4}
\]

\[
\frac{2.40}{1.3225} + \frac{2.88}{1.5209} + \frac{3.46}{1.7490} + \frac{4.15}{1.7490} + \frac{43.60}{1.7490}
\]

\[
2.09 + 2.18 + 2.28 + 2.38 + 24.93 = 33.86
\]

Therefore, the fair or intrinsic value for the stock is $33.86. In other words, given your assumptions about the future cash flows and riskiness associated with them, you think the stock is worth $33.86 per share.
A stock is deemed **overvalued** if the actual stock price exceeds the stock’s intrinsic value, in which case a “sell” recommendation is made. A stock is deemed **undervalued** if the actual stock price is less than the stock’s intrinsic value, in which case a “buy” recommendation is made. For instance, if Amazing Glass stock is trading at $30, you would conclude that the stock is undervalued. You think the stock is worth $33.86, but it’s trading for only $30 in the marketplace. You would recommend a purchase.

The remainder of this section presents models for predicting cash flows (future dividends and stock prices) needed to find the intrinsic value. We first discuss dividend discount models and then close the section with the earnings multiplier model.

### The Dividend Discount Model

The **dividend discount model** states that the intrinsic value for a stock equals the present value of all its expected future dividends:

\[
\text{intrinsic value} = \frac{D_1}{(1+k)} + \frac{D_2}{(1+k)^2} + \frac{D_3}{(1+k)^3} + \cdots + \frac{D_{\infty}}{(1+k)^\infty} \quad (1)
\]

where:

- \(D_t\) = the dividend expected at year \(t\)
- \(k\) = the required return (derived from the CAPM) for the stock

**Single-stage dividend discount model.** Estimating all future dividends and their present values could be a very time consuming process. One simplification is to assume that dividends grow at a constant rate forever (e.g., 5 percent growth forever). The model that assumes dividends will grow at a constant rate forever is called the **Gordon Growth Model**, named after Professor Myron Gordon who developed it in 1962. Of course, the model is merely a simplification, but it still provides a helpful starting point for intrinsic value determination.

For example, assume last year’s dividend, \(D_0\), was $2 and that dividends are assumed to increase 5 percent per year forever. Therefore, the expected yearly dividends equal:

- Year 1: \(D_1 = D_0 \times 1.05 = $2.10\)
- Year 2: \(D_2 = D_1 \times 1.05 = $2.10 \times 1.05 = $2.21\)
- Year 3: \(D_3 = D_2 \times 1.05 = $2.21 \times 1.05 = $2.32\)
- Year \(n\): \(D_n = D_{n-1} \times 1.05\)

In other words, each dividend is the previous dividend multiplied by one plus the expected rate of growth. In this manner we estimate all future dividends. Note that all the previously listed dividends are **expected** or **predicted** values. None of the future dividends are known with certainty at time 0.

The explicit growth period is the period during which the firm enjoys above-average growth in earnings and dividends. Analysts must explicitly estimate the firm’s growth rate during this period. During the implicit growth period, the firm performs at a sustainable, long-term rate of growth indicative of mature firms within its industry.

Professor Gordon showed that if we assume that **dividends grow at a constant rate forever**, the intrinsic value or fair price at time \(t\) can be calculated with the simple formula:
As an example of the single-stage dividend discount model, assume last year’s dividend was $2 and that you think dividends will increase 5 percent per year forever. Using the CAPM, you determine that the required return for the stock is 15 percent. Find the stock’s intrinsic value and make a buy or sell recommendation.

Solution: Next year’s predicted dividend (D1) is $2.10 (which equals last year’s dividend, $2, grown at 5 percent). The required return for the stock is 15 percent, and the expected growth rate in dividends is 5 percent. Therefore the intrinsic value equals:

\[
\text{intrinsic value} = \frac{D_{t+1}}{k - g} = \frac{2.10}{0.15 - 0.05} = \frac{2.10}{0.10} = $21
\]

Multi-stage dividend discount model. Notice that the constant growth dividend model does not work when the expected dividend growth rate equals or exceeds the stock’s required return. For instance, if the expected growth rate in the example above equals 15 percent, then the “intrinsic value” becomes infinity. Also, if the growth rate exceeds the required return, the “intrinsic value” turns negative. Neither of these outcomes is feasible because the growth rate cannot possibly equal or exceed the stock’s required return forever. The growth rate can exceed the required return temporarily, but not permanently. When companies experience high growth rates, competition will enter the company’s market, which will eventually erode profitability, and the growth rate will decline. Thus the company cannot possibly increase dividends forever at a supernormal rate. The solution to this problem lies in forecasting multiple growth stages for the firm, which we illustrate below.

Growth in dividends is typically tied directly to the growth of the firm. Although most firms are assumed to maintain consistency in growth, some firms might be in industries where new innovations result in exceptional growth over varying periods of time. Some might be able to maintain higher-than-normal growth rates for several years, while others might enjoy higher-than-normal growth for only months or a few years.

The period when firms are expected to perform well above (or below) average is known as the explicit growth period because the growth in earnings and dividends must be explicitly estimated. The period when the firm performs at a more sustainable, long-term rate of growth is called the implicit growth period. During this period we assume the firm will perform as most other firms in the industry, and its dividends will grow at the industry average. Of course, not all firms (e.g., those in mature industries) will experience explicit growth periods.

Let’s now consider that Amazing Glass, Inc. develops a new heat-reflective glass for automobiles. This innovation could give Amazing Glass a decided edge over competitors until the competition develops its own glass. During this period, Amazing may enjoy a higher-than-normal growth rate as sales increase dramatically. When the competition starts producing equivalent (or even better) glass, Amazing will resume a more sustainable growth rate.
As an example of the multi-stage dividend discount model, Amazing Glass has developed a new type of glass that will give it a competitive advantage for four years, the time it will take competitors to develop their own glass. In this case, you assume that Amazing’s assets, earnings, and dividends will grow at an accelerated rate of 20 percent for four years then revert to the normal growth of 5 percent for all periods after year four. You determine that the required return for Amazing Glass should be 15 percent. Find the intrinsic value for the stock and make a buy or sell recommendation. The stock currently is trading at $30.

Solution: To find the intrinsic value for this 2-Step problem, we will complete the following tasks:

E. Calculate the predicted dividends during the explicit growth, years 1-4.
F. Calculate the intrinsic value for the implicit growth stage, years 5-infinity.
G. Calculate the present value of all the predicted cash flows.

**Step 1:** Calculate the predicted dividends during the explicit (supernormal) growth years.

The growth rate for the first four years is 20 percent, meaning dividends one through four are expected to be 20 percent greater than each preceding dividend. We estimate them as:

\[ D_1 = D_0 (1 + g) = $2.00 (1.20) = $2.40 \]
\[ D_2 = D_1 (1 + g) = $2.40 (1.20) = $2.88 \]
\[ D_3 = D_2 (1 + g) = $2.88 (1.20) = $3.46 \]
\[ D_4 = D_3 (1 + g) = $3.46 (1.20) = $4.15 \]

**Step 2:** Calculate the intrinsic value for the normal growth years.

Recall that as long as the dividend growth is constant forever, we can utilize Equation 2 to find the present value. Our example fits this requirement because, starting with dividend five, dividends are expected to grow at a rate of five percent indefinitely. Using Equation 2, the intrinsic value of Amazing Glass as of year 4 equals:

\[
\text{Year 4 intrinsic value} = \frac{D_5}{k - g} \tag{3}
\]

where \( D_5 \) is the predicted dividend for year 5. Our assumption is that dividends will grow at 5 percent after year 4. Therefore, \( D_5 = $4.15 (1.05) = $4.36 \). Therefore, the year 4 intrinsic value equals \( 4.36/(0.15 - 0.05) = $43.60 \). Note that the year 4 intrinsic value is the price at which we think Amazing Glass will sell for in year 4.

**Step 3:** Find the present value of the predicted cash flows.

Our timeline now can be illustrated as a series of four dividends (from step 1) and a predicted selling price for year 4 (from Step 2).

**Figure 3:** Dividends and Selling Price
We are now in a position to calculate the present value of all future cash flows to find our intrinsic value for the stock. The first three amounts on the time line are the predicted dividends for each of the next four years: $2.40, $2.88, $3.46, and $4.15, respectively. The fourth figure, $43.60, is the present value of dividends expected to occur during the more normal 5 percent constant growth period. The fourth figure, $43.60, also is interpreted as the predicted year 4 price for Amazing Glass stock. Together, these two pieces represent the present value of all future dividend estimates.

We are now prepared to calculate the intrinsic value of Amazing Glass stock:

\[
\frac{D_1}{1+k} + \frac{D_2}{(1+k)^2} + \frac{D_3}{(1+k)^3} + \frac{D_4}{(1+k)^4} + \frac{P_4}{(1+k)^5}
\]

\[
\frac{2.40}{1.15} + \frac{2.88}{1.15^2} + \frac{3.46}{1.15^3} + \frac{4.15}{1.15^4} + \frac{43.60}{1.15^5}
\]

\[
2.09 + 2.18 + 2.28 + 2.38 + 24.93 = 33.86
\]

Given our estimates of the stock’s future dividends, we estimate the price of Amazing Glass to be $33.86. Since the actual stock price is $30, you might issue a “buy” recommendation. In other words, you think the stock is worth $3.86 more than its actual price. You think the stock is undervalued by $3.86. Notice that these are the same dividend and predicted year 4 price that were used in the original example in this section. This example also shows how the year 4 price can be predicted.

**Earnings Multiplier Model**

A simple alternative to the dividend discount model is offered by the earnings multiplier model. The earnings multiplier refers to the price-to-earnings ratio, simply called the P/E ratio. Earnings (E) refers to the net income per share of common stock that was earned by the company. The P/E ratio can be calculated in two ways:

E. Trailing P/E: current price divided by prior year earnings.
F. Leading P/E: current price divided by predicted next year earnings.

We can use Equation 2 to identify the major factors affecting a company’s fair P/E ratio. For instance, if we divide both sides of Equation 2 by leading earnings, \(E_{t+1}\), we find that the fair or intrinsic P/E equals:

\[
\frac{P_t}{E_t} = \frac{\frac{D_{t+1}}{E_{t+1}}}{k - g}
\]

Equation 4 shows how the P/E ratio is determined by four factors:

E. The dividend payout ratio, \(D/E\). As the dividend payout ratio increases, the P/E ratio increases (e.g., the numerator, \(D/E\), increases), assuming risk and growth remain unchanged. In other words, if investors predict that their cash flows will rise, they will be willing to pay a higher price relative to the net income earned by the company.

F. The predicted growth rate, \(g\). As predicted growth increases, the P/E ratio increases (e.g., the denominator, \(k - g\), decreases), assuming risk and dividend payout remain unchanged. As investors raise their predictions of future growth, they become willing to pay a higher price for the stock (P/E increases). For example, most technology companies have high P/E ratios because investors expect earnings to grow at a high rate for the next few years. Companies in a mature, slowing industry stage (transportation, utilities, and financial sector companies) have lower P/E ratios.

G. The perceived riskiness of the company. As investors perceive that the company riskiness increases, the beta will increase, which in turn causes the required return, \(k\), to increase. As \(k\)
increases, the P/E ratio decreases (the denominator, \(k - g\), increases), assuming dividend payout and growth remain unchanged.

H. Similarly, as investors become more risk averse, their required risk premiums rise, causing \(k\) to rise. As \(k\) rises, the fair P/E will fall, assuming dividend payout and growth remain unchanged.

The earnings multiplier model can be used to calculate the fair value of the stock. For instance, suppose we think Amazing Glass Inc. should have a P/E ratio that’s 20 percent above the Industry average of 10. Therefore, we think Amazing Glass deserves a P/E of 12. Further, suppose we predict that next year’s earnings per share will be $3. We can now use the following mathematics to find the intrinsic or fair value for Amazing Glass using the earnings multiplier model. Defining \(P\) to be the fair price for Amazing Glass stock:

\[
\frac{P}{E} = P
\]

\(12 \times 3 = 36\)

Notice that this method does not require that the company pay dividends. As long as we can determine the fair P/E and can predict next year’s earnings, we can find the fair value for the company using the earnings multiplier model.

**Other Equity Securities**

Preferred stock is another well-known form of equity security. As with common stock, preferred stock prices are calculated by taking the present value of all expected future dividends.

Let’s assume you are valuing a preferred stock with a face value of $100 and a 6 percent dividend, \(D_p\). The required return on the preferred stock, \(k_p\), is 6 percent, and it will never be retired. That is, the preferred stock is *perpetual*, which means that the $6.00 annual dividend is never expected to stop or change.

Equation 6 is the general equation used to value any dividend-paying (equity) security. If dividends are never expected to change, the growth in dividends is zero, and Equation 6 reduces to the *constant growth dividend discount model*, Equation 7.

\[
P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1 + k_c)^t}
\]

\[
P_0 = \frac{D_1}{k_c - g}
\]

Substituting the appropriate data into Equation 7, we find our preferred stock is selling at par, $100. Note that we insert a zero for \(g\) in the equation since the preferred dividend is constant and has no growth.

Once the debt is no longer outstanding, it is said to be retired.

\[
P_p = \frac{D_p}{k_p - g} = \frac{D_p}{k_p - 0} = \frac{D_p}{k_p} = \frac{6.00}{0.06} = \$100.00
\]
Because of the fixed dividend payment, preferred stock prices fluctuate in the same manner as fixed income securities. Recall that a fixed income security’s price is inversely related to changes in interest rates. Figure 2 shows the price of our preferred stock assuming various required returns. In each case the

\[ P_p = \frac{D_p}{k_p} \]

price is found as above using \( P_p = \frac{D_p}{k_p} \) the formula for the price of perpetual preferred stock.

You will notice from Figure 4 that the price of a preferred stock varies much like the price of a bond when its required return changes. As the required return increases, the price decreases. As the required return decreases, the price of the preferred stock increases. And as long as the required return is equal to the dividend rate, the preferred stock sells at its par value.

![Open table as spreadsheet](#)

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<tr>
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**Figure 4:** Perpetual Preferred Stock Price Reactions to Changes in Required Return [for a stock with face value = $100, dividend = $6.00 (6%)]

---

1. The stock recently has regained some of its strength as its market value has risen to $894 million by January 2005, still far below its peak of $23 billion in 1999.


3. An alternative measure is the return on owner’s equity which measures the net income available to common stockholders as a percentage of common equity. The numerator equals net income minus preferred stock dividends and the denominator equals total equity minus preferred stock dividends. Obviously, if the company has a relatively small amount preferred dividends, then the two ratios are very similar.

4. We note that, in practice, many analysts use year-end averages of all balance sheet items in all ratio calculations, especially for ratios that combine income statement and balance sheet items. For example, the return on assets equals net income divided by assets. Net income is a cumulative figure computed over the entire year, while assets is a snapshot at the end of the year. So when the balance sheet item has changed dramatically through the year, it is best to use an average of the year \( t \) and year \( t – 1 \) values (e.g., ROA = net income divided by the average assets for the year). For simplicity here we use only the ending 2004 Balance Sheet values.

5. Note that deferred taxes were not included in the long-term debt calculation. Deferred taxes represent a long-term liability, but in this particular ratio we are more interested in the actual debt financing obtained by the company through the issuance of long-term debt securities.

6. Note that the ROE equals the ROA times the equity multiplier: \( 0.097 \times 2.0196 = 19.6 \) percent.

7. The CAPM states that the required return equals the risk-free rate plus a risk premium required by investors as compensation for risk. The equation equals \( k_i = r_f + (k_m – r_f) \), where \( k_i \) is the required return for the stock, \( r_f \) is the risk-free rate (e.g., Treasury bill rate), and \( k_m \) is the required return for the broad market.
Even though dividends are typically paid quarterly, the valuation methods used assume the four quarterly dividends are paid in one annual payment. The error attributable to this simplification is very small.

Growth in a firm is usually defined as the percentage growth in earnings per share (EPS), the change in the value of the firm’s assets, or the change in its stock price. As long as management pays out a constant percentage of earnings as dividends, the dividend growth rate will be the same as the firm’s overall growth rate.

Some texts will refer to this period as supernormal growth.

It could be said there are normal rates of growth for firms based upon their industries. All firms in mature industries might have reached a point of zero or very low “normal” growth. Some industries, such as computer software and communications, are prone to rapid innovation.

The normal rate of growth for the firm’s dividends is the average long-term growth for firms in the industry.

For an historical perspective, the trailing P/E on the S&P 500 stock market index has averaged approximately 17 since 1960, and has ranged from 7 to 39 over that time period.

Preferred stock has both equity and debt characteristics. For valuation purposes we are considering preferred stock to be an equity security.

Section 2: Debt Securities

There are many reasons and many methods for corporations and other entities to go into debt. Primarily, the motivation is to gain funds for operations without relinquishing control over the entity. A debt security typically represents an obligation on the part of the borrower to make periodic interest payments and to repay the borrowed amount at a specified future date. Because the borrower promises to pay back the debt, no ownership over the entity must be given to the lender as is characteristic of equity securities. This chapter examines the basic features and characteristics of debt (or fixed income) securities, such as bonds and other types of loan contracts, and explains how such securities are valued.

The first part of this section will focus on the descriptive aspects of the most well-known fixed-income security, the bond. We will then detail the various bond sectors, including the types of debt issues and the entities that issue debt securities. Our discussion then turns to the risks associated with debt securities and how these risks affect issuers and investors. Methods of bond valuation are subsequently covered to provide insight into how fixed-income securities are priced by the market. We conclude the section with a discussion of various common yield measures used in the bond market.

Chapter Objective: Describe the characteristics of the most familiar debt securities, bonds.

Bond Features, Sectors, And Risks

Common Bond Features

Corporations and other entities often raise capital by issuing (or selling) bonds to investors willing to lend money. In essence, the corporation is borrowing money today and promising to repay the borrowed funds at a later date. The bond functions as a loan from investors. Corporations are able to complete such a transaction by creating a legal document (the bond indenture) that obligates the borrower to repay the
borrowed funds to the lender. This legal contract specifies all of the features of the bond in advance including its face value, coupon rate, maturity date, interest payment dates, any collateral, its rank with respect to other bonds previously issued by the firm, whether it is callable, whether it is convertible, the name of the trustee, any positive or negative covenants, the procedures followed in case of bankruptcy, and other features of the bond that are important for the lender to know in advance. An expanded discussion of each of these features follows.

The typical corporate bond has a face value of $1,000,\textsuperscript{[19]} which represents the amount borrowed (also called the principal or par value). Unlike common stock, bonds almost always have a stated maturity, which can range anywhere from five to thirty years. On the maturity date, the final day that the bond is outstanding, the firm repays the original $1,000 borrowed to the bondholder, and the debt is no longer outstanding.

Unlike a home mortgage or car loan, which are fully amortized and contain both principal and interest in each payment, corporate bonds tend to be interest-only securities until the final payment. The firm typically makes semiannual interest-only payments until the bond matures\textsuperscript{[16]}, at which time the full principal amount is paid in one lump sum. The semiannual payments are called coupon payments and are determined by the coupon rate. The coupon rate is an annual interest rate stated as a percentage of par or face value. To find the expected annual interest payment for any bond, simply multiply the coupon rate by the face value of the bond. If the bond pays interest semiannually, divide the total annual payment by two to find the semiannual payments. Coupon rates can be either fixed or floating rates. Fixed rate coupons pay the same interest rate on every coupon regardless of interest rate movements in the general economy. Floating rate coupons are tied to some interest rate benchmark which adjusts the coupon rate and interest payment of each coupon. Coupon payments and the principal are automatically sent to the registered owner of the bond.

As with individual borrowings such as a home mortgage loan, bonds can be backed by (guaranteed by) collateral. These are called mortgage (or senior) bonds, and the collateral used to secure the bonds could be equipment, buildings, or any other fixed asset owned by the firm. Debentures are bonds that are not backed by collateral and as such have higher risk associated with their cash flows than a senior mortgage bond. They are guaranteed only by the firm’s promise of repayment, and they are subordinate to the mortgage bonds. Therefore a debenture, because it is an unsecured and subordinated issue, should carry a higher coupon rate than a senior mortgage bond.

In the event of default or bankruptcy, bonds are repaid according to their rank, from the most senior issues to the most subordinated issues. Bonds that are subordinated have a lower seniority rank and a weaker claim to the assets of the firm. Bonds with the least seniority therefore have the lowest probability of receiving any payment after the firm’s assets are liquidated or the firm is restructured. Therefore, the coupon rate on junior subordinated debt securities will reflect their low rank and high risk. Bonds with the lowest level of seniority will have higher coupon rates than more senior issues, and mortgage bonds will have the lowest rates.

When a firm issues bonds, there are often many investors (often tens of thousands) who will purchase portions of the issue. Therefore it is necessary to establish a trustee to ensure that the issuing firm acts in the best interest of the bondholders and follows all provisions as detailed in the bond indenture. The individual or institution designated as the trustee will regularly monitor the issuing firm to ensure there are no violations of the agreement between the firm and its bondholders. Trustees will be responsible for monitoring all aspects of the indenture but will most likely spend a great deal of time making sure the issuer does not violate the bond covenants listed in the indenture. These can be negative covenants that prescribe what management cannot do, including restrictions on issuing additional debt without meeting certain conditions or without the approval of the current bondholders. They can also be affirmative covenants that prescribe what management must do, including maintaining certain levels of financial ratios, maintaining the firm’s equipment in good working condition, and providing the trustee with periodic reports.
Bond indentures often contain a provision to retire the issue prior to final maturity. One such provision is known as a **sinking fund**. Under this provision, management makes annual deposits with the trustee to ensure funds are available to retire the issue upon its final maturity. A sinking fund can be used to retire all the bonds in the issue at once, or it can be used to retire the bonds over time (as is the case with serial bonds). **Serial bonds** are retired in portions according to their serial numbers (their registration numbers). For example, if 20 percent of the bonds are retired every four years, the entire issue will be retired in 20 years. In either case, a sinking fund makes investing in bonds less risky because it helps ensure timely retirement of the debt.

Bonds may also be retired early (before the stated maturity date) as a result of call options embedded in the structure of the bond. Such bonds are called, quite appropriately, **callable** bonds. To force the early retirement of the bonds, management announces the call publicly, and whoever owns the bonds must surrender them. Since calling the bonds requires the firm to pay the outstanding principal earlier than expected, issuers are hesitant to do so unless there is a substantial benefit. The benefit lies in being able to take advantage of lower interest rates by replacing a callable outstanding issue with another issue that carries a lower coupon rate.

To guarantee bondholders at least a certain amount of time at the high coupon rate, U.S. corporate bonds are not usually callable for the first five years. This is known as **call protection** because during this period management is legally prohibited from calling the bonds. During the next five years the bonds may be callable at face value plus a **call premium**. The premium usually starts at one year's interest and decreases in equal annual increments to zero by year 10.

In contrast to callable bonds, which favor the issuer, some bonds contain options that favor the bondholder. When a corporate bond is **convertible**, the owner of the bond may exchange it for another type of security, usually common or preferred stock. The bond will be convertible into a set number of shares, determined by the **conversion ratio**. For example, if the bond has a conversion ratio of 25:1, this means it is exchangeable for 25 shares of stock at any time at the discretion of the owner. If the bond sells for $1,000, this implies a **conversion price** of $1,000 / 25 = $40.00. Thus, if the owner converted immediately after purchasing the bond, he would effectively pay $40.00 per share of stock.

The **Treasury yield curve** is constructed by graphing the yields of outstanding Treasury securities of various maturities. Changes in the yield curve impact the value of bonds and other securities.

Since the ability to convert to common or preferred stock is usually considered a valuable option, convertible bondholders are willing to accept a lower rate of interest. The coupon rate on convertible bonds averages about of the coupon rate on an otherwise identical nonconvertible bond.

**Chapter Objective:** Describe the most common fixed-income sectors and issuers and the securities typically issued in these sectors.

**Bond Sectors and Instruments**

The U.S. bond market can be separated into four major segments: (1) Treasury, (2) agency, (3) state and local (or municipal), and (4) corporate. Each sector has developed its own features and issue characteristics, as well as its own trading mechanisms. Treasury securities are issued by, and are general obligations of, the federal government and are considered to be “riskless” in that they are assumed to carry no risk of default. Agency bonds are issued by agencies of the federal government and organizations affiliated with the federal government. Municipal bonds are issued by governmental units below the federal
level, such as cities, counties, and states. Corporate bonds are issued by private business enterprises, and these can be issued via private placement or public offering.

**Treasury securities.** U.S. Treasury securities (or “Treasurys”) are issued by the U.S. Treasury Department and, because they are backed by the full faith and credit of the U.S. government, are considered to be free from risk of default though they are not free from interest-rate/price risk (we will discuss risk in greater detail later in this section). The Treasury issues four different types of securities: bills, notes, bonds, and inflation-protected securities. Some Treasuries are sold as pure discount (zero-coupon) instruments, and some are sold as coupon-bearing instruments.

**Treasury bills (or T-bills)** denote the Treasury securities with the shortest maturity. All T-bills have an original maturity of less than one year. They are always sold as zero-coupon securities (i.e., the price paid for the T-bill, both at issuance and anytime prior to maturity, is always less than face value). The Treasury currently issues 4-week, 13-week, and 26-week T-bills at weekly auctions. Occasionally, the Treasury will issue cash management bills, with maturities ranging from a few days to six months, to meet short-term cash requirements.

**Treasury notes (or T-notes)** are medium-maturity Treasurys. They are currently issued with original maturities of two, three, five, or ten years. T-notes, unlike T-bills, are coupon-bearing instruments. T-notes are issued with coupon rates that are set according to market rates at the time of issuance. On quotation sheets, T-notes are denoted with an \( n \) to distinguish them from T-bonds.

Because it is not taxable, the yield on a municipal bond may be lower than an otherwise comparable taxable bond. The after-tax yield on the taxable bond, however, should be equal to the comparable municipal bond yield.

**Treasury bonds (or T-bonds)** are the longest-maturity securities issued by the U.S. Treasury. T-bonds have historically been issued with maturities from ten years up to 30 years. The required yield on the longest maturity T-bond is considered by market participants to be a bellwether for long-term interest rates. However, the Treasury recently announced that it would no longer issue new T-bonds.

In January 1997, the U.S. Treasury started selling Treasury inflation protection securities (TIPS), or inflation indexed notes (IIN) with face values that adjust periodically with changes in the rate of inflation. The coupon rate is fixed for the life of the issue and represents the rate an investor earns, net of inflation. This rate is also known as the **real rate**.

Inflation is measured by changes in the Consumer Price Index (CPI) for All Urban Consumers (CPI-U). Changes in the rate of inflation are reflected through a series of semiannual adjustments to the principal value of the bond. Once the par value of the bond has been increased to what is known as the inflation-adjusted principal, the fixed coupon rate, \( c \), is used to determine the interest payments to investors.

Each Treasury security has an associated yield which is compiled to form the **Treasury yield curve**. Because Treasury securities are free of default risk, the Treasury yield curve demonstrates the relationship between maturity and interest rates. Figure 5 provides a representative sample of what the Treasury yield curve might look like. Notice that this particular yield curve is upward sloping, indicating that investors are demanding higher interest rates for longer-term securities.
Agency securities. In addition to the U.S. Treasury, some agencies of the federal government and some organizations affiliated with the federal government also issue fixed-income securities. Securities issued by federally related institutions, much like Treasuries, are backed by the U.S. government and, as such, bear little default risk. The primary difference between Treasury securities and those issued by federally related institutions is that Treasury securities are direct obligations of the U.S. government, whereas securities issued by federally related institutions are not. Securities issued by government-sponsored entities do not have the same backing that the Treasury and federally related institutions have but are generally considered low-credit-risk securities. Both types of “agency” securities, however, will have a somewhat higher rate of interest than that of a Treasury security due to increased credit or liquidity risk or both. An expanded discussion of both types of agency securities follows:

Federally-related institutions, such as the Government National Mortgage Association (Ginnie Mae), are institutions owned by the U.S. government. Their securities are (currently) exempt from Securities and Exchange Commission (SEC) registration. These securities are also implicitly backed by the full faith and credit of the U.S. government and are generally considered to be free from credit risk.

Interest rate risk is an important concept in the CFA curriculum. A bond’s interest rate risk is measured by its duration, a calculation which we do not detail in this book.

Government sponsored entities (GSEs) include the Federal Farm Credit System, the Federal Home Loan Bank System, the Federal National Mortgage Association (Fannie Mae), the Federal Home Loan Mortgage Corporation (Freddie Mac), and the Student Loan Marketing Association (Sallie Mae). These are privately owned but publicly chartered organizations created by the U.S. Congress. They issue their securities directly in the marketplace and expose investors to some (albeit very little) credit risk.

Agency securities vary widely in their features and include various forms of debentures and securities known as mortgage-backed or asset-backed securities. Mortgage-backed and asset-backed securities are created through the securitization of a pool of loans or other assets. The agency sponsoring the issue takes control of the collateral pool and issues a fixed-income security to a group of investors. Basically, the loans or assets serve as collateral to repay the mortgaged-backed or asset-backed security.

Municipal securities. Debt securities issued by state and local governments in the U.S. are known as municipal bonds (or munis for short). Munis are referred to as tax-exempts since the coupon interest is generally exempt from federal income taxes. While interest income may be tax-free, any capital gains on
these munis are subject to capital gains tax. The coupon interest on municipals, except for some double-
exempt bonds, is taxable at the state level. Because municipalities have a greater risk of default than the
U.S. Treasury, munis typically carry higher rates of interest (on a tax-adjusted basis) than Treasuries.

Munis are often issued as serial obligations, which means that the issue is broken into a series of smaller
issues, each with its own maturity date and coupon. Most municipal bonds are brought to the market as
either general obligation or revenue bonds. General obligation (GO) bonds are backed by the full faith,
credit, and taxing power of the issuer. In contrast, revenue bonds are serviced with the income generated
from a specific revenue- generating project funded with the issue (e.g., bonds issued to fund a toll road).

Corporate securities. Private corporations cannot rely on taxing power; therefore, debt issued by
corporations is of higher risk than Treasury, agency, and most municipal debt (though some corporations
have lower credit risk than some municipalities). Corporate debt may be secured or unsecured and may be
sold to the public or to a private party. Privately placed debt is sold by a corporation to a large financial
institution, such as an insurance company, that typically holds the bond issue until maturity. Rule D of the
Securities and Exchange Act allows corporations to issue debt privately to qualified buyers without having
to register the debt with the SEC. However, the public is not allowed to buy these unregistered securities.
An institution that buys privately placed debt may not sell the issue unless it is pursuant to Rule 144A. Rule
144A allows for the secondary market trading of privately placed debt between qualified institutional buyers.

Corporate debt securities that are going to be sold to the public must generally be registered with the
Securities and Exchange Commission (SEC). Bonds sold to the public are usually “underwritten” by an
investment bank (i.e., a price guarantee has been given to the borrower for the bonds sold). Securities
placed privately typically have no price guarantee and are sold on a “best-efforts” basis (i.e., the entire price
risk is borne by the issuer). Securities issued by private corporations include bonds, notes, commercial
paper, and asset-backed securities.

Bonds issued by corporations can either be secured mortgage bonds or unsecured debentures, the details
of which have been previously addressed in this chapter. Corporate bonds range in maturity from one to
thirty years and can be plain vanilla (i.e., no options or exotic features) or structured with embedded
derivatives to meet the needs of a niche market. In addition, corporations also issue notes which may have
similar maturities and features as bonds but are sold on a continuous basis rather than all at once as with a
bond issuance. Some firms also issue commercial paper, which is a short-term discount security similar to a
Treasury bill. Only large firms with high credit ratings are able to issue commercial paper for short- term
borrowing purposes.

Chapter Objective: List and describe the key risk factors affecting the market value of bonds.

Risks Associated With Fixed Income

Like any other investment vehicle, bonds should be evaluated on the basis of the return offered and the risk
involved. Returns on bonds come in the form of interest (coupons) and/or capital gains (i.e., increases in
the market price of the bond). The size of the expected return is determined by the perceived risk of the
bonds. The risks to bond investors are a function of both macroeconomic and microeconomic factors.
Following is a list and brief description of the most important risks to bond investors. While this is not an
exhaustive list, the key factors affecting bond values are detailed. To varying degrees (based on their
maturity, coupon rate, and other characteristics), bonds are subject to the following types of risks:

Interest-rate risk (price risk) is the risk that interest rates will increase and the value of an investor’s bond
holdings will decrease. All securities are affected to a degree by changes in interest rates. Their prices tend
to move in the opposite direction of interest rates (i.e., increases in rates will lower prices, and decreases in
rates will raise prices). However, fixed-income securities (e.g., bonds) are particularly sensitive to
changes in interest rates. Generally, the longer the maturity of the bond and the lower the coupon rate, the more sensitive it is to changes in interest rates.

**Reinvestment risk** is the risk that cash flows received from a bond holding will have to be reinvested at a lower rate of return than that expected at the time of the original investment. Reinvestment risk is often thought of as being the opposite of interest rate risk. The required yield on a bond investment will be realized only if the cash flows during the life of the bond can be reinvested at the required yield (i.e., the yield to maturity prevailing at the time of purchase). If these cash flows are reinvested in the future at rates that are less than the required yield, the actual return on the investment will be less than the required yield. The lower actual return is the essence of reinvestment risk.

**Credit risk** is the risk that the issuer will not be able to pay interest and/or principal when due. Investors in fixed-income securities are lending money to the issuer of the securities. Consequently, there is the risk that the borrower will not be able to repay the principal and interest as promised. Bond rating agencies assess this risk by rating the creditworthiness of borrowers and their bond issues outstanding. For a given borrower, each bond issue is analyzed individually, and a single borrower can have multiple ratings (e.g., one rating for senior debt, one for subordinated debt). The rating assigned by the agency is based upon their assessment of the probability of repayment, as well as other factors such as the economic and political environment.

**Liquidity risk** is the risk that the investor will not be able to sell the bond quickly at a fair price should the need arise. Liquidity risk means an investor would either have to wait a long time before an order can be filled or would have to significantly reduce the price in order to sell the bond quickly. Liquidity risk can be estimated by looking at the size of the bid-ask spread, or the difference between the price at which a dealer would buy the bond (the bid price) and the price at which the dealer would sell the bond (the ask price).

**Inflation risk** is the risk that actual inflation will exceed expected inflation, thereby leading to a loss of purchasing power. Since fixed-coupon bonds pay a constant stream of interest income, increasing prices erode the buying power associated with bond payments. Increasing inflation results in an unexpected reduction of the purchasing power of future bond payments for existing bondholders.

**Call (prepayment) risk** is the risk the bond will be retired early by the issuer and that the funds received will need to be reinvested at a lower yield. Investors in callable bonds face the risk that their bonds may be redeemed early at the option of the issuer, usually after a significant decline in interest rates, and the subsequent reinvestment of the proceeds must be done at lower yields.

**Event risk** is the risk of an unforeseen event that has a negative impact on the financial condition of the issuer. If the impact is severe, this can call into question the issuer’s ability to meet its obligations and can have an impact on the underlying value of the issuer’s bonds.

Determining the **value of a bond** is simply a matter of finding the sum of the present value of all the bond’s cash flows, discounted at the required rate of return for the bond.

---

**Chapter Objective:** Calculate and interpret the price (value) of a debt security.

---

**Bond Valuation and Yield Measures**

When a corporation or other entity issues (sells) bonds, it promises to pay the holder (buyer) a series of interest payments, known as coupons, and repay the face value (i.e., the principal) at maturity. For U.S. corporations, coupon payments are paid semiannually and resemble the ordinary annuities we discussed in
the chapter on Quantitative Methods. The principal repayment is a lump sum payment on the maturity date. Using the capitalization of income method, the market value of the bond can be determined by calculating the sum of the present values of those cash flows.

In the U.S. most bonds pay semiannual coupons. In many other countries bonds pay annual coupons. We have written this discussion from the U.S. perspective for semiannual pay bonds. However, the same techniques and assumptions apply for annual pay bonds. The only difference is that the “m” in the bond valuation formula becomes a one instead of a two.

There are three fundamental steps in the bond valuation process:

Step 1: Determine the timing and amount of cash flows for both coupons and principal.

Step 2: Estimate the appropriate discount rate.

Step 3: Calculate the sum of the present values of the estimated cash flows.

**Step 1: Cash Flows**

The typical cash flow structure for an option-free bond (i.e., one that is not callable, putable, or convertible) is depicted by the timeline shown in Figure 6.

**Figure 6: Typical Structure of Bond Cash Flows**

where:

\[ \text{PAR} = \text{maturity value or, as it is more commonly known, the par value of the bond} \]

\[ \text{CPN} = \text{coupon payment, calculated as: } (\text{PAR} \times \text{coupon rate})/\text{(number of coupons per year)} \]

\[ N = \text{life of the issue, defined as: } (\text{years to maturity}) \times (\text{number of coupons per year}) \]

**Step 2: Discount Rate**

The appropriate discount rate (or required yield) for a given bond is the risk-free rate plus a risk premium.

\[
\text{(discount rate for a risky bond)} = \left( \frac{\text{discount rate for a similar default-free bond}}{} \right) + \left( \frac{\text{risk premium}}{} \right)
\]

(8)

The benchmark risk-free rate is the yield on a Treasury security of comparable maturity. The more difficult problem is to determine the appropriate risk premium that correctly reflects the differential in risk between the bond in question and the benchmark. The size of the risk premium is a function of a variety of risk factors which we discussed previously in this section. All else equal, the riskier the security, the greater the risk premium.
Step 3: Valuing the Bond

Once the bond’s expected future cash flows have been determined and the appropriate discount rate has been estimated, the bond’s value as the present value of the expected future cash flows discounted at the appropriate discount rate can be calculated as:

\[
\text{bond value} = \sum_{i=1}^{n} \frac{CPN_i}{(1 + \frac{i}{m})^i} + \frac{CPN_{n\times m} + \text{Par}}{(1 + \frac{i}{m})^{n\times m}} \tag{9}
\]

where:

- \(i\) = interest rate per year
- \(m\) = number of coupons per year
- \(n\) = number of years to maturity
- \(n \times m = N\), the life of the bond

Some argue that, since the face value is received only once instead of semiannually like the coupons, it should be discounted for ten years at 8 percent instead of 20 six-month periods at 4 percent. However, if this is done, you would be discounting the coupons and face value at different effective rates of interest, which is theoretically incorrect.

In order to illustrate the general valuation method we have just described, we will value a 10-year, 8 percent semiannual coupon bond, yielding 8 percent. But before we begin, let’s recap each of the bond’s key characteristics.

E. “10-year” indicates that the bond matures in 10 years. This should not be confused with the bond’s original length of issue, which could be up to 30 years or even longer.

F. “8 percent” refers to the annual coupon rate on the bond. The bond pays 8 percent of its face value each year, in two equal semiannual payments. Assuming the bond has a $1,000 face value, it will pay $80/2 = $40 every six months.

G. “Yielding 8 percent” indicates that the bond is priced to yield 8 percent. This means that based upon the risk of the firm and the bond, its required return or discount rate is 8 percent.

Since the bond pays coupons semiannually, there are twenty \((10 \cdot 2)\) coupons paid in ten years. Also, since the annual required return is 8 percent, the semiannual required return is 4 percent.

The pattern of the coupon payments is nothing more than an annuity. Each payment is $40, and the payments come exactly six months apart. In order to determine the value of the bond, we must find the present value of each coupon and sum them to find the total present value of all the coupons we will receive. This results in an annuity of twenty payments of $40 each, discounted at four percent.

Let’s explore two ways of finding this value. First, we could actually find all the individual present values and sum them, which is a very tedious job to say the least. Second, we could use the ordinary annuity formula:
\[
PV_A = \frac{PM_T}{\frac{1}{i/m} - \frac{1}{(1 + \frac{i}{m})^{mn}}}
\]

where:

- **PV** = the present value of an annuity (the annuity in this case is the series of coupons we will receive)
- **PMT** = the amount of each payment (the payments are the $40 coupons)
- **i** = the annual interest rate
- **n** = the number of years
- **m** = the number of coupons per year

\[
PV_A = \frac{\$40}{\frac{1}{0.04/2} - \frac{1}{(1.04)^{20}}}
\]

\[
PV_A = \$40 \times [25 - 11.4097]
\]

\[
PV_A = \$40 \times 13.5903 = \$543.61
\]

$543.61 represents the present value of the stream of coupon payments expected, if we buy the bond. Of course we would also expect the repayment of the principal in ten years. The relationship between present and future values of a lump sum can be expressed in the following manner:

\[
FV_n = PV \left(1 + \frac{i}{m}\right)^{mn}
\]

Rearranging the equation above to solve for **PV** yields:

\[
PV = \frac{FV_n}{\left(1 + \frac{i}{m}\right)^{mn}}
\]

where:

- **FV** = the future value (in this case, the lump sum return of principal) (the face value of the bond)
- **i** = the annual interest rate
- **m** = the compounding periods per year (in this case, coupons are paid semi annually)
- **n** = the number of years
Remember that present value always moves opposite the change in the discount rate. When a bond’s required return is greater than its coupon rate, the discount rate has increased, so the bond’s price must fall. When the bond’s required return is less than the coupon rate, the discount rate has fallen, so the price must rise.

In this example,

\[
PV = \frac{\$1000}{\left(1 + \frac{0.08}{2}\right)^{2(10)}} = \frac{\$1000}{(1.04)^{20}} = \frac{\$1000}{2.191123} = \$456.39
\]

Thus, the present value of $1,000 to be received in 20 semiannual periods (10 years) at four percent is $456.39. Now that we have the present value of both the series of coupons and the lump sum face value, we find the total price of our bond is $543.61 + $456.39 = $1,000.

Two very important points are worth mentioning: (1) when the coupon rate and required return on a bond are the same, the bond will always be quoted at (sell at) par value; (2) the model assumes you purchase the bond on a coupon date. This means both methods assume the next coupon will be received in exactly six months (180 days). In practice, this is obviously not the typical case.

Accrued interest. When you purchase a bond between interest payment dates, you will have to pay accrued interest because even though coupons are paid semiannually, interest accrues daily. The bond in the above example pays $80 in interest every 360 days (in two payments of $40), or 22.22 cents per day. The holder of the bond (the seller) not only wants but is entitled to the interest accrued since the last coupon payment.

Let’s assume the bond last paid interest 115 days ago (65 days before the next interest payment). Since you must pay the seller the interest accrued since the last coupon, you must pay him $0.2222/day · 115 days = $25.55 in addition to the bond’s quoted price. If a bond price is quoted without accrued interest added in, the quote is called the clean price. A price quote that includes the accrued interest is known as the dirty price. While you should be aware of the effect of accrued interest in the bond pricing relationships, further treatment of this topic is beyond the scope of this text.

Price vs. yield. In following examples, we will illustrate the inverse relationship between bond yield and price.

Characteristics of the bond:
E. The coupon rate is 8%. (It pays 8% of its face value in two equal, semiannual $40 payments).
F. The bond has ten years remaining until maturity.
G. The bond has a face value of $1,000.

When the required return is 8 percent, the bond’s price is $1,000. This is because its required return equals its coupon rate. Using the TI Business Analyst II Plus® calculator, we’ll find the value of our bond at various required returns. The TI BAII Plus keystrokes are as follows:

\[
\text{Required Return} = 8\%
\]

\[
\begin{align*}
\text{PMT} & = 40 \\
\text{I/Y} & = 4 \\
\text{N} & = 20 \\
\text{FV} & = 1,000 \\
\text{CPT} \hspace{1cm} \text{PV} & = -1,000
\end{align*}
\]
Let the required return fall to 7 percent and 6 percent respectively:

<table>
<thead>
<tr>
<th>Required Return = 7%</th>
<th>Required Return = 6%</th>
</tr>
</thead>
<tbody>
<tr>
<td>$40</td>
<td>$40</td>
</tr>
<tr>
<td>PMT</td>
<td>PMT</td>
</tr>
<tr>
<td>3.5%</td>
<td>3%</td>
</tr>
<tr>
<td>I/Y</td>
<td>I/Y</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>N</td>
<td>N</td>
</tr>
<tr>
<td>$1,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>FV</td>
<td>FV</td>
</tr>
<tr>
<td>CPT</td>
<td>CPT</td>
</tr>
<tr>
<td>PV = –$1,071.06</td>
<td>PV = –$1,148.77</td>
</tr>
</tbody>
</table>

Let the required return increase to 9 percent and 10 percent respectively:

<table>
<thead>
<tr>
<th>Required Return = 9%</th>
<th>Required Return = 10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>$40</td>
<td>$40</td>
</tr>
<tr>
<td>PMT</td>
<td>PMT</td>
</tr>
<tr>
<td>4.5%</td>
<td>5%</td>
</tr>
<tr>
<td>I/Y</td>
<td>I/Y</td>
</tr>
<tr>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>n</td>
<td>n</td>
</tr>
<tr>
<td>$1,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>FV</td>
<td>FV</td>
</tr>
<tr>
<td>CPT</td>
<td>CPT</td>
</tr>
<tr>
<td>PV = –$934.96</td>
<td>PV = –$875.38</td>
</tr>
</tbody>
</table>

As shown in the illustration, the price of the bond moves in the opposite direction from the change in required return, giving us three very important relationships that will be true for all bonds that do not contain options:

E. If the required return equals the coupon rate, the bond sells at par (i.e., face value).
F. If the required return is less than the coupon rate, the bond sells at a premium (i.e., greater than face value).
G. If the required return is greater than the coupon rate, the bond sells at a discount (i.e., less than face value).

Price vs. maturity. Another very important bond characteristic is the relationship between maturity and the change in price given a change in required return. We already know that there is an inverse relationship between the bond’s price and its required return. Now we’ll show that the greater the time until maturity of the bond, the greater the change in value associated with an interest rate change. Using the same bond illustrated above, let’s assume that the maturity of the bond is 20 years instead of 10 (i.e., there will be 40 semiannual periods instead of 20).

<table>
<thead>
<tr>
<th>Required Return = 8%</th>
</tr>
</thead>
<tbody>
<tr>
<td>$40</td>
</tr>
<tr>
<td>PMT</td>
</tr>
<tr>
<td>4%</td>
</tr>
<tr>
<td>I/Y</td>
</tr>
<tr>
<td>40</td>
</tr>
<tr>
<td>n</td>
</tr>
<tr>
<td>$1,000</td>
</tr>
<tr>
<td>FV</td>
</tr>
<tr>
<td>CPT</td>
</tr>
<tr>
<td>PV = –$1,000</td>
</tr>
</tbody>
</table>

Again, as long as the required return and coupon rate are equal, the bond sells at par.

Let the required return fall to 7 percent and 6 percent respectively:
Investment strategies will be heavily dependent on forecasts for interest rates. Expected interest rate declines will need to be buffered by holding short-term bonds, bonds with high coupon rates, or both.

Let the required return increase to 9 percent and 10 percent respectively:

<table>
<thead>
<tr>
<th>Required Return = 9%</th>
<th>Required Return = 10%</th>
</tr>
</thead>
<tbody>
<tr>
<td>$40 PMT</td>
<td>$40 PMT</td>
</tr>
<tr>
<td>4.5% I/Y</td>
<td>5% I/Y</td>
</tr>
<tr>
<td>40 n</td>
<td>40 n</td>
</tr>
<tr>
<td>$1,000 FV</td>
<td>$1,000 FV</td>
</tr>
<tr>
<td>CPT PV = –$907.99 CPT</td>
<td>PV = –$828.41</td>
</tr>
</tbody>
</table>

In Figure 7, we have summarized the relationship between a bond’s price and changes in the required return and the relationship between price and maturity for the same changes in required return. Notice that for both bonds, the prices increase (decrease) as the required return decreases (increases). However, the magnitude of the price changes is greater for the longer maturity bond (i.e., the 20-year bond). This demonstrates numerically our earlier claim that the greater the time until maturity, the greater the change in price for a given change in required return.

### Open table as spreadsheet

<table>
<thead>
<tr>
<th>Maturity (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
</tr>
<tr>
<td>20</td>
</tr>
</tbody>
</table>

### Figure 7: Bond Price Reactions to Changes in Required Yield and Maturity

**Price vs. coupon rate.** In addition to the time until maturity, the change in a bond’s price is also affected by its coupon rate. In general, the higher the coupon rate (i.e., the higher the interest payments), the smaller the change in price for a given change in required return. Let’s revisit our 20-year bond again, but let’s now assume it has a 12 percent coupon rate instead of 8 percent (i.e., there will be $60 semiannual payments instead of $40) and that the yield on the bond is 12% (i.e., the bond trades at par value). Using your TI BAII Plus®.
Required Return = 12%

$60 PMT 6% I/Y 40 n $1,000 FV

CPT PV = –$1,000

Let the required return fall to 11 percent and 10 percent respectively:

<table>
<thead>
<tr>
<th>Required Return = 10%</th>
<th>Required Return = 11%</th>
</tr>
</thead>
<tbody>
<tr>
<td>$60 PMT</td>
<td>$60 PMT</td>
</tr>
<tr>
<td>5.5% I/Y</td>
<td>5% I/Y</td>
</tr>
<tr>
<td>40 n</td>
<td>40 n</td>
</tr>
<tr>
<td>$1,000 FV</td>
<td>$1,000 FV</td>
</tr>
<tr>
<td>CPT PV = –$1,080.23</td>
<td>CPT PV = –$1,171.59</td>
</tr>
</tbody>
</table>

Let the required return increase to 13 percent and 14 percent respectively:

<table>
<thead>
<tr>
<th>Required Return = 13%</th>
<th>Required Return = 14%</th>
</tr>
</thead>
<tbody>
<tr>
<td>$60 PMT</td>
<td>$60 PMT</td>
</tr>
<tr>
<td>6.5% I/Y</td>
<td>7% I/Y</td>
</tr>
<tr>
<td>40 n</td>
<td>40 n</td>
</tr>
<tr>
<td>$1,000 FV</td>
<td>$1,000 FV</td>
</tr>
<tr>
<td>CPT PV = –$929.27</td>
<td>CPT PV = –$866.68</td>
</tr>
</tbody>
</table>

Let’s sum up the results of our findings in Figure 8. The first column shows the change in required return from the original coupon rate. Remember, the bond will sell at par value as long as the coupon rate and required return are equal. The second and third columns demonstrate that changes in price are less severe (for both increases and decreases) for the bond with the shorter maturity. The third and fourth columns demonstrate that changes in price are less severe for bonds with larger coupons. We can summarize the results of our examples in two general rules for all fixed income securities:

**Rule 1:** The longer the maturity of any fixed income instrument, the more sensitive its price is to changes in interest rates.

**Rule 2:** The greater the interim cash flows associated with a fixed income security, the less sensitive its price is to changes in interest rates.

<table>
<thead>
<tr>
<th>Chg. in Req.Return</th>
<th>10-year, 8%</th>
<th>20-year, 8%</th>
<th>20-year, 12%</th>
</tr>
</thead>
<tbody>
<tr>
<td>–2%</td>
<td>+ 148.77</td>
<td>+ 231.15</td>
<td>+ 171.59</td>
</tr>
<tr>
<td>–1%</td>
<td>+ 71.06</td>
<td>+ 106.77</td>
<td>+ 80.23</td>
</tr>
<tr>
<td>No change</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
**Yield Measures**

In the bond market, investment decisions are typically made on the basis of a bond’s yield rather than its price. A bond’s yield affects the price at which it trades and serves as an important measure of potential or expected return. One well-known yield measure, the yield to maturity, is found by reversing the bond valuation process (described previously in this section) and solving for yield rather than price. In this section we explore various yield measures used in the market. Some yield measures provide little information and suffer from significant limitations, while others provide more reliable information and are more indicative of the true return on a bond investment.

In practice, the yield to maturity on a bond is found through an iterative process usually performed by a calculator or a computer.

**Nominal Yield**

The nominal yield is the stated coupon rate on the bond. This is stated as a percentage of the bond’s par value. The nominal yield will equal the required return on the bond only when the bond sells at par value.

For example, a bond with a 6 percent coupon rate that is selling at par has a nominal yield and required return (YTM) of 6 percent. If the required return on the bond changes to 8 percent, the bond will sell at a discount, but the nominal yield will stay at 6 percent. Thus the nominal yield may be misleading under certain circumstances.

**Current Yield**

The current yield is the annual coupon payment divided by the bond’s current price. It is easy to see that this measure looks at just one source of return: the bond’s annual interest income. That is, the current yield does not consider capital gains/losses or reinvestment income. The formula for the current yield is:
annual cash coupon payment \[ \frac{\text{bond price}}{13} \]

You should note that the nominal yield and the current yield are only useful measures of the bond's expected return when the bond is trading at or very close to par value. As the discount or premium on a bond increases, the information content of the nominal and current yields decreases.

**Yield to Maturity**

Yield to maturity (YTM) is the most widely used bond yield measure. YTM considers both interest income and capital gains/losses, and also the timing of the cash flows received over the life of an issue. However, the actual return to an investor will equal the YTM only if all interim cash flows are reinvested at an interest rate equal to the YTM.

The basic bond valuation model (introduced previously) is used to find YTM. In most cases, the price of the bond is known since this can be observed in the market. The required yield is the unknown. Therefore, the problem becomes solving for the discount rate that equates the present value of the bond’s cash flows to its current market price. You should be aware that the formulas used for bond valuation in this chapter are conceptual aids only; in practice, bond calculations are almost always done with the help of a financial calculator.

The formula for computing YTM, which can be used with annual \((m = 1)\), semiannual \((m = 2)\), or any other frequency of coupons, is as follows:

\[
\text{bond value} = \frac{\text{CPN}_1}{\left(1 + \frac{\text{YTM}}{m}\right)} + \frac{\text{CPN}_2}{\left(1 + \frac{\text{YTM}}{m}\right)^2} + ... + \frac{\text{CPN}_{n\cdot m} + \text{Par}}{\left(1 + \frac{\text{YTM}}{m}\right)^{n\cdot m}}
\]

where:
- \(\text{bond value}\) = current market price
- \(\text{CPN}_t\) = coupon payment received at time \(t\)
- \(\text{PAR}\) = maturity, par, or face value of the bond
- \(m\) = number of coupon payments per year
- \(n\) = number of years to maturity
- \(\text{YTM}\) = yield to maturity

The yield to maturity is the interest rate that, when plugged into the bond value equation, makes the equation true. In order to find the YTM, the analyst (or the analyst’s calculator) chooses a value for the YTM, discounts the bond’s cash flows to their present value using the YTM, adds the present values, and compares the sum of the present values to the market price of the bond. If the sum of the present values is equal to the bond’s market price, the YTM has been found and the process can stop. If they are not equal, the process begins again with a higher or lower YTM. Let’s calculate the YTM on the following bond.

Consider a 10-year, $1,000 par value, 9 percent, semiannual coupon bond, trading at a price of $1,103.57.

On the TI BA II Plus® calculator:
- **E.** The present value (PV) is the bond’s price, $1,103.57.
- **F.** Since the bond pays semiannually, \(N\) is two times the number of years, \(2 \times 10 = 20\).
- **G.** The future value (FV) is the maturity or face value of the bond, $1,000.
- **H.** Since the bond pays coupons semiannually, the payment is half the annual coupon, \(90/2 = 45\).

\[-$1,103.57 \quad \text{PV}\]
Since the bond pays semiannual coupons, the computed value of 3.7544 percent is the semiannual measure of yield. It is the required yield per half year, but market convention dictates that YTM be quoted in nominal (or uncompounded) percent per year. Therefore, double the semiannual yield of 3.7544 percent to find the YTM for the semiannual-pay bond (7.51 percent). This yield measure (the uncompounded YTM) is also known as the bond equivalent yield (BEY).

The relationship between the different yield measures we have discussed depends on whether a bond is trading at par, at a discount, or at a premium. These relationships are shown in Figure 9. The relationships demonstrated in Figure 9 will hold in all cases.

<table>
<thead>
<tr>
<th>Bond Selling at:</th>
<th>Relationship</th>
</tr>
</thead>
<tbody>
<tr>
<td>Premium</td>
<td>Coupon rate &gt; current yield &gt; yield to maturity</td>
</tr>
<tr>
<td>Par</td>
<td>Coupon rate = current yield = yield to maturity</td>
</tr>
<tr>
<td>Discount</td>
<td>Coupon rate &lt; current yield &lt; yield to maturity</td>
</tr>
</tbody>
</table>

Figure 9: Price–Yield Relationships

Assumptions of YTM. YTM is a summary measure of yield. Whether an investor actually realizes a return equal to the YTM depends upon several assumptions that underlie the calculation of YTM. Some of these key assumptions are described as follows.

E. **All Coupons Can Be Reinvested at the YTM.** Failure to reinvest coupons at the YTM rate will result in a realized yield that is more or less than the YTM. The only way to actually generate a rate of return equal to the bond’s promised yield at the time of purchase is to reinvest all coupons at the YTM. This is the reinvestment assumption that is part of any present value-based measure of yield and is the basis of reinvestment risk.

F. **The Bond Can Be Held to Maturity.** This usually means that it cannot be called or redeemed prior to maturity. When a bond is called, the maturity will be shortened, and the call price is often different from par value. Both of these factors make it unlikely that the realized yield will equal the YTM at the time of purchase.

G. **All Coupon Payments Are Received in a Prompt and Timely Fashion.** YTM is often referred to as a promised yield because it assumes that principal and interest payments will be made as promised.

As a final consideration, we must mention that not all yields are directly comparable. For instance, when choosing to invest between two different bonds, you should never compare the nominal yield on one bond to the current yield on another bond. Nominal yields are only comparable to other nominal yields. The same is true for current yields and yields to maturity. In addition, if the YTM on an annual pay bond is being compared to the YTM on a semiannual pay bond, the investor may make the wrong choice. The YTM on a semiannual pay bond is calculated assuming semiannual compounding of the interest payments. The YTM on an annual pay bond makes no such assumption and thus is not directly comparable to the YTM on a semiannual pay bond without an adjustment.

In order to convert the YTM on a semiannual pay bond to a comparable annual pay YTM, use the following formula:
On the expiration date of an option, the option holder must either exercise the option or let it expire worthless.

After adjusting the yields so that both are stated on the same basis, the investment decision can be made.

Although not a requirement, virtually all U.S. corporate bonds are issued with $1,000 face (par) values.

Semiannual interest payments are common in the U.S., whereas annual interest payments are the norm in Europe.

Firms typically issue callable bonds during times of historically high interest rates. As interest rates fall, fewer bonds are issued with call features. Because of historically low rates and other factors, fewer callable bonds are being issued.

For example, a $1,000, 8 percent bond would be callable at $1,080 in year 6, $1,060 in year 7, $1,040 in year 8 and so on.

Since he paid $1,000 for the bond and then exchanged it for 25 shares, the effective price is $40.00, as if he had purchased the stock instead of the bond with his $1,000.

A 360-day year is assumed by convention.

Interim means the cash flows are received between the purchase date and maturity date, as with the coupon payments for a bond.

A change in the required return on a bond is usually caused by a change in inflation and/or a change in the bond’s risk.

Section 3: Derivatives

A derivative is a security that derives its value from the value or return of another asset or security. The creation and growth of derivatives markets is largely attributable to both the need of certain market participants to control the risk (uncertainty) associated with certain assets and the desire of other market participants to speculate on the future value of the same assets. Thus it is possible to use derivative instruments to either decrease or increase the risk associated with an investor’s portfolio. In this section we discuss three of the most well-known derivatives: options, forwards, and futures. Some of these derivatives trade “over the counter” and others trade on established exchanges, such as the Chicago Board of Trade (CBOT), the Chicago Board Options Exchange (CBOE), the Chicago Mercantile Exchange (CME), and the New York Futures Exchange (NYFE). While it is possible to structure any of the derivatives covered in this section as a customized over-the-counter transaction, we will discuss each of the derivatives in their most common settings (i.e., standardized exchanges are generally used for options and futures, while the over-the-counter market is generally used for forwards). We begin our discussion with options.
Chapter Objective: Discuss the characteristics of call and put options on common stock.

Options

Imagine an investor believes that the price of XYZ Company’s stock will increase above its current price of $20 per share some time in the next six months but is unsure of how much or exactly when the stock price is going to increase. The investor is hesitant to purchase the stock since there is still a risk that the stock will decline in value, but he wants to take advantage of the price increase if and when it actually occurs. This is where the derivatives market comes in. The investor in this scenario needs the flexibility to participate in the stock price increase but avoid any losses that might occur. For a price, the investor can obtain such flexibility through the purchase of a call option. Likewise, an investor can obtain the flexibility to participate in an expected price decline of a particular stock through the purchase of a put option.

An American option allows the option holder to exercise the option any time between the purchase date and the expiration date. A European option, however, can only be exercised on the expiration date. The terms American and European have nothing to do with where the options trade, and both types can be found in U.S. markets.

An option contract gives its owner the right, but not the legal obligation, to buy or sell an underlying asset at a predetermined future date (the exercise date) at a predetermined price (the exercise or strike price). Options give the buyer the right to decide whether or not the trade will eventually take place, but the seller of the option must transact if the buyer desires it. Although there are many different types of assets covered by options, we will focus our attention on stock options.

E. The owner of a call option has the right to purchase the underlying stock at a specific price for a specified time period.
F. The owner of a put option has the right to sell the underlying stock at a specific price for a specified time period.

For every owner of an option, there must be a seller. The seller of the option is also called the writer. The writer takes a short position in the options contract while the owner takes the long position. Combining long and short positions with call and put options gives us four possible options positions:

E. Long call: the buyer of the call option. A long call position has the right to buy the stock at the specified price. An investor will hold a long call position when he expects the price of the stock to increase.
F. Short call: the writer (seller) of the call option. A short call position has the obligation to sell the stock at the specified price if the owner of the option decides to exercise (buy the asset). An investor will take the short position in a call when he expects the price of the stock to remain unchanged or decrease.
G. Long put: the buyer of a put option. A long put position has the right to sell the stock at the specified price. An investor will hold a long put position when he expects the price of the stock to decrease.
H. The option premium is just the selling price of the option. Be careful not to confuse this with the exercise price of the option, which is the price at which the underlying asset (stock) will be exchanged. In this example, the option premium is $10, and the exercise price is $50.

* Short put: the writer (seller) of a put option. A short put position has the obligation to buy the stock if the owner of the option decides to exercise (sell the asset). An investor will take the short position in a put when he expects the price of the stock to remain unchanged or increase.
Option Terminology

Before we go any further into the reasons to hold options and their expected payoffs, we must introduce the terminology essential to understanding the features of options contracts. We have already described some of the differences between call and put options. Now we introduce features that are common to all options.

Options on stocks and other assets are standardized legal contracts that entitle the owner to either purchase or sell an asset at a pre-specified price. The price at which the option holder is entitled to buy or sell the asset is known as the exercise price or strike price. The exercise price of the option will remain constant throughout the life of the option.

In general, options have a finite life. The final day that the option is still alive or exercisable is known as the expiration date. Therefore the time to expiration is the number of days until the option reaches the expiration date. Options can be purchased with anywhere from a few weeks to several months until the expiration date. Once the option reaches the expiration date, however, it is no longer exercisable and is considered dead.

Owners of options (the long positions) must buy them by paying the price of the option, which is called the option premium, to the seller of the option. Listed stock option contracts trade on exchanges and are normally traded in bundles of 100. Each option contract, therefore, contains 100 options, and each individual option gives the owner the right to buy or sell one share of stock.

Options, both call and put, can be American or European. The key distinction between American and European options is when the owner can exercise. It has nothing to do with where they are traded.

E. American options may be exercised at any time up to and including the expiration date.
F. European options may be exercised only on the expiration date.

If two options are identical (maturity, underlying stock, strike price, etc.) in all ways, except one is a European option and the other is an American option, the value of the American option will equal or exceed the value of the European option. This is because the early exercise feature of the American option gives it more flexibility, so it should be worth at least as much as, and possibly more than, a comparable European option. The increased flexibility stems from the fact that the American option gives the holder many more opportunities to exercise. That is, the European option has only one day that it can be exercised, while the American can be exercised at any time before it expires.

To see how an option contract works, consider the stock of ABC Company. ABC shares sell in the market for $55 and have an American call option available on them that sells for a premium of $10. This call option has an exercise price of $50 and has an expiration date in five months.

Recall that earlier in this section it was stated that options contracts generally trade in bundles of 100 options for 100 shares of the underlying stock. Price quotations, however, generally are stated on a per share or per option basis. For the ABC Company call option, the option premium was quoted as $10 per option, but the total price paid for the bundle of options would be $10 x 100 = $1,000. Likewise, the total amount paid for the underlying stock if the call option were to be exercised would be $50 x 100 = $5,000.

If one ABC call option is purchased for $10, the buyer can purchase one share of ABC stock from the option seller anytime over the next five months for $50. Note that if the holder exercises the option immediately, he will effectively pay $60 for the stock (the $50 exercise price plus the $10 option premium). Since the stock is currently selling for $55, the holder will not exercise. He will wait and hope the stock rises to at least $60.

The writer of the option gets to keep the $10 premium received from the holder no matter what the stock does during this time period (i.e., no matter whether the buyer exercises the option or not). If the buyer exercises the option, the seller will receive the $50 strike price and must deliver one share of ABC stock to the buyer for each option sold.
A single put option on ABC stock with the same exercise price gives the buyer the right to sell one share of ABC for $50 at any time during the next five months. The put writer has the obligation to buy the ABC stock from the owner at the exercise price if the buyer chooses to exercise.

**Chapter Objective:** Discuss what is meant by moneyness; with respect to options on common stock, determine an option’s payoff and profit, and discuss the factors affecting option value.

### Moneyness And Payoffs

**Moneyness** refers to the relationship between the strike price and the stock price. If there is benefit, not necessarily a profit, from exercising the option, it is said to be “in-the-money.” If there is no benefit, the option is “out-of-the-money.” To be clear, we will define in greater detail what exactly is meant by the terms benefit, in-the-money, and out-of-the-money.

For a call option, the benefit of exercising occurs when the market price of the stock is greater than the option’s exercise price. Given this situation, the holder of the call option can exercise the option, pay the exercise price for the stock, and immediately sell the stock in the market at a higher price. Conversely, the benefit to exercising a put option occurs when the market price of the stock is less than the option’s exercise price. In this situation, the holder of the put option can buy the stock at the market price, exercise the option, and immediately sell the stock for the higher exercise price. In the above scenarios, the call and put options are said to be in the money. When an option is in the money, it is in the option holder’s best interest to exercise or sell the option and capture the favorable difference between the market price of the stock and the exercise price of the option. The favorable difference is known as the option **payoff** and can be summarized as follows:

Payoff of a call or put option to the option holder:

\[
C_{\text{buyer}} = \max(0, S - X) \quad \text{and} \quad P_{\text{buyer}} = \max(0, X - S)
\]

where:
- \( S \) = market price of the stock
- \( X \) = exercise price of the option
- \( C \) = call option payoff
- \( P \) = put option payoff

Notice that we have written the payoff functions as the maximum of zero or \( S - X \) (for call options) and the maximum of zero or \( X - S \) (for put options). If the difference between the exercise price and the stock price is ever unfavorable (i.e., stock price is less than exercise price for a call, or stock price is greater than exercise price for a put), the option would go unexercised since the payoff to the option holder would be negative. Therefore the option payoff to the buyer is limited by zero. When the payoff to the option holder is unfavorable or negative, then the option is said to be out-of-the-money.

Let’s look at an example. We’ll assume that the exercise price for an option on a share of ABC stock is $50, and the stock price is $55. If this is a call option, the option is in-the-money because it allows the owner to buy a $55 stock for $50. If it is a put option, it is out-of-the-money because it allows the owner to sell a $55 stock for $50.

We have summarized the relationships between the stock price, exercise price, and moneyness for calls and puts in **Figure 10**. We will let \( S \) stand for the stock price, \( C \) for the call premium, \( P \) for the put premium, and \( X \) for the exercise price.

<table>
<thead>
<tr>
<th>Option</th>
<th>S &gt; X</th>
<th>S &lt; X</th>
<th>S = X</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
We have covered the payoffs to the option buyer, but what about the other side of the transaction; the option writer? The writer of the contract faces the opposite payoff function at expiration. If the holder of the call option chooses to exercise, the option writer will be forced to buy the stock in the market and immediately sell the stock for the lower exercise price. If a put option holder chooses to exercise, the option writer will be forced to buy the stock at the exercise price but will have to sell the stock at the lower market price. Both the call and put writers in these scenarios face a negative cash flow in the event that the option holder exercises the call or put option. We can summarize the relationships as follows. Payoff of a call or put option to the option writer:

\[
C_{\text{writer}} = -\max(0, S - X) \quad \text{and} \quad P_{\text{writer}} = -\max(0, X - S)
\]

As stated before, the payoff to the option writer is the opposite of the payoff to the option holder. Options, therefore, are a zero sum game in the sense that the benefit to one party of the transaction is a cost to the opposite party.

At any point, the size of the potential (i.e., if exercised) payoff of a call or put option is equal to what is known as the option’s intrinsic value. Therefore, because the option payoff is limited by zero, the intrinsic value of an option is also limited by zero. How do we then interpret an out-of-the-money option with a premium greater than zero? There is obviously some value to the market of holding an out-of-the-money option. The value lies in the time to expiration. If there is still time for the option to become an in-the-money option, then there is value to purchasing the out-of-the-money option. Thus, every option has a value based on two components—the intrinsic value and the time value.

**Profits**

A question that is probably bothering you at this point relates to the premium paid for the option. That is, if an option is in-the-money, is exercising it profitable? The answer, unfortunately, is “it depends.” This is because moneyness is determined solely by the strike and stock prices. To calculate profit, you must take the premium into consideration. Returning to our preceding example, we’ll assume the option premium is $10.

For the call option, \( S = 55 \), \( X = 50 \), and \( C = 10 \). Let’s assume the date is the day the option matures (expires). Would the holder exercise the option? The answer is yes, even though there is a loss. Let’s look at the reason:
If the holder does not exercise, she is out the original premium paid of $10. If she exercises the option, she gains $5 from buying the stock, which helps to offset the $10 cost of the option. Let’s specify the profit of a call option as:

$$\text{Profit}_{\text{Call}} = (S - X) - C$$

where:
- $S$ = the stock price
- $X$ = the exercise price
- $C$ = the call premium

If the holder exercises the call, profit = ($55 - $50) – $10 = –$5. If the holder does not exercise, the profit is –$10, the cost of the option. In this case, the holder will exercise, even though the transaction is a loss. Exercising the option does not generate a profit, but it reduces the loss.

Let’s now assume:

- $S = $50$, $X = $55$, and $C = $10$

$$\text{profit}_{\text{Call}} = (S - X) - C = ($50 - $55) - $10 = -$15$$

In this case, the holder will not exercise the option because doing so would only increase the loss from $10 to $15. You will note that since $X > S$, the call is out-of-the-money. In fact, any time an option is out-of-the-money at maturity, the holder is better off simply throwing the option away.

Turning to the put option, assume $S = $50$, $X = $55$, and $P = $10$. The profit for a put option can be expressed by the following equation:

$$\text{profit}_{\text{Put}} = (X - S) - P$$

where:
- $S$ = the stock price
- $X$ = the exercise price
- $P$ = the put premium

$$\text{profit}_{\text{Put}} = ($55 - $50) - $10 = -$5$$

Again, the holder will exercise, even though there is a net loss on the transaction, because the put is in-the-money; exercising the put decreases the loss. In this example, the investor would have suffered a loss of $10 without exercising the option, but by exercising, the loss is reduced to $5. Of course, if the put is out-of-the-money ($X < S$) at maturity, it will not be exercised.

This brings us to an important point about the risk of options. A buyer of an option has the risk that the option will expire out-of-the-money, and he will lose the entire premium paid for the option. The buyer also has the upside potential of participating in stock price increases (in the case of calls) or stock price decreases (in the case of puts). The writer of an option has significantly more risk. A call option writer has the benefit of receiving the option premium but has the risk that the stock price will rise infinitely. Therefore, the call writer could experience an infinite loss. Similarly, a put writer could watch as the price of the underlying stock falls to zero. The loss to the put writer could be very large indeed but is limited somewhat by the lower boundary of stock prices. That is, a stock’s price cannot fall below zero.

**Factors That Affect Option Value**

As you can probably guess from this discussion, the value of an option is determined by whether it is or is expected to become an in-the-money option. Since the vast majority of options are issued out-of-the-
money, there are several factors the investor can use to estimate whether the option will get in the money: current stock price, exercise price, maturity, and the volatility of the underlying stock (i.e., its variance).

**Stock price.** Generally, for a given exercise price, the higher the stock price, the higher the value of a call option and the lower the value of a put. Rather than resort to mathematics in proving this relationship, let’s use simple logic. As the price of a stock increases toward the exercise price of a call option, the probability that the market price will surpass the exercise price and the option will move into the money increases. Thus the value of the call option increases as the stock price increases. Conversely, as the price of a stock decreases towards the exercise price of a put option, the probability that the market price will fall below the exercise price increases. Therefore the value of the put option increases as the stock price decreases. Remember, the exercise price is fixed in the option contract, so the probability of getting in-the-money is determined by whether the stock price is expected to move favorably for the option holder.

**Exercise price.** Given a certain stock price, it is reasonable to assume that a call option with a low exercise price should be more valuable than one on the same stock with a higher exercise price, simply because the former allows the option holder to purchase the stock at a lower price and a higher payoff. At the same time, the higher the exercise price, the higher the value of a put option because it allows the option holder to sell the stock at a higher price and a higher payoff.

**Time until expiration.** The time until expiration of most put and call options on common stock is fairly short (e.g., 6 months). There are long-term options [e.g., Long Term Equity Anticipation Securities (LEAPS), which have lives of up to 2 ½ years], but “ordinary” stock options are far more prevalent. Currently, there are only around 400 different LEAPS contracts offered.

The relationship between the maturity of an option and its value is positive. That is, the longer the remaining life, the greater its value. Again, logic would dictate that the longer the remaining life of the option, the higher the probability it will get in-the-money (i.e., there is more time for the stock price to move favorably for the option holder).

**Stock volatility.** In the risk discussion we used variance as a measure of risk because variance (standard deviation) measures the volatility of the investment’s returns. Variance measures the dispersion of possible returns [i.e., the range of possible returns (price movements) over the period]. Relying on logic once again, it would seem reasonable that the greater the volatility of the stock’s price, the higher the probability it will get in-the-money.

Note that even though there is no price risk, each side of a forward contract is exposed to default risk; the probability that the other party (the counterparty) will not fulfill the obligation specified in the contract.

Figure 11 summarizes the nature of the relationships we have discussed. Remember, a positive relationship means the two variables move in the same direction (as one increases, the other increases), and negative means they move in opposite directions (as one increases, the other decreases):

<table>
<thead>
<tr>
<th>Variable</th>
<th>Call Value</th>
<th>Put Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock price</td>
<td>+</td>
<td>–</td>
</tr>
<tr>
<td>Exercise price</td>
<td>–</td>
<td>+</td>
</tr>
<tr>
<td>Maturity</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Volatility</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

**Note**  
+ means the change in the option value is in the same direction as the change in the variable. – means the changes are in opposite directions.
**Types Of Options**

The focus of our discussion on options has been on stock options, but the options market encompasses much more than just stock options. Options are traded on a number of assets, including bonds, bond indexes, stock indexes, foreign currencies, interest rates, commodities, futures, swaps, and even other options. While we do not get into the specifics of each type of option available, most of the same principles detailed in this section apply to other types of options as well.

**Forwards And Futures**

Much like the options market, the forwards and futures markets developed to manage and speculate on the uncertainty associated with the price of an asset. Unlike the options market, however, forwards and futures represent a contractual obligation to transact with the counterparty. In other words, each side to a forward or futures contract must buy or sell the underlying asset or settle the contract in cash. There is no option to perform on the contract: it must be done upon the expiration of the contract. Because of this characteristic, forwards and futures pose different issues (as compared to options) regarding their value and use. We will examine each of these issues in the following discussion.

**Chapter Objective:** Briefly discuss the characteristics of spot and forward markets.

**Spot vs. Forward market**

As a precursor to the discussion of the features of forwards and futures, it is useful to briefly review the spot and forward markets introduced in the Capital Markets chapter.

Recall from the Capital Markets chapter that the spot market is a market for the immediate delivery of an asset. Buyers and sellers who desire to transact today will go to the spot market to find a counterparty to their proposed transaction. In some instances, however, a buyer or seller may not wish to transact today but knows that she will need or want to transact in the future. Unfortunately, there is uncertainty associated with waiting until the future date to enter the spot market and complete the transaction. This is where the forward market comes in. In the forward market, contracts between buyers and sellers are written based on an agreed-upon price and quantity today, but delivery does not occur until some pre-specified date in the future.

Being able to secure a known price today for a transaction that will occur in the future has a definite benefit. However, forward contracts have a down side resulting from the lack of a liquid market in which holders can buy and sell contracts quickly. If it were possible, a corn farmer could buy and sell forward contracts as the harvest date neared in order to hedge most of his risk. Since such a forward market doesn’t exist, futures markets were developed. Futures are standardized contracts traded on organized exchanges and are similar in concept to a forward contract. In the case of a corn contract, it would specify the grade of corn, the bushels in one contract, the delivery price per bushel, and the delivery location. We discuss the key features of forwards and futures in the next sections.

**Chapter Objective:** Discuss the characteristics of forwards, including common terminology and payoff structure.
**Forwards**

A *forward* contract is a privately negotiated contract that obliges one party to buy and the other to sell a specific quantity of an asset at a set price on a specific date in the future. Typically, neither party to the contract pays anything to initiate the contract.

Investors can enter into forward contracts as a speculation on the future price of the underlying asset, but more often they enter into forward contracts to hedge a risk they already have. The forward contract is used to eliminate uncertainty about the price of an asset they plan to buy or sell at a later date. Forward contracts on physical assets, such as agricultural products, have existed for centuries.

The party to the forward contract who agrees to buy the financial or physical asset is said to have a *long forward position* and is referred to as the *long*. The party to the forward contract that agrees to sell/deliver the asset has a *short forward position* and is referred to as the *short*.

We will illustrate the mechanics of the basic forward contract through an example based on the purchase and sale of a Treasury bill. Note that while forward and futures contracts on T-bills are usually quoted in terms of a percentage discount from face value, we will use dollar prices to make the example easier to follow. Actual pricing for T-bill conventions and calculations were covered in the Capital Markets chapter.

**Example:**

Investor A agrees (through a forward contract) to buy a Treasury bill from investor B. The contract calls for investor A to pay $990 for a 90-day, $1,000 face value bill in 30 days. Describe the uncertainty associated with price movements on the 90-day T-bill.

**Answer:**

Both parties have removed any uncertainty about the price they will pay/receive for the T-bill at the future date because regardless of the actual price, the agreed-upon price is $990. For example, if 30 days from now 90-day T-bills are selling for $992, the short must deliver the T-bill to the long and the long must pay $990. If T-bills are trading at $988 on the future date, the long must purchase the T-bill from the short for $990, the contract price. Also, investors A and B can agree to a *cash settlement* in lieu of actually exchanging the T-bill. We'll assume the T-bill is selling for $995 (in the spot market) at the forward date. Since A has agreed to pay $990 and B has agreed to accept $990, investor B could simply pay investor A the $5 difference between the contract price and the actual price of the T-bill in the spot market. A would then buy the bill at $995 with a net cost of $990 (i.e., $995 less the $5 received from B). Note that A ends up paying the forward contract price.

This example actually demonstrates the two motives for entering forward contracts: hedging and speculation. A, who actually needed a T-bill, hedged the price he would have to pay by entering into the contract. B, on the other hand, did not actually have a T-bill he could deliver on the forward contract. Rather, B was speculating (incorrectly) that the price of T-bills would fall, and he would profit from the decline in the T-bill's price.

**Forward Payoffs**

If the forward contract has no provisions for early settlement, the counterparties can still, by mutual agreement, settle the contract if they choose to do so. When the contract expires, most contracts allow for two methods of settlement. *Cash settlement* (described in the previous example) is frequently used and consists of the payment of the net difference between the contract price and the spot price on the settlement date. *Physical delivery* of the actual underlying asset can also occur when the short counterparty actually delivers the underlying asset to the long counterparty at the agreed-upon price.

With cash settlement, one of the counterparties will pay the other an amount equal to the difference between the spot price and forward price times the contract size. Usually, the contract size is the value of a
certain amount of an asset such as a foreign exchange or a quantity of a commodity such as an agricultural product. If we let $F_0$ represent the forward price at contract initiation and $ST$ represent the spot price at contract expiration, then if $F_0 > ST$, the long counterparty will pay the short counterparty an amount equal to $(F_0 - ST) \cdot \text{(contract size)}$, and if $F_0 < ST$, the short counterparty will pay the long counterparty an amount equal to $(ST - F_0) \cdot \text{(contract size)}$.

In the history of U.S. futures trading, a clearinghouse has never defaulted on a trade.

We say the payoffs to a forward contract are symmetric. Because the transaction price is set in the contract, if the price of the specified asset increases above the contract price, the buyer (long position) gains value. She has agreed to pay a lower price for the asset. At the same time, the seller (short position) loses the same value because she has agreed to accept the lower price.

At the end of every trading day all futures contracts are marked to market (settled) at the “settle” price, which is reported in various financial media. Although occasionally required, most forward contracts are not marked to market.

Chapter Objective: Discuss the characteristics of futures, including marking to market, convergence, and payoffs.

Futures

Futures are very similar to forward contracts in several ways and are often used for many of the same reasons that forward contracts are used. There are some key differences, however, that make futures a distinct financial instrument.

Futures are similar to forwards in that both:
- E. Have similar terminology. The purchaser of a futures contract is said to have gone long or taken a long position, while the seller of a futures contract is said to have gone short or taken a short position. For each contract traded, there is a buyer and a seller.
- F. Obligate the long to buy and the short to sell a set quantity of an asset for a set price on a specified future date.
- G. Allow for cash settlement by paying the net contract value in cash on the expiration date.

Futures differ from forwards in the following ways:
- E. Futures contracts trade on organized exchanges and require the payment of a margin (deposit) at inception. Forwards are private contracts that usually do not trade once the agreement is signed, and they rarely require a margin payment.
- F. Futures are standardized. Forwards are customized contracts satisfying the needs of the parties involved.
- G. Acting as a “middle man,” a clearinghouse is the counterparty to all futures contracts. Forwards are contracts with the originating counterparties.
- H. The government regulates futures markets. Forward contracts are usually not regulated.

As previously stated, a major difference between forwards and futures is that futures contracts have standardized contract terms. Futures contracts specify the quality and quantity of the underlying asset that
can be delivered, the delivery time, and the manner of delivery. The exchange also sets the minimum price fluctuation (which is called the tick size).

As an example, Figure 12 shows the characteristics for a corn futures contract traded on the Chicago Board of Trade (CBOT).

<table>
<thead>
<tr>
<th>Contract size</th>
<th>5,000 bushels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deliverable grade</td>
<td>No. 2 yellow at par, No. 1 yellow at 1½ cents over contract price, No. 3 yellow at 1½ cents under contract price</td>
</tr>
<tr>
<td>Tick size</td>
<td>¼ cent ($12.50 per contract)</td>
</tr>
<tr>
<td>Price quote</td>
<td>Cents and quarter cents per bushel (the contract maturing in September is currently trading at ~264 cents)</td>
</tr>
<tr>
<td>Contract months</td>
<td>December, March, July, and September</td>
</tr>
<tr>
<td>Last trading day</td>
<td>The business day prior to the last trading day of the delivery month</td>
</tr>
<tr>
<td>Trading hours</td>
<td>Open auction: 9:30 a.m. to 1:15 p.m. Central time, Monday through Friday. Electronic: 7:30 p.m. to 6:00 a.m. Central time, Sunday through Friday. Trading in expiring contracts closes at noon on the last trading day.</td>
</tr>
<tr>
<td>Ticker symbol</td>
<td>Open auction: C Electronic: ZC</td>
</tr>
<tr>
<td>Daily price limit</td>
<td>± $0.20 from the previous settle price</td>
</tr>
</tbody>
</table>

![Open table as spreadsheet](#)

**Figure 12:** Corn Futures Contract: CBOT

It might seem like such strict standards would restrict trading activity, but in fact, they stimulate it. Standardization tells traders exactly what is being traded and the conditions of the transaction. This uniformity promotes liquidity, which is a primary driver of securities trading.

Each exchange has a clearinghouse. The clearinghouse guarantees that traders in the futures market will honor their obligations by splitting each trade once it is made and acting as the guarantor for each position. The clearinghouse does not actually buy or sell contracts, but it matches every buyer to a seller. Since the clearinghouse acts as the middleman, buyers and sellers need not even know each other. The clearinghouse also ensures each side performs as required under the contract, effectively eliminating any risk of non-performance. By doing this, the clearinghouse provides the means for either side of the trade to reverse positions at any time before the maturity date without having to contact the other side of the initial trade. Thus the clearinghouse effectively ensures a highly liquid, smooth-flowing futures market.

This is unlike forward contracts, which have been customized to fit the two parties involved and may be very difficult to get out of. For example, in our preceding forward contract discussion, investor B (the speculator) could have reversed his position when he first noticed the T-bill price going the wrong way, if he had been in a futures contract. Instead he could only watch as the price increased.

**Marking To Market**

The price at which a futures contract is closed on a given day is the settlement price. Every trading day, all futures contracts are marked to market based on the settlement price. Marking to market is the process of adjusting the margin balance (i.e., the money deposited with the clearinghouse) in a futures account each day for the change in the value of the contract assets from the previous trading day.
If the futures contract has lost value, those who bought the contract have lost the same amount. Their margin account will be reduced by the difference, and they may be required to deposit the difference between the price they paid and the settlement price. Those who sold the contract have actually made that amount and may withdraw it. In this fashion, profits and losses on futures contracts are settled every trading day.

**Example: Computing Margin Balances**

Consider a long position on a July wheat contract, which covers 5,000 bushels. Assume that the contract requires an initial margin deposit of $150 and a maintenance margin of $100. Compute the margin balance for this position after a two-tick decrease in price followed by a one-tick increase, then a one-tick decrease. Note that on this contract one tick is one cent.

**Answer:**

Each $0.01 change (tick) in the price of wheat for this contract represents a gain or loss of $50 ($0.01 × 5,000 = $50.00). Figure 13 illustrates the change in the margin balance as the price of this contract changes each day. Note that the required deposit is based upon the previous day’s price change.

<table>
<thead>
<tr>
<th>Day</th>
<th>Required Deposit</th>
<th>Settle Price</th>
<th>Change in Price</th>
<th>Gain/ Loss</th>
<th>Margin Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beg 1</td>
<td>$150</td>
<td></td>
<td></td>
<td></td>
<td>$150</td>
</tr>
<tr>
<td>End 1</td>
<td>0</td>
<td>$1.98</td>
<td>−$0.02</td>
<td>−$100</td>
<td>$50</td>
</tr>
<tr>
<td>2</td>
<td>$100</td>
<td>$1.99</td>
<td>+ $0.01</td>
<td>+ $50</td>
<td>$200</td>
</tr>
<tr>
<td>3</td>
<td>0</td>
<td>$1.98</td>
<td>−$0.01</td>
<td>−$50</td>
<td>$150</td>
</tr>
</tbody>
</table>

**Figure 13:** Daily Margin Balance (Day 0 is the date of entering the contract)

**Discussion:**

**Beginning of Day 1:** The long investor pays a deposit of $150 to enter into the futures contract at a price of $2.00 per bushel.

**End of Day 1:** The price in the spot market has dropped to $1.98. This means the long position has agreed to pay $2.00 for a product worth $1.98, a loss of $0.02 per bushel. On a contract for 5,000 bushels, this means a loss of $100, which is deducted from the investor’s margin and drops the margin to $50.

**End of Day 2:** Since the investor’s margin fell to $50 the previous day, the investor is required to bring the margin back to its original level of $150 with a $100 deposit. Then, at the end of the day, the contract is settled at $1.99.

Settling futures contracts through marking to market everyday means profits and losses are calculated and collected/paid daily.

This effectively closes the futures contract and opens a new one each day at the last settle price. In this case the contract was settled at $1.98 on the previous day, so when the contract is settled at $1.99, the long position experiences a $0.01 per bushel ($50.00) gain. This is added to the investor’s margin, which ends the day at $200.

**End of Day 3:** The contract is again settled at $1.98, so the long position experiences another 0.01 per bushel loss ($50.00). The amount is deducted from the margin, which ends day 3 at $150.
Convergence

The concept of convergence is very important to futures contracts. The futures price at any point should be an estimate of the spot price on the maturity date of the futures contract. This means that as the maturity date approaches, the futures and spot prices must converge (i.e., come together and become equal). This relationship can be demonstrated mathematically, but the actual proof is beyond the scope of this discussion.

Terminating Futures Contracts

Delivery is included in every futures contract as a matter of convention and for the infrequent necessity to actually deliver or take receipt of the commodity or financial instrument specified in the contract. Most futures positions are actually established by speculators who have no use for the underlying asset. Speculators therefore need a way to satisfy the commitment without the hassle of delivering or taking delivery of the underlying asset.

There are four ways to satisfy your commitment under a futures contract:

E. A short can satisfy the contract by delivering the goods, a long by accepting delivery and paying the contract price to the short. This is called delivery. The location for delivery (for physical assets), terms of delivery, and specification of what is to be delivered are all specified in the contract. Deliveries represent less than one percent of all settlements.

F. In a cash-settlement contract, delivery is not an option. The futures account is marked to market based on the settlement price on the last day of trading.

G. A position can be closed by making a close-out or offsetting trade in the futures market as previously described. Since the other side of your position is held by the clearinghouse, if you make an exact opposite trade (maturity, quantity, and good) to your current position, the clearinghouse will net your positions out, leaving you with a zero balance. This is how most futures positions are settled.

H. A position may also be settled through an exchange for physicals (EFP). Here you find a trader with an opposite position to your own and deliver the goods and settle up between yourselves off the floor of the exchange (called an ex-pit transaction). This is the sole exception to the federal law that requires that all trades take place on the floor of the exchange. You must then contact the clearinghouse and tell them what happened. An exchange for physicals differs from a delivery in that the traders actually exchange the goods, the contract is not closed on the floor of the exchange, and the two traders privately negotiate the terms of the transaction.

Futures Payoffs

The payoffs to futures contracts are calculated in the same way as the payoffs to forward contracts (i.e., the difference between the contract price and spot price at maturity). If we assume cash settlement and we let $F_0$ represent the futures price at contract initiation and $S_T$ represent the spot price at contract expiration, then if $F_0 > S_T$, the long counterparty will pay the short counterparty an amount equal to $(F_0 - S_T) \cdot $ (contract size), and if $F_0 < S_T$, the short counterparty will pay the long counterparty an amount equal to $(S_T - F_0) \cdot $ (contract size).

Types Of Forward And Futures Contracts

Forwards and futures contracts exist for a variety of underlying asset types. In virtually any market where uncertainty exists regarding the future price of an asset, you will find a forward or futures contract that can be used to reduce the risk of changing spot prices or to speculate on the future price of the asset. Forward and futures contracts exist on the following assets: agricultural and other commodities, stocks, bonds, interest rates, and foreign currencies. This is not an all-encompassing list, but it does summarize some of the more common forward and futures contracts.
The examples assume we are at the maturity of the option contract. This is because it can be shown mathematically that an option is “worth more alive than dead.” That is, as long as an in-the-money option has remaining life (exercising an option “kills” it), it should be sold rather than exercised. If it is exercised, it is worth $S - X$ (or $X - S$ for a put), while other investors will be willing to pay more than that to purchase the option from you.

Hedging is the reduction or elimination of risk.

“Do not trade” in this context means that there is no organized secondary market for forwards. This makes it very difficult for either side to get out of a forward contract.

Source: http://www.cbot.com

For a complete discussion of forward and futures markets, see Chapter 6, Investment Analysis and Portfolio Management, 6 E, by Reilly and Brown, The Dryden Press, 2000.

As with any investment the owner loses money when the value of the investment falls.

Summary

Section 1: Equity Securities

A. The market value of a company equals its stock price times shares outstanding. The market value is also called the company's market capitalization.

B. In a speculative bubble, the market value of stocks are driven more by emotion and fads than by discipline and facts.

C. Benjamin Graham and David Dodd provided a systematic and disciplined approach to equity analysis. The two key components of this method are financial statement analysis and equity valuation.

   A. Financial statement analysis refers to extensive, unbiased examination of the company's financial statements and key financial ratios.
   B. Valuation encompasses various methods used to calculate the intrinsic value of the company's stock.

D. To value any security we use the capitalization of income method.
   A. Estimate all future cash flows from the security.
   B. Estimate the risk of the cash flows.
   C. Based upon the risk, determine a required return (discount rate).
   D. Find the total present value (today) of the cash flows.

F. Financial statement analysis using ratios

   A. Internal liquidity
      A. Liquidity refers to the firm's ability to meet short-term obligations with short-term assets. It represents the firm's ability to liquidate short-term assets to meet short-term liabilities.
      B. The current ratio is the ratio of total current assets to total current liabilities.
         A. Generally, a higher CR is desired.
         B. A CR that is considerably higher than the industry average could mean the firm has too much invested in short-term assets, such as inventory or accounts receivable.

         \[
         \text{CR} = \frac{\text{total current assets}}{\text{total current liabilities}}
         \]
      C. The quick ratio eliminates inventories from the numerator of the CR because inventories are not always easily liquidated.
A. Again, larger is usually better.
B. Too high could mean accounts receivable are too high.

$$QR = \frac{\text{total current assets} - \text{inventory}}{\text{total current liabilities}}$$

D. The receivables turnover ratio shows how quickly the firm is collecting accounts receivable.
A. Measures how many times, on average, the firm collects its accounts receivable in one year.
B. Should be near the industry average.
C. Too low means the firm is not collecting quickly enough, but too high could mean they have set their credit terms too strictly and are losing business.
D. Customers will go to the firm offering the best credit terms.

$$\text{receivables turnover} = \frac{\text{Sales}}{\text{A/R}}$$

E. The average collection period is another measure of collection of accounts receivable.
A. Measures the average number of days it takes the firm to collect an account receivable.
B. Should be near the industry average.
C. Too long (too many days) means the firm is not collecting quickly enough, but too short (too few days) could mean its has set its credit terms too strictly and is losing business.
D. Customers will go to the firm offering the best credit terms.

$$ACP = \frac{365}{\text{receivables turnover}}$$

F. The inventory turnover ratio measures how many times inventory is “cycled” during the year.
A. How many times the inventory is depleted and refilled.
B. Should be near the industry average.
C. Too high could mean the firm is not holding enough inventory for the level of sales and risks outages.
D. Too low could mean the firm is holding too much inventory.
A. Risk of inventory obsolescence.
B. Too much cash invested (tied up) in inventory.

$$\text{inventory turnover} = \frac{\text{COGS}}{\text{Inventory}}$$

G. The payables turnover ratio measures how many times during the year accounts payable (trade credit) is paid off and “refilled.”
A. Should be near the industry average.
B. Too high could mean the firm is paying too quickly. The firm should take as long as possible without risking good credit rating.
C. Too low could mean the firm is not paying quickly enough.
A. Bad reputation.
B. Possible loss of trade credit.

$$\text{payables turnover} = \frac{\text{COGS}}{\text{A/P}}$$
H. The payables payment period measures the average number of days the firm takes to meet trade credit obligations.
   A. Should be near the industry average.
   B. Too short (too few days) could mean the firm is paying too quickly. Should take as long as possible without risking good credit rating.
   C. Too long (too many days) could mean the firm is not paying quickly enough.
      A. Bad reputation.
      B. Possible loss of trade credit.

   \[
   \text{payables turnover} = \frac{365}{\text{payables payment period}}
   \]

B. Operating performance ratios are two categories, efficiency and profitability, that measure how well management is running the firm.
   A. Efficiency ratios
      A. The total asset turnover ratio measures how efficiently management is utilizing all the firm’s assets.
         A. Should be near the industry average.
         B. Too low could mean the firm is underutilizing its assets.
         C. Too many short-term assets and/or too many fixed assets.
         D. Too high could mean outdated assets (old and fully depreciated).

         \[
         \text{total asset turnover} = \frac{\text{sales}}{\text{total assets}}
         \]

      B. The fixed asset turnover ratio measures the utilization of just the firm’s fixed assets.
         A. Should be near the industry average.
         B. Too low could mean the firm is underutilizing its assets.
         C. Too many short-term assets and/or too many fixed assets.
         D. Too high could mean outdated assets (old and fully depreciated).

         \[
         \text{fixed asset turnover} = \frac{\text{sales}}{\text{fixed assets}}
         \]

   B. Profitability ratios
      A. Gross profit margin measures the operating profitability of the firm before the effects of all fixed obligations and taxes (i.e., sales less cost of goods sold).

         \[
         \text{gross profit margin} = \frac{\text{gross profit}}{\text{sales}}
         \]

      B. Operating profit margin measures the operating profitability of the firm after all operating expenses but before interest and taxes.

         \[
         \text{operating profit margin} = \frac{\text{EBIT}}{\text{sales}}
         \]

      C. Net profit margin measures the profitability of the firm after all expenses (before dividends).

         \[
         \text{net profit margin} = \frac{\text{NI}}{\text{sales}}
         \]

      D. Return on total equity measures the return to all equity capital providers.
C. Risk analysis
   A. Business risk is the uncertainty regarding the operating income of a company (EBIT) and is a result of the variability of sales and production costs.
   B. Financial risk is the additional volatility of equity returns (ROE) caused by the firm’s use of debt.
   C. Business risk is often measured as the coefficient of variation of a company’s operating income (EBIT) over several years:
      \[
      \text{business risk} = \frac{\sigma_{EBIT}}{\text{average EBIT}}
      \]
   D. Sales volatility is the coefficient of variation of sales over several years:
      \[
      \text{sales volatility} = \frac{\sigma_{sales}}{\text{average sales}}
      \]
   E. The debt-equity ratio measures management’s use of fixed-cost financing as opposed to equity in financing the firm’s assets.
      \[
      \text{debt-equity ratio} = \frac{\text{long-term debt}}{\text{total equity}}
      \]
   F. The debt/assets ratio, or total debt ratio, is another way of measuring management’s use of debt to finance the firm’s assets. All debts, including short-term sources such as accounts payable, are included.
      \[
      \frac{\text{total debt}}{\text{assets}} = \frac{\text{total debt}}{\text{total capital}}
      \]
   G. The interest coverage ratio also known as the \textit{times-interest-earned ratio}, measures the firm’s ability to meet its interest (debt) obligations with operating income (EBIT).
      \[
      \frac{\text{EBIT}}{\text{interest expense}}
      \]

D. Growth analysis
   A. The sustainable growth rate is the rate of growth (increase in assets) the firm can maintain without having to sell new common stock.
      \[
      g = RR \times \text{ROE}
      \]
      where
      \[
      g = \text{sustainable growth rate} \\
      RR = \text{retention rate} \\
      \text{ROE} = \text{return on (common) equity}
      \]
   B. The retention rate is the percentage of net income that is held within the business as retained earnings. The dividend payout ratio is the percentage of net income paid out to the common stockholders as dividends. The sum of the two must equal 100%.
      \[
      \frac{\text{dividends paid}}{\text{net income}}
      \]
retention rate = (1 - dividend payout ratio)

\[
E. \text{ The Du Pont System is an approach that can be used to analyze return on equity (ROE) by looking at combinations of various ratios. It uses basic algebra to break down ROE into a function of different ratios, so an analyst can see the impact of leverage, profit margins, and turnover on shareholder returns.}
A. The traditional Du Pont approach starts with ROE:
\[
\text{return on equity} = \frac{\text{net income}}{\text{equity}}
\]
B. Through algebraic manipulation we arrive at the Du Pont equation:
\[
\text{ROE} = \left( \frac{\text{net income}}{\text{sales}} \right) \left( \frac{\text{sales}}{\text{assets}} \right) \left( \frac{\text{assets}}{\text{equity}} \right), \text{ or}
\]
\[
\text{ROE} = \left( \frac{\text{net profit margin}}{\text{turnover}} \right) \left( \frac{\text{asset turnover}}{\text{equity multiplier}} \right)
\]
C. This is the traditional Du Pont equation. It breaks down a ROE into three key components. If ROE is low, it must be that at least one of the following is true:
A. The company has a poor profit margin.
B. The company has poor asset turnover.
C. The company is not highly leveraged.

F. Relative ratio analysis
A. The value of a single financial ratio is not meaningful by itself. It must be interpreted relative to one of three factors: industry norms, overall economy norms, and the company’s own historical (past) performance.
A. Comparison to the industry norm (average) is the most common type of comparison. Industry comparisons are particularly valid when the products generated by all the firms in the industry are similar.
B. Comparing a company to the overall economy is particularly important when overall business conditions are changing. For example, a stable profit margin might be considered good if the economy is in recession and the economy-wide average profit margin is declining. On the other hand, it might be considered problematic if a stable profit margin occurs during an economic expansion and overall average profit margins are increasing.
C. Comparing a firm with its history is very common. Typically the analyst will look at the current level of the ratio and then look to see if it has been declining over time, stable over time, or improving over time.

G. Limitations of financial ratios
A. Ratios can be very misleading, and the analyst must remember a few rules:
A. Financial ratios are not useful when viewed in isolation. They are only valid when compared to other firms or the companies’ historical performance.
B. Comparisons with other companies can be difficult because of different accounting treatments.
C. It is difficult to find comparable industry ratios when analyzing companies that operate in multiple industries.
D. Conclusions cannot be made from viewing one set of ratios. All ratios must be viewed relative to one another over time.
E. Determining the target or comparison value for a ratio is difficult, as the industry is often difficult to identify properly.

B. Ratios are used for internal analysis and comparisons and across firms. They are often most useful in identifying questions that need to be answered rather than answering questions directly. In conducting your analysis, you must always be aware of the limitations of ratios.
   A. Do the firms being compared have compatible accounting practices?
   B. Do the ratios give consistent readings? For example, if the debt ratio is too high, is the interest coverage ratio low?
   C. Do the ratios yield a reasonable figure for the industry?

G. Equity valuation
   A. Common stock is the best-known equity security.
   A. Cash flows associated with common stock include dividends and the eventual selling price of the stock (received when the investor sells the stock).
   B. The intrinsic value for a common stock equals the present value of the cash flows the investor expects to receive.
   B. The constant growth dividend discount model assumes dividends will grow at a constant rate forever.
      A. Using the constant growth model, the intrinsic value (fair price, Pt) equals:
         \[ P_t = \frac{D_{t+1}}{k - g} \]
      B. The constant growth model does not work for a company that is growing at a rate equal to or above the stock’s required return.
   A. The multi-stage dividend discount model permits the company to grow at different rates over different periods of time.
      A. Some companies experience an explicit growth period.
         A. Dividends grow at a rate above the normal industry growth rate.
         B. This *supernormal* growth is due to a *temporary* competitive advantage.
         C. Each dividend during this period is estimated using an explicit growth rate.
      B. Following the explicit growth period, the firm will return to its normal growth rate implied by its position in the industry. This is known as the implicit growth period.
      C. The estimated price of the stock is the present value of all future dividends.
         A. We find the present value of all dividends to be received during the explicit growth period.
         B. We find the present value of all dividends to be received during the implicit growth period.
         C. Price = \((\text{Present value of dividends during the explicit growth period}) + (\text{Present value of dividends during the implicit or constant growth period})\)

         \[ P = \sum_{t=1}^{n} \frac{D_t}{(1 + k)^t} + \frac{\left( \frac{D_{n+1}}{k - g} \right)}{(1 + k)^n} \]

   B. The earnings multiplier model shows the relationship between the company’s P/E ratio and its dividend payout, growth, and required return.
   A. The earnings multiplier equation is:
      \[ \frac{P_t}{E_{t+1}} = \frac{D_{t+1}/E_{t+1}}{k - g} \]
Section 2: Debt Securities

E. Bond features, sectors, and risks
   A. Bonds are debt securities and represent borrowing by the issuing firm.
      A. The indenture contains a legal description and all characteristics of the bond including maturity, coupon dates, any collateral, covenants, etc.
      B. The trustee monitors the actions of the firm to ensure adherence to all the conditions of the indenture.
   C. Bonds typically have maturities ranging from 5 to 30 years.
   D. Corporate bonds are typically sold with face values of $1,000.
      A. U.S. corporations usually pay semiannual coupon payments.
      B. The coupon rate is stated as a percentage of face value.
      C. Each semiannual coupon is half of the annual interest payment.
      D. The par value (face value) of the bond represents the amount of funds borrowed and gets repaid at maturity.
   E. Holders of bonds are not entitled to vote on corporate matters.
   F. Bonds can be backed by (secured by) collateral or, in the case of debentures, have no assets directly supporting the issue.
   G. Bonds are ranked for payoff in case of bankruptcy.
      A. Bonds are ranked by collateral (i.e., mortgage bonds have seniority over debentures).
      B. Bonds are ranked by order of seniority (i.e., earlier issues have seniority over newer issues).
   H. Covenants prescribe or prohibit certain actions for the issuer.
      A. Affirmative covenants dictate what management must do, such as file periodic reports with the trustee.
      B. Negative covenants describe what management cannot do, such as issue more debt without approval of the trustee.
   I. Bonds sometimes have a sinking fund.
      A. Annual deposits the firm must make with the trustee to ensure sufficient funds to retire the issue as scheduled.
      B. Serial bonds are often retired from a sinking fund.
J. Callable bonds give the firm the opportunity to retire the bond issue early and replace it with another issue at a lower rate of interest.

K. Bonds can be convertible (i.e., exchanged at the discretion of the holder for common stock). The conversion ratio describes how many shares of common stock can be obtained by surrendering the bond.

B. The U.S. bond market can be separated into four major segments: Treasury, agency, state and local (or municipal), and corporate.

A. U.S. Treasury securities (or “Treasuries”) are issued by the U.S. Treasury Department.
   A. Treasuries are backed by the full faith and credit of the U.S. government and are considered to be free from risk of default.
   B. They are not free from interest rate/price risk.
   C. T-bills have a maturity of less than one year and are issued at a discount to their face value.
   D. T-notes have maturities ranging from two to ten years and are coupon-bearing securities.
   E. T-bonds have maturities of greater than ten years and, like T-notes, are coupon-bearing securities.
   F. The Treasury yield curve is constructed by graphing the yields of outstanding Treasury securities of various maturities.

B. Agencies of the federal government and some organizations affiliated with the federal government also issue fixed-income securities.
   A. Federally related institutions are owned by the U.S. government. Their securities are implicitly backed by the full faith and credit of the U.S. government.
   B. Government-sponsored entities are privately owned but publicly chartered organizations created by the U.S. Congress. Their securities are not backed by the full faith and credit of the U.S. government.
   C. Agency securities vary widely in their design but include debentures as well as mortgage-backed and asset-backed securities.

C. Debt securities issued by state and local governments in the U.S. are known as municipal bonds.
   A. Interest on munis is generally exempt from federal income taxes, but any capital gains are subject to capital gains tax. The interest is generally taxable at the state level.
   B. Munis have higher risk of default than Treasury securities.
   C. Munis are issued as general-obligation (backed by tax revenue) or revenue bonds (backed by funds from a public works project).

D. Public corporations also issue fixed income securities.
   A. Corporate debt securities are sold through public and private placements.
   B. Publicly sold corporate debt must be registered with the SEC while privately placed corporate debt can go unregistered.
   C. Corporate debt can be either secured or unsecured.
   D. Maturities for corporate debt vary from less than one year for commercial paper to thirty years for corporate bonds. Corporate notes generally have a maturity greater than one year but less than thirty years.

C. The risks to bond investors are a function of both macroeconomic and microeconomic factors.
   A. Interest rate risk (price risk) is the risk that interest rates will increase and the value of an investor’s bond holdings will decrease. Generally, the longer the maturity of the bond and the lower the coupon rate, the more sensitive it is to changes in interest rates.
   B. Reinvestment risk is the risk that cash flows received from a bond holding will have to be reinvested at a lower rate of return than that expected at the time of the original investment. If cash flows are reinvested at rates that are less than the required yield, the actual return will be less than the required yield.
C. Credit risk is the risk that the issuer will not be able to pay interest and/or principal when due. Bond rating agencies assess this risk by rating the creditworthiness of borrowers and their bond issues outstanding.

D. Liquidity risk is the risk that the investor will not be able to sell the bond quickly at a fair price should the need arise. Liquidity risk can be estimated by looking at the size of the bid-ask spread.

E. Inflation risk is the risk that actual inflation will exceed expected inflation, thereby leading to a loss of purchasing power.

F. Call (prepayment) risk is the risk the bond will be retired early by the issuer and that the funds received will need to be reinvested at a lower yield.

G. Event risk is the risk of an unforeseen event that has a negative impact on the financial condition of the issuer.

Section 3: Bond Valuation And Yield Measures

E. To value any security we use the capitalization of income method.

A. Estimate all future cash flows from the security.

B. Estimate the risk of the cash flows.

C. Based upon the risk, determine a required return (discount rate).

D. Find the total present value (today) of the cash flows.

E. The total present value of all coupons and the face value is our estimate of the value of the bond.

F. When bonds are purchased between coupon payment dates, the buyer must pay accrued interest to the seller.

G. Bond prices are sensitive to changes in interest rates (required return).

A. When the coupon rate equals the required return, the bond will sell at par (face value).

B. When the required return increases (decreases), the price of the bond will fall (rise).

C. The longer the maturity of the bond, the greater the price reaction to a given change in required return.

D. The greater the coupon rate on the bond, the smaller the price reaction to a given change in required return.

H. In the bond market, investment decisions are typically made on the basis of a bond’s yield rather than its price. A bond’s yield affects the price at which it trades and serves as an important measure of potential or expected return.

A. The nominal yield is the stated coupon rate on the bond. Nominal yield is only a meaningful measure if the bond is selling at or close to par value.

B. The current yield is the annual coupon payment divided by the bond’s current price. Current yield is only meaningful if the bond is selling at or close to par value.

C. The yield to maturity on a bond is the discount rate that makes the sum of the present values of a bond’s cash flows equal to its current market price.

A. YTM considers both interest income and capital gains/losses and also the timing of the cash flows received over the life of an issue.

B. The yield to maturity makes the following three assumptions

A. Interim cash flows can be reinvested at a rate equal to the yield to maturity.

B. The bond is held until its maturity date.

C. All coupons and principal payments are received as expected.

D. Not all yields are directly comparable. To compare the yield on an annual pay bond to the yield on a semiannual pay bond, first convert the semiannual bond yield to an annual basis.

Section 4: Derivatives

1. Options
1. A derivative is a security that derives its value from the value or return of another asset or security.
2. An option contract gives its owner the right, but not the legal obligation, to buy or sell an underlying asset at a predetermined future date (the exercise date) at a predetermined price (the exercise or strike price).
   1. The seller of the option has the obligation to perform if the buyer decides to exercise the option.
   2. The owner of a call option has the right to purchase the underlying stock at a specific price for a specified time period.
   3. The owner of a put option has the right to sell the underlying stock at a specific price for a specified time period.
3. There are four options positions.
   1. Long call: the buyer of the call option. Has the right to buy the stock at the specified price.
   2. Short call: the writer (seller) of the call option. Has the obligation to sell the stock at the specified price if the owner of the option chooses to exercise (buy the asset).
   3. Long put: the buyer of a put option. Has the right to sell the stock at the specified price.
   4. Short put: the writer (seller) of a put option. Has the obligation to buy the stock if the owner of the option chooses to exercise (sell the asset).
4. Options can be either American or European.
   1. American options may be exercised at any time up to and including the contract’s expiration date.
   2. European options may be exercised only on the contract’s expiration date.
   3. If two options are identical (maturity, underlying stock, strike price, etc.) in all ways except that one is a European option and the other is an American option, the value of the American option will equal or exceed the value of the European option.
   4. Options contracts generally trade in bundles of 100 options for 100 shares of the underlying stock.
5. Moneyness refers to the relationship between the strike price and the stock price.
   1. An option is in-the-money when there is a positive payoff associated with the exercise of the option. An option is out-of-the-money when there is a negative payoff. An option is at-the-money when the payoff is equal to zero.
      1. A call option’s payoff is: \( C_{\text{buyer}} = \max(0, S - X) \).
      2. A put option’s payoff is: \( P_{\text{buyer}} = \max(0, X - S) \).
   2. The payoff to the writer of an option is the opposite of the payoff to the buyer of the option.

<table>
<thead>
<tr>
<th>Option</th>
<th>( S &gt; X )</th>
<th>( S &lt; X )</th>
<th>( S = X )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Call</td>
<td>In-the-money</td>
<td>Out-of-the-money</td>
<td>At-the-money</td>
</tr>
<tr>
<td>Put</td>
<td>Out-of-the-money</td>
<td>In-the-money</td>
<td>At-the-money</td>
</tr>
</tbody>
</table>

6. An option’s value is equal to its intrinsic value (payoff if exercised immediately) plus its time value (associated with probability of moving into the money).
   1. Intrinsic value of call = \( S - X \)
   2. Intrinsic value of put = \( X - S \)
7. Profit on an option contract is determined by the stock price, the exercise price, and the premium paid for the option.
   1. Profit of call = \( (S - X) - C \)
   2. Profit of put = \( (X - S) - P \)
8. The value of an option is either a positive or negative function of the stock price, the exercise price, its remaining maturity, and the volatility of the underlying stock.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Call Value</th>
<th>Put Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stock price</td>
<td>+</td>
<td>–</td>
</tr>
<tr>
<td>Exercise price</td>
<td>–</td>
<td>+</td>
</tr>
<tr>
<td>Maturity</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Volatility</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

9. Options exist on many different assets, including bonds, bond indexes, stock indexes, foreign currencies, interest rates, commodities, futures, swaps, and even other options.

2. **Forwards and futures**
   1. In spot markets, securities, commodities, and other goods are traded for immediate delivery.
   2. In forward markets, traders agree to transact at a future date at a specified price.
   3. A forward contract is privately negotiated and obliges one party to buy and the other to sell a specific quantity of an asset, at a set price, on a specific date in the future.
   4. There are two primary reasons to enter into a forward contract:
      1. Speculation.
      2. Hedging risk.
   5. The party agreeing to purchase the asset in the future is referred to as the long. The party agreeing to sell the asset in the future is referred to as the short.
   6. Parties to a forward contract may agree to a cash settlement rather than a delivery of the underlying product/good.
   7. Payoffs to a forward contract are symmetric.
   8. Futures contracts are similar to forwards in that both are:
      1. Similar in the terminology used to distinguish the buyer and the seller.
      2. Deliverable contracts that obligate the long to buy and the short to sell a certain quantity of an asset for a certain price on a specified future date.
      3. Cash settlement contracts that are settled by paying the contract value in cash on the expiration date.
   9. Futures contracts differ from forward contracts in the following ways:
      1. Futures contracts trade on organized exchanges and require the payment of a margin (deposit) at inception. Forwards are private contracts that usually do not trade and rarely require a margin payment.
      2. Futures contracts are highly standardized. Forwards are customized contracts satisfying the needs of the parties involved.
      3. A single clearinghouse is the counterparty to all futures contracts. Forwards are contracts with the originating counter-party.
      4. The government regulates futures markets. Forward contracts are usually not regulated.
   10. A major difference between forwards and futures is that futures contracts have standardized contract terms.
      1. Futures contracts also have a daily price change limit, which sets the maximum price movement allowed in a single day.
      2. Uniformity due to standardization promotes liquidity.
   11. Each futures exchange has a clearinghouse.
      1. The clearinghouse guarantees the transaction (removes default risk) by splitting each trade and acting as the intermediary for the trade.
      2. The clearinghouse makes sure each side of the contract fulfills the terms of the agreement.
12. Marking to market is the process of adjusting the margin balance in a futures account each
day for the change in the value of the contract assets from the previous trading day, based on
that day’s settlement price.
   1. Settling futures contracts through marking to market everyday means profits and
      losses are calculated and collected/paid daily.
   2. Profits to one party are losses to the opposite party.
13. The concept of convergence is very important to futures contracts. As the maturity date
    approaches, the futures and spot prices must converge (i.e., come together and become
    equal).
14. There are four ways to satisfy your commitment under a futures contract.
   1. A short can satisfy the contract by delivering the goods, a long by accepting
      delivery and paying the contract price to the short. This is called delivery. Deliveries
      represent less than one percent of all settlements.
   2. In a cash-settlement contract, delivery is not an option. The futures account is
      marked to market based on the settlement price on the last day of trading.
   3. A position can be closed by making a close-out or offsetting trade in the futures
      market. This is how most futures positions are settled.
   4. A position may also be settled through an exchange for physicals (EFP) in which a
      trader finds another trader with an opposite position to his own, delivers the goods,
      and settles up off the floor of the exchange (called an ex-pit transaction).
15. Futures payoffs are calculated in the same way as forwards payoffs.
16. Forwards and futures contracts exist on many different assets, including commodities,
    stocks, bonds, interest rates, and foreign currencies.

Practice Questions: Securities Analysis

1. At the end of 2004, PriceCo, a low cost retailer, had an inventory balance of $2,300 and an
   inventory turnover ratio for the year of 1.9. PriceCo had a receivables turnover ratio of 2.3 for
   2004 based on sales of $7,200 for the year. If in 2003, cost of goods sold (COGS) was $4,720
   and accounts receivable (AR) was $2,930, are COGS and AR increasing or decreasing,
   respectively?
   
   COGS       AR
   A.  Increasing  Increasing
   B.  Decreasing  Increasing
   C  Decreasing  Decreasing
   D.  Increasing  Decreasing

Use the following table to answer Questions 2 through 4.

<table>
<thead>
<tr>
<th>Open table as spreadsheet</th>
<th>FRD Co.</th>
<th>Spencer</th>
<th>Henley Inc.</th>
<th>Worth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Liabilities</td>
<td>$3,000</td>
<td>$5,000</td>
<td>$3,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>Owners Equity</td>
<td>$10,000</td>
<td>$10,000</td>
<td>$4,000</td>
<td>$20,000</td>
</tr>
<tr>
<td>Total Assets</td>
<td>$13,000</td>
<td>$15,000</td>
<td>$7,000</td>
<td>$30,000</td>
</tr>
<tr>
<td>Revenues</td>
<td>$20,000</td>
<td>$30,000</td>
<td>$40,000</td>
<td>$50,000</td>
</tr>
<tr>
<td>Net Income</td>
<td>$2,000</td>
<td>$3,000</td>
<td>$1,000</td>
<td>$5,000</td>
</tr>
<tr>
<td>Operating Expenses</td>
<td>$6,000</td>
<td>$4,000</td>
<td>$28,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>COGS</td>
<td>$10,000</td>
<td>$20,000</td>
<td>$10,000</td>
<td>$30,000</td>
</tr>
</tbody>
</table>
2. Which of the companies in the table has the greatest degree of financial leverage?
   A. FRD Co.
   B. Spencer.
   C. Henley Inc.
   D. Worth.

3. Which of the companies in the table has the highest return on equity?
   A. FRD Co.
   B. Spencer.
   C. Henley Inc.
   D. Worth.

4. Which of the companies in the table has the highest gross profit margin?
   A. FRD Co.
   B. Spencer.
   C. Henley Inc.
   D. Worth.

5. Higgins & Company manufactures replacement vacuum cleaner parts for the U.S. and
   Canadian markets. The company has been able to sustain a high return on equity for each of
   the past ten years despite a steady decline in profitability. Which of the following scenarios is a
   possible explanation as to how Higgins & Company has been able to consistently provide a
   high return to equity shareholders over time?
   A. The company has slowly decreased its interest expense over ten years through a
      reduction in debt in its capital structure and has also maintained a constant level of
      asset utilization.
   B. The first five years of the decade were marked with increases in efficient asset
      utilization, while the last five years relied on increasing amounts of debt financing.
   C. The company has decreased the relative proportion of fixed assets on its balance
      sheet over the ten-year period through asset sales and has used the proceeds to
      decrease its reliance on debt financing.
   D. In the first five years, the company decreased the proportion of equity financing on the
      balance sheet and in the following five years, increased the proportion of equity
      financing.

6. Janet Walker is evaluating several companies for a possible equity investment. Walker has
   developed a model which predicts that the best investment opportunities are within companies
   that have an ROE better than the industry average, a lower-than-average level of leverage, and
   a higher-than-average asset turnover ratio. Data on the companies that Walker is evaluating
   and the corresponding industry data are presented in the following table:

<table>
<thead>
<tr>
<th>Rogers Inc.</th>
<th>QuickCo</th>
<th>Blair Inc.</th>
<th>Dyna Corp.</th>
<th>Industry Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assets</td>
<td>$100</td>
<td>$151</td>
<td>$200</td>
<td>$250</td>
</tr>
<tr>
<td>Sales</td>
<td>183</td>
<td>273</td>
<td>297</td>
<td>372</td>
</tr>
<tr>
<td>Debt</td>
<td>31</td>
<td>30</td>
<td>64</td>
<td>82</td>
</tr>
<tr>
<td>Net Income</td>
<td>13</td>
<td>22</td>
<td>24</td>
<td>23</td>
</tr>
</tbody>
</table>

   Using Walker’s criteria, which company should she choose for an investment?
   A. QuickCo.
   B. Dyna Corp.
   C. Blair Inc.
Use the following information to answer Questions 7 through 12:

The following income and balance sheet information is for Vincent Corporation. All financial statement numbers are in $ millions (except per-share data).

<table>
<thead>
<tr>
<th>Income Statement</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenues</td>
<td>$4,950</td>
<td>$5,140</td>
</tr>
<tr>
<td>Cost of goods sold</td>
<td>2,420</td>
<td>2,540</td>
</tr>
<tr>
<td>Operating expenses</td>
<td>1,660</td>
<td>1,770</td>
</tr>
<tr>
<td>Interest expense</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>Income taxes</td>
<td>308</td>
<td>295</td>
</tr>
<tr>
<td>Balance sheet</td>
<td>2003</td>
<td>2004</td>
</tr>
<tr>
<td>Cash</td>
<td>$380</td>
<td>$400</td>
</tr>
<tr>
<td>Accounts receivable</td>
<td>670</td>
<td>700</td>
</tr>
<tr>
<td>Inventories</td>
<td>610</td>
<td>600</td>
</tr>
<tr>
<td>Net property, plant and equip.</td>
<td>1,350</td>
<td>1,400</td>
</tr>
<tr>
<td>Current liabilities</td>
<td>590</td>
<td>600</td>
</tr>
<tr>
<td>Long-term debt</td>
<td>310</td>
<td>300</td>
</tr>
<tr>
<td>Stockholder’s equity</td>
<td>1,846</td>
<td>2,200</td>
</tr>
<tr>
<td>Shares outstanding</td>
<td>260</td>
<td>260</td>
</tr>
<tr>
<td>Annual dividend per share</td>
<td>$0.58</td>
<td>$0.60</td>
</tr>
<tr>
<td>Stock price per share</td>
<td>$28.00</td>
<td>$30.00</td>
</tr>
</tbody>
</table>

7. Is Vincent Corporation increasing or decreasing the profitability of equity and assets, respectively, from 2003 to 2004?
   - A. Decreasing  Increasing
   - B. Increasing  Decreasing
   - C. Increasing  Increasing
   - D. Decreasing  Decreasing

8. Vincent Corporation’s operating profit margin in 2004 is:
   - A. between 5% and 8%.
   - B. between 8% and 11%.
   - C. between 11% and 14%.
   - D. between 14% and 17%.

9. From 2003 to 2004, how has Vincent Corporation’s debt ratio and interest coverage ratio changed?
Debt Ratio | Interest Coverage
---|---
A. | Increased | Decreased
B. | Decreased | Increased
C. | Increased | Increased
D. | Decreased | Decreased

10. What is Vincent Corporation’s retention rate for the year 2003?
   A. Between 40% and 50%.
   B. Between 50% and 60%.
   C. Between 60% and 70%.
   D. Between 70% and 80%.

11. In 2004, Vincent Corporation had a P/E ratio between:
   A. 4 and 8.
   B. 8 and 12.
   C. 12 and 16.
   D. 16 and 20.

12. What was Vincent Corporation’s sustainable growth rate in 2003 and 2004, respectively?
   | 2003 | 2004 |
---|---|---|
A. | 20.7% | 16.1% |
B. | 8.2% | 16.1% |
C. | 20.7% | 7.1% |
D. | 8.2% | 7.1% |

13. An analyst has gathered the following information about a firm:
   - The last dividend was $3.00.
   - The required return on equity is 15 percent.
   - Its assets, earnings, and dividends are expected to grow 5 percent per year indefinitely.

   The firm’s stock should sell at a market price of:
   A. $20.00.
   B. $30.00.
   C. $31.50.
   D. $34.50.

    She believes that the mature company has been experiencing abnormally low growth rates for the past two years but will return to the normal long-term growth rate. Bennet has forecasted that the current dividend of $1.25 will grow at a rate of 2 percent in the coming year. Bennet then expects the growth rate to increase by 1 percent per year until reaching the long-term growth rate of 5 percent. Using Bennett’s forecast, what should be the current market price of NEFI’s stock assuming investors require a 12 percent rate of return?
    A. $17.05.
    B. $17.74.
    C. $17.93.
    D. $18.02.

15. Which of the following statements about the dividend discount model is **TRUE**?
    A. Supernormal growth rates normally last 15 to 20 years.
B. If a stock’s required rate of return is 12% and its dividend growth rate is a constant 5%, the formula implies that the stock’s expected dividend yield is 5%.
C. The price of a stock is the present value of all expected future dividends, discounted at the dividend growth rate.
D. If the expected rate of return on a stock exceeds the required rate return, the stock is considered a good buy.

16. Which of the following is FALSE regarding the use of the constant growth dividend discount model?
   A. The growth rate must be greater than the required rate of return.
   B. The dividend stream must be known with certainty.
   C. The required rate of return must be greater than the growth rate.
   D. The growth rate can be positive or negative.

17. Victory Company just reported a net income of $10 per share. The company has a stated policy of retaining 70 percent of its earnings. If Victory Company’s return on equity is 20 percent, calculate next year’s expected dividend per share.
   A. $2.00.
   B. $3.00.
   C. $3.42.
   D. $7.98.

18. Texas Oil Company just reported earnings of $11.00 per share, giving the company book value of $91.50 per share. The required return on the stock is 11 percent. Texas Oil Company’s payout ratio is 40 percent. Assuming dividends will grow at a constant rate forever, the company’s intrinsic value is closest to:
   A. $100.
   B. $116.
   C. $124.
   D. $133.

19. BIG Company has a new technology that allows the company to produce more advanced labeling equipment. The new product will generate overall company growth of 25 percent per year for the next three years, at which time the company’s growth rate is expected to return to its historical 10 percent level. The company just reported earnings of $8.00 per share, and its book value is $40.00 per share. Given the company’s new technology and other factors, you calculate a discount rate of 16 percent. BIG Company retains 65 percent of its earnings to support its capital-spending program. The company’s intrinsic value using the supernormal form of the dividend discount model is closest to:
   A. $40 per share.
   B. $59 per share.
   C. $74 per share.
   D. $81 per share.

20. Which of the following will cause the fair P/E to rise?
   A. Dividend payout falls.
   B. Company risk rises.
   C. Investor risk aversion rises.
   D. Company growth rises.

21. Spiel Corp. has just announced it will issue $100 million in debenture bonds in the public debt market. Which of the following pieces of information would not be included in the bond’s indenture?
   A. The bonds will be subordinated to a previously outstanding bond issue.
   B. Spiel Corp.’s manufacturing facilities will serve as collateral for the issue.
C. Interest on the bond will be paid semiannually based on a floating rate of interest.
D. Spiel Corp. will be prohibited from making any further debt issuances if its interest coverage ratio falls below 1.5.

22. Bair Enterprises has just announced that the firm will be liquidating its assets as a result of its bankruptcy status. Which of the following bondholders is least likely to receive any payment from the liquidation?
   A. First mortgage bonds.
   B. Subordinated debentures.
   C. Subordinated mortgage bonds.
   D. Senior debentures.

23. Jefferson Inc. is about to issue $10 million worth of debentures to the public. Its underwriters have informed them, however, that to achieve a reasonable coupon rate on the bond, the firm must include negative covenants in the indenture. Which of the following covenants suggested by the firm is not a negative covenant?
   A. The firm must periodically provide reports to the trustee.
   B. The firm’s level of indebtedness must not increase.
   C. The firm must gain bondholder approval before declaring stock dividend.
   D. The firm cannot acquire other businesses while the bonds are outstanding.

24. James Turner is analyzing bonds issued by two separate companies, HCG Corporation and Riviera Trading Company (RTC). Both companies have similar operations, balance sheets, and profitability. The only difference between their bond issuances is the presence of a sinking fund in RTC’s bonds. Based on the preceding information, which of the following statements is TRUE?
   A. The RTC bond should carry a higher coupon rate than the HCG bond.
   B. HCG’s bonds will have greater interest rate risk than RTC’s bonds.
   C. The likelihood of principal repayment will be greater for RTC’s bonds.
   D. The market for RTC’s bonds will be more liquid than for RTC’s bonds.

25. When corporate bonds are callable, which of the following statements would be TRUE?
   A. They may be converted to common stock at the holder’s discretion.
   B. They may be exchanged for another bond at the owner’s discretion.
   C. They can be retired early by management.
   D. They cannot be held until maturity.

26. GigantiCo is a multinational mining corporation that relies heavily on debt financing to maintain and expand its operations. Yesterday, the company issued $520 million in serial bonds that will be retired in equal amounts over a period of twenty years. The bonds have a coupon rate of 4.5 percent. Using the preceding information, which of the following is CORRECT?
   A. GigantiCo will have outstanding principal at the end of year 7 equal to $338 million and will have paid $16.38 million in interest for the year.
   B. GigantiCo will have outstanding principal at the end of year 7 equal to $312 million and will have paid $15.21 million in interest for the year.
   C. GigantiCo will have outstanding principal at the end of year 7 equal to $338 million and will have paid $15.21 million in interest for the year.
   D. GigantiCo will have outstanding principal at the end of year 7 equal to $312 million and will have paid $16.38 million in interest for the year.

27. Jesse Smith is considering investing in a semiannual coupon bond with a par value of $2,000, a coupon rate of 6.5 percent, and a maturity of 20 years. What is the dollar amount of each coupon payment and the total amount of interest that will be paid to Smith if she invests in this bond?

<table>
<thead>
<tr>
<th>Coupon</th>
<th>Total Interest</th>
</tr>
</thead>
</table>

Chapter 7: Securities Analysis
28. Charles Mendleson, the Chief Financial Officer of CBX Autoworks, is considering issuing $275 million of subordinated debentures to fund a major capital spending project. Mendleson believes that current market interest rates will remain stable over the next three to five years but will then start declining rapidly. Which of the following bonds should Mendleson issue?
   A. Serial bonds.
   B. Callable bonds.
   C. Convertible bonds.
   D. Non-callable fixed-rate bonds.

29. Mueller Corporation issued convertible bonds three years ago to raise funds for an acquisition. The convertible bonds were issued at par value with a conversion ratio of 15 to 1, a coupon rate of 5 percent, and a maturity of ten years. Mueller’s convertible bonds currently sell for $993, and the company’s common stock has a current price of $53 per share. Given the preceding information, which of the following statements regarding Mueller’s bonds is FALSE?
   A. An otherwise comparable non-convertible bond issued by Mueller would have a coupon rate of 7.5%.
   B. By issuing a convertible bond, Mueller has effectively purchased a call option from the investor.
   C. If an investor purchased Mueller’s convertible bonds and converted immediately, he would effectively pay $66 per share.
   D. Purchasers of Mueller’s convertible bonds pay for the option embedded in the bonds by accepting a lower coupon rate.

30. Harwood Enterprises, a large retailer of pet supplies, is about to call its 9.5 percent semiannual 20-year callable bonds. The next coupon date is in 85 days. The current market price is $1,115. The call price is $1,050. What is the amount that investors holding the callable bonds will receive?
   A. $1,115.
   B. $1,050.
   C. $1,075.
   D. $1,140.

31. Which of the following fixed-income securities are explicitly backed by the full faith and credit of the U.S. government?
   A. 15-year, 5% coupon mortgage-backed federally related institution security.
   B. 20-year, 6% coupon Treasury bonds.
   C. 10-year, 9% coupon corporate bond.
   D. 8-year, 6% coupon government sponsored entity debenture.

32. Jason Hall is a debt analyst for a small portfolio management firm in the United States. Hall has recently observed a change in the forecasted Treasury yield curve relative to the current yield curve. The forecasted yield curve reflects consensus expectations among securities analysts as to the level of interest rates of various maturities one year from now. The current and forecasted yield curves are presented in the following table:

<table>
<thead>
<tr>
<th>Maturity (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>10</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>30</td>
</tr>
</tbody>
</table>

   A. $65  $1,300
   B. $130 $1,300
   C. $130 $2,600
   D. $65  $2,600
Which of the following best describes the expectations reflected in the forecasted Treasury yield curve?

A. In one year, investors will be less uncertain about holding long-term debt securities relative to short-term debt securities.
B. In one year, investors will be more uncertain about holding long-term debt securities relative to short-term debt securities.
C. In one year, there will be no change in uncertainty about holding long-term debt securities relative to short-term debt securities.
D. In one year, investors will be less unwilling to hold long-term debt securities.

33. The city of Phoenix is about to raise $400 million by issuing long-term debt securities. An analyst for Hughes Capital Inc., Gail Roberts, is asked to write an investment summary of Phoenix's new debt issue. Which of Robert's statements regarding Phoenix's municipal bond issues is NOT specific to this type of security?

A. The debt issue will contain a sinking fund.
B. Interest income on the bond is exempt from federal taxes.
C. Interest will be paid based on the authority of the city of Phoenix to levy taxes.
D. The bonds' pre-tax yield will be lower than that of an otherwise comparable Treasury bond.

34. Technology Inc. is a relatively small high-tech firm with little fixed assets and a mediocre credit rating. The company has decided to raise capital for expansion by issuing debt. Which of the following forms of corporate debt can Technology Inc. not issue?

A. Long-term debentures.
B. Commercial paper.
C. Asset-backed securities backed with receivables.
D. Medium-term notes.

35. Hank Simpson is considering making an investment in fixed-income securities. He is concerned, however, that the bonds he is considering will either have too much price sensitivity to changes in interest rates or will experience a widening of their respective bid/ask spreads. What two risks is Simpson concerned about?

A. Interest rate risk and credit risk.
B. Reinvestment risk and liquidity risk.
C. Price risk and liquidity risk.
D. Reinvestment risk and event risk.

36. All of the following are potential risks of investing in bonds EXCEPT:

A. loss of purchasing power as a result of higher-than-expected inflation.
B. issuer receives an unexpected upgrade in his credit rating.
C. early retirement of the bond following a decline in interest rates.
D. lower-than-expected reinvestment rates.

37. Consider a bond issued by Grift Corporation. The bond has a semiannual coupon payment of 5.0 percent, a 10-year maturity, and a par value of $1,000. If yields on comparable default-free bonds rise by 1.0 percent but Grift's credit rating remains unchanged, all of the following are likely to occur EXCEPT:

A. the bond's risk premium will decrease.
B. reinvestment income will increase.
C. the price of the bond will decrease.
D. the present value of the coupon payments will decrease.
38. Which of the following represents the value of a bond with a $1,000 face value, ten years to maturity, a 10 percent coupon rate (semiannual coupons), and a required return of 10 percent?  
A. $587.  
B. $924.  
C. $1,000.  
D. $1,065.

39. If an investor purchased only the principal of a bond with a $1,000 face value, a coupon rate of 6 percent (semiannual coupons), ten years to maturity, and a required return of 8 percent, he would pay:  
A. $408.  
B. $456.  
C. $864.  
D. $1,094.

40. Which of the following represents the value of a bond with a $1,000 face value, ten years to maturity, a 10 percent coupon rate (semiannual coupons), and a required return of 12 percent?  
A. $885.  
B. $984.  
C. $1,000.  
D. $1,125.

41. Information on six different corporate bonds is given in the following table.  

<table>
<thead>
<tr>
<th></th>
<th>SFG Corp.</th>
<th>Alton Inc.</th>
<th>QED Inc.</th>
<th>Bell Corp.</th>
<th>Weld Corp.</th>
<th>MDB Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Par Value</td>
<td>$1,000</td>
<td>$2,000</td>
<td>$1,000</td>
<td>$1,000</td>
<td>$2,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>Coupon Rate</td>
<td>7.2%</td>
<td>6.5%</td>
<td>5.9%</td>
<td>4.6%</td>
<td>7.7%</td>
<td>8.0%</td>
</tr>
<tr>
<td>Maturity (years)</td>
<td>10</td>
<td>15</td>
<td>5</td>
<td>8</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>Yield to Maturity</td>
<td>7.2%</td>
<td>6.0%</td>
<td>6.5%</td>
<td>7.0%</td>
<td>7.2%</td>
<td>8.5%</td>
</tr>
</tbody>
</table>

Based on the information in the table, which bonds sell in the market at a premium, and which bonds have a current yield greater than their coupon rate?  
A. MDB Inc.  
B. Bell Corp.  
C. Weld Inc.  
D. QED Inc.

42. Consider four bonds issued by Bear Corporation, Servers Inc., OldCo, and Waldon LLC. Each of the bonds is approximately the same credit quality, and each has a coupon rate of 3.5 percent. The maturity of the bonds differs, however, with maturities of 5, 7, 9, and 12 years for Bear Corporation, Servers Inc., OldCo, and Waldon LLC, respectively. Which of the four bonds will be most affected by a 1 percent increase in interest rates?  
A. Waldon LLC.  
B. Servers Inc.  
C. Bear Corporation.  
D. OldCo.
43. Julia Nickel is considering investing in a 10-year, 4.0 percent semiannual corporate bond issued by BCS Corp. with a credit rating of AA. Nickel’s brother, however, has suggested that she invest in a comparable 10-year, 6.0 percent semiannual corporate bond issued by FWX Corp. with a credit rating of AA. Which of the following will be true of the BCS Corp. bond relative to the FWX Corp. bond?

A. As interest rates rise, the BCS Corp. bond will decrease by a greater amount than the FWX Corp. bond.
B. As interest rates fall, the BCS Corp. bond will decrease by a greater amount than the FWX Corp. bond.
C. As interest rates rise, the BCS Corp. bond will decrease by a smaller amount than the FWX Corp. bond.
D. As interest rates fall, the BCS Corp. bond will decrease by a smaller amount than the FWX Corp. bond.

44. Larry is analyzing a discount bond currently trading for $615. The bond will mature in ten years with proceeds of $1,000. What is the interest rate of the bond?

A. 4%.
B. 5%.
C. 6%.
D. 7%.

45. Larry is evaluating a bond issued by Allen Corp and a bond issued by Ethan Corp. Both bonds are selling at par value. Each bond pays a 7 percent coupon rate. The Allen bond will mature in 5 years, while the Ethan bond matures in 8 years. If each bond’s yield increases from 8 percent to 9 percent, which one of the following statements is TRUE?

A. The value of the Allen bond will decrease more than the Ethan bond.
B. The value of the Ethan bond will decrease more than the Allen bond.
C. The value of the Allen bond will increase more than the Ethan bond.
D. The value of the Ethan bond will increase more than the Allen bond.

46. United States Steel has a bond outstanding with a 6 percent coupon paid semi-annually and a maturity of 10 years. If the bond’s yield is 5 percent, the price of the bond is closest to:

A. $956.
B. $1,000.
C. $1,078.
D. $1,153.

47. A bond issued by StillWater Corporation carries a coupon rate of 8 percent, paid semiannually, and a yield to maturity of 6.5 percent. StillWater’s bond has 15 years remaining until the final maturity date and a par value of $1,000. An analyst with BondInvest Inc. has estimated the clean price of the StillWater bond to be $1,142. Which of the following statements regarding StillWater’s bond is correct?

A. If yields rise by approximately 1.5%, StillWater’s bond will trade at its par value of $1,000.
B. A Treasury bond with a maturity of 15 years and a coupon rate of 8% will have a yield to maturity greater than StillWater’s.
C. The analyst’s model makes the implicit assumption that the valuation date is also a coupon date.
D. An investor looking to sell his StillWater bond will need to pay accrued interest to the buyer of the bond.
48. Which of the following bonds will have its value most affected by a 1 percent increase in interest rates?
   A. Bond A with a 6% coupon and 10-year maturity.
   B. Bond B with a 6% coupon and 20-year maturity.
   C. Bond C with an 8% coupon and 10-year maturity.
   D. Bond D with an 8% coupon and 20-year maturity.

Use the following information to answer Questions 49 through 51.

Brighton Company has two bond issues outstanding the details of which are as follows:

<table>
<thead>
<tr>
<th>Bond Series</th>
<th>A</th>
<th>B</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maturity (years remaining)</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Coupon rate</td>
<td>6.5%</td>
<td>7.0%</td>
</tr>
<tr>
<td>Interest frequency</td>
<td>Semiannual</td>
<td>Semiannual</td>
</tr>
<tr>
<td>Face value</td>
<td>$1,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>Market price</td>
<td>$964.47</td>
<td>$913.54</td>
</tr>
</tbody>
</table>

49. Calculate the current yield for each bond series.
   A. 6.7% 7.0%
   B. 6.5% 7.0%
   C. 6.7% 7.7%
   D. 6.5% 7.7%

50. Which of the following statements regarding Brighton Company’s bonds is FALSE?
   A. Nominal yield on B > YTM on B.
   B. YTM on A < YTM on B.
   C. Nominal yield on A < YTM on A.
   D. YTM on B > Current yield on B.

51. Calculate the yield to maturity for each of Brighton Company’s bond series.
   A. 6.5% 7.0%
   B. 7.0% 8.0%
   C. 7.0% 7.0%
   D. 6.5% 8.0%

52. Sheldon Wills is considering investing in one of four bonds. He wants to choose the investment offering the highest return. The details of each bond are listed in the following table:

<table>
<thead>
<tr>
<th>Bond</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Table

<table>
<thead>
<tr>
<th>Maturity (years remaining)</th>
<th>20</th>
<th>20</th>
<th>20</th>
<th>20</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coupon rate</td>
<td>6.5%</td>
<td>7.0%</td>
<td>7.5%</td>
<td>8.0%</td>
</tr>
<tr>
<td>Interest frequency</td>
<td>Annual</td>
<td>Semiannual</td>
<td>Semiannual</td>
<td>Annual</td>
</tr>
<tr>
<td>Face value</td>
<td>$1,000</td>
<td>$1,000</td>
<td>$1,000</td>
<td>$1,000</td>
</tr>
<tr>
<td>Market price</td>
<td>$853</td>
<td>$1,056</td>
<td>$960</td>
<td>$1,051</td>
</tr>
<tr>
<td>YTM</td>
<td>8.0%</td>
<td>6.5%</td>
<td>7.9%</td>
<td>7.5%</td>
</tr>
</tbody>
</table>

Which bond should Wills choose?
- A. Bond A.
- B. Bond B.
- C. Bond C.
- D. Bond D.

53. Which of the following is not an assumption of the yield to maturity measure of a bond’s return?
- A. The investor will be able to keep the bond in her portfolio until the final maturity date.
- B. Interim cash flows will be reinvested in securities with returns equal to the YTM.
- C. The bond’s cash flows are received at the time and in the amount expected.
- D. The price of the bond will increase over the life of the bond.

54. Martha Hibbert holds a long option on Gill Company, a national microchip manufacturer, with an exercise price of $45. Hibbert can exercise the option immediately for a profit of $5.10. Alternatively, Hibbert can wait to see if the stock price and the profit on the option increase further. What type of option does Hibbert hold?
- A. European call option.
- B. American call option.
- C. European put option.
- D. American put option.

55. A put option on Boeing Company has an exercise price of $75. The current stock price of Boeing Company is $63 per share. The put option is:
- A. in-the-money.
- B. at-the-money.
- C. out-of-the-money.
- D. too volatile to determine.

56. Phil Harmony is an options trader for an investment management firm. Harmony recently wrote a European put option on CBA stock. The option expires in 90 days, has a strike price of $25, and has a premium of $2.91 per option. The price of CBA common stock is currently $23. Which of the following statements regarding the option on CBA stock is FALSE?
- A. Harmony has written an option with positive time value.
- B. The buyer of the option is obligated to sell CBA stock to Harmony on the option’s expiration date.
- C. The intrinsic value of the option is greater than its time value.
- D. Harmony has the obligation to buy CBA stock if the buyer of the option chooses to exercise.

57. Jim Mitchell is certain that the price of Fashion Co. stock will decrease by at least $8 in the near future. The stock is currently selling in the marketplace for $35 per share. Which of the following option strategies should Jim take advantage of?
- A. Short put option with strike price of $35.
- B. Long put option with strike price of $30.
C. Short call option with strike price of $35.
D. Long call option with strike price of $30.

58. Six months ago, Samantha Marquez bought a European put option on the common stock of Vegas Holding Company (VHC) for a premium of $4. The put option has a strike price of $25. The price of VHC at the time of the option purchase was $33. The current price of VHC stock is $23. What is the intrinsic value at the time of purchase and the current profit, assuming the option can be exercised immediately?

<table>
<thead>
<tr>
<th>Intrinsic Value</th>
<th>Current Profit</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. $0</td>
<td>$2</td>
</tr>
<tr>
<td>B. $4</td>
<td>$2</td>
</tr>
<tr>
<td>C. $4</td>
<td>$2</td>
</tr>
<tr>
<td>D. $0</td>
<td>$2</td>
</tr>
</tbody>
</table>

59. A European put option exists on a broad market index. The strike price of the option is $150, and the current market price of the underlying index is $148. The expiration date for the option is June 15th. The value of the option will increase if all of the following occur EXCEPT:
A. the price of the index decreases by 10%.
B. exercise price changes to $148.
C. the expiration date becomes July 15th.
D. option gets changed to an American-style call option.

60. Which of the following option positions has the highest level of risk associated with the position?
A. Long call.
B. Short put.
C. Short call.
D. Long put.

61. The stock of CSB Corporation is selling in the market for $23 per share. Currently an investor can obtain a call option on CSB with a strike price of $20 for a premium of $6.40. A put option is also available on CSB with a strike price of $25 and a premium of $5.30. What are the intrinsic value of the call option and the time value of the put option?

<table>
<thead>
<tr>
<th>Call (Intrinsic)</th>
<th>Put (Time)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. $3.00</td>
<td>$3.30</td>
</tr>
<tr>
<td>B. $3.40</td>
<td>$3.30</td>
</tr>
<tr>
<td>C. $3.40</td>
<td>$2.00</td>
</tr>
<tr>
<td>D. $3.00</td>
<td>$2.00</td>
</tr>
</tbody>
</table>

62. A soybean farmer has entered into a futures contract to hedge his exposure to soybean prices. The futures price on the farmer’s three month contract at the time of contract initiation is $45 per bushel. The next day the price of soybeans jumps to $50 per bushel. Which of the following statements accurately describes the soybean farmer’s position at the start of the second day after the contract is initiated?
A. The farmer owes $5 to the counterparty.
B. The farmer is owed $5 from the counterparty.
C. The farmer is owed $50 from the counterparty.
D. The farmer does not owe anything.
63. The following table presents the price of a futures contract on pork bellies over time as well as the spot price of pork bellies over time.

<table>
<thead>
<tr>
<th>Spot &amp; Futures Prices of Pork Bellies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jan 15th</td>
</tr>
<tr>
<td>Spot Price</td>
</tr>
<tr>
<td>Futures Price</td>
</tr>
</tbody>
</table>

What is the futures property demonstrated by the table?
A. Mark to market.
B. Clearing.
C. Settlement.
D. Convergence.

64. An investor weighing the advantages and disadvantages of hedging his interest rate risk using forwards or futures on interest rates has decided to enter into a forward contract on the 90-day T-bill rate. All of the following are potential reasons for the investor’s decision EXCEPT:
A. The investor’s contract needs did not coincide with a standardized expiration date.
B. The investor was able to disregard increasing exposure to credit risk as a result of the hedge.
C. The investor needed a high degree of liquidity in case the hedge suddenly needed to be reversed.
D. The amount of the asset to be hedged was significantly different than a standardized contract amount.

65. Michelle, a wheat farmer, believes that the price of wheat will fall significantly in the future. She is convinced the price decline will happen before she is ready to sell her harvest. George, a speculator, thinks that the price of wheat will rise in the future. He is convinced that the price increase will occur before the time of the wheat harvest. What futures position should Michelle and George, respectively, enter into?

<table>
<thead>
<tr>
<th>Michelle</th>
<th>George</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Long futures</td>
<td>Long futures</td>
</tr>
<tr>
<td>B. Short futures</td>
<td>Short futures</td>
</tr>
<tr>
<td>C. Long futures</td>
<td>Short futures</td>
</tr>
<tr>
<td>D. Short futures</td>
<td>Long futures</td>
</tr>
</tbody>
</table>

66. Nine months ago, Jeffrey Jones took a short position in a gold forward contract. The terms of the contract specified that the contract price (futures price) would be $430 per ounce based on a contract size of 1,500 ounces. The tenor of the contract was to be nine months. If the current price of gold is $445 per ounce and assuming cash settlement, what is the payoff and to what party is payment owed?

A. The counterparty owes Jones $22,500.
B. Jones owes the counterparty $1,500.
C. Jones owes the counterparty $22,500.
D. The counterparty owes Jones $1,500.

Use the following information to answer Questions 67 and 68.
Bill Michaels has entered into a futures contract on soybeans. The contract terms are as follows: the tenor is three months; the contract price is $35; the contract size is 2,000 bushels; and the tick size is one cent. Michaels must deposit margin in the amount of $700. The soybean spot price moves down three ticks on the first day after Michaels enters into the contract, moves down another two ticks on the second day, moves up three ticks on the third day, and moves down five ticks on the fourth day.

67. What is the margin account balance after the second day?
   A. $660.
   B. $560.
   C. $640.
   D. $600.

68. What is the margin account balance after the fourth day?
   A. $600.
   B. $660.
   C. $560.
   D. $640.

69. Tim Matthews is short a futures contract for oats that will expire tomorrow. The price stated in his contract is $54 per bushel. Matthews expects the spot price of oats will close tomorrow at a price of $56 per bushel. If his price prediction is correct, Matthews can satisfy his commitment in the futures contract in which of the following ways?
   A. Settle the contract in cash by receiving a payment in the amount of $2 per bushel.
   B. Negotiate privately with a long futures holder to accept delivery of the contracted bushels of oats.
   C. Deliver the contracted bushels of oats to the specified location, and accept payment of $56 per bushel.
   D. Enter into an offsetting short futures contract with a futures price equal to the spot price.

70. Jason King recently gave a presentation on the similarities and differences between options, forwards, and futures. During his presentation, King made four statements regarding the features common to all three types of derivatives. Which of his following statements CORRECTLY summarizes a feature common to options, forwards, and futures?
   A. Options, forwards, and futures positions can all be reversed quickly to eliminate the contract obligation.
   B. Options, forwards, and futures all require both parties to the contract to transact at a future date.
   C. Options, forwards, and futures all have payoff structures in which the gain to one party is a loss to the counterparty.
   D. Options, forwards, and futures all have cumbersome regulations imposed by government regulatory bodies.

Answers

1. B

To know if COGS and AR are increasing or decreasing over time, we must know what their values were in 2004 (2003 is stated already in the question). We are given enough information to calculate the values indirectly as follows:
inv turnover = \frac{COGS}{Inv} \Rightarrow COGS = inv \times turnover \times Inv

COGS = 2,300 \times 1.9 = 4,370

4,370 < 4,720 \Rightarrow COGS is decreasing

\frac{sales}{AR} \Rightarrow AR = \frac{sales}{AR \times turnover}

AR = \frac{7,200}{2.3} = 3,130

3,130 > 2,930 \Rightarrow AR is increasing

2. C

Total assets / owners equity or total liabilities / owners equity
FRD Co.: 13,000/10,000 = 1.30 or 3,000/10,000 = 0.30
Spencer: 15,000/10,000 = 1.50 or 5,000/10,000 = 0.50
Henley Inc.: 7,000/4,000 = 1.75 or 3,000/4,000 = 0.75, greatest leverage
Worth: 30,000/20,000 = 1.50 or 10,000/20,000 = 0.50

3. B

Net income / owners equity
FRD Co.: 2,000/10,000 = 0.20
Spencer: 3,000/10,000 = 0.30, highest ROE
Henley Inc.: 1,000/4,000 = 0.25
Worth: 5,000/20,000 = 0.25

4. C

(Revenues – COGS) / revenues
FRD Co.: (20,000 – 10,000)/20,000 = 0.50
Spencer: (30,000 – 20,000)/30,000 = 0.33
Henley Inc.: (40,000 – 10,000)/40,000 = 0.75, highest gross profit margin
Worth: (50,000 – 30,000)/50,000 = 0.40

5. B

Du Pont system states that ROE = net profit margin \cdot total asset turnover \cdot equity multiplier (leverage).
Thus if profitability is falling steadily over a 10-year period, the only way to maintain a high ROE is to increase total asset turnover (asset efficiency) or the amount of debt financing over the 10-year period to offset the decline in net profit margin.

6. A

To answer this question, you must first compute the ROE using the Du Pont model. We begin with
profit margin, followed by total asset turnover, equity multiplier, and return on equity:

\[
\begin{align*}
\text{Rogers:} & \quad \text{PM} = \frac{13}{183} = 7.1\%; \quad \text{TAT} = \frac{183}{100} = 1.83; \quad \text{EM} = \frac{100}{(100 - 31)} = 1.45 \\
\text{QuickCo:} & \quad \text{PM} = \frac{22}{275} = 8.1\%; \quad \text{TAT} = \frac{273}{151} = 1.81; \quad \text{EM} = \frac{151}{(131 - 39)} = 1.25 \\
\text{Blair:} & \quad \text{PM} = \frac{24}{297} = 8.1\%; \quad \text{TAT} = \frac{207}{200} = 1.04; \quad \text{EM} = \frac{200}{(200 - 64)} = 1.47 \\
\text{Dyna:} & \quad \text{PM} = \frac{23}{372} = 6.2\%; \quad \text{TAT} = \frac{372}{250} = 1.49; \quad \text{EM} = \frac{250}{(250 - 32)} = 1.49 \\
\text{Industry} & \quad \text{PM} = \frac{20}{282} = 7.1\%; \quad \text{TAT} = \frac{282}{162} = 1.74; \quad \text{EM} = \frac{162}{(162 - 99)} = 1.45
\end{align*}
\]

Next we must calculate the ROE for each company and the industry:

\[
\begin{align*}
\text{Rogers:} & \quad 7.1\% \times 1.83 \times 1.45 = 18.8\% \\
\text{QuickCo:} & \quad 8.1\% \times 1.81 \times 1.25 = 18.2\% \\
\text{Blair:} & \quad 8.1\% \times 1.49 \times 1.47 = 17.6\% \\
\text{Dyna:} & \quad 6.2\% \times 1.49 \times 1.49 = 13.7\% \\
\text{Industry} & \quad 7.1\% \times 1.74 \times 1.45 = 17.9\%
\end{align*}
\]

From these calculations, we can see that only QuickCo meets all three of Walker’s criteria: higher-than-average ROE, lower-than-average use of leverage (as evidenced by the low equity multiplier), and higher-than-average asset turnover ratio.

**7. D**

Profitability of equity and assets is reflected in the ROE and ROA ratios, respectively. To determine if ROE and ROA are increasing or decreasing, we need to calculate net income, total equity, and total assets for 2003 and for 2004.

<table>
<thead>
<tr>
<th></th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Revenue</td>
<td>$4,950</td>
<td>$5,140</td>
</tr>
<tr>
<td>– COGS</td>
<td>2,420</td>
<td>2,540</td>
</tr>
<tr>
<td>– Operating expenses</td>
<td>1,660</td>
<td>1,770</td>
</tr>
<tr>
<td>– Interest expense</td>
<td>30</td>
<td>25</td>
</tr>
<tr>
<td>– Taxes</td>
<td>308</td>
<td>295</td>
</tr>
<tr>
<td>Net income</td>
<td>$532</td>
<td>$510</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Assets</th>
<th>2003</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cash</td>
<td>$380</td>
<td>$400</td>
</tr>
<tr>
<td>+ Accounts receivable</td>
<td>670</td>
<td>700</td>
</tr>
<tr>
<td>+ Inventories</td>
<td>610</td>
<td>600</td>
</tr>
<tr>
<td>+ Net PPE</td>
<td>1,350</td>
<td>1,400</td>
</tr>
<tr>
<td>Total assets</td>
<td>$3,010</td>
<td>$3,100</td>
</tr>
</tbody>
</table>
The ROE is declining from 2003 to 2004, as shown in the following ratios:

\[
\text{ROE}_{2003} = \frac{532}{1,846} \quad \text{ROE}_{2004} = \frac{510}{2,200}
\]

The ROA is also declining from 2003 to 2004 as shown in the following ratios:

\[
\text{ROA}_{2003} = \frac{532}{3,010} \quad \text{ROA}_{2004} = \frac{16.5\%}{}=16.5\%}
\]

8. D

Operating profit (EBIT) margin is calculated as follows:

\[
\text{Operating margin} = \frac{\text{Operating profit}}{\text{Sales}} = \frac{(5,140 - 2,540 - 1,770)}{5,140} = \frac{830}{5,140} = 16.1\%
\]

9. B

Compute the debt ratio (also called the debt-to-assets ratio) as follows:

\[
\text{Debt ratio} = \frac{\text{Total debt}}{\text{Total assets}}
\]

\[
\text{Debt ratio}_{2003} = \frac{310}{3,010} = 10.3\% \quad \text{Debt ratio}_{2004} = \frac{300}{3,100} = 9.7\%
\]

The ratio is falling from 2003 to 2004.

Compute the interest coverage ratio as follows:

\[
\text{Int. Coverage} = \frac{\text{EBIT}}{\text{Interest expense}}
\]

\[
\text{Int. Coverage}_{2003} = \frac{870}{30} = 29.0 \quad \text{Int. Coverage}_{2004} = \frac{830}{25} = 33.2 \times
\]

The ratio is increasing from 2003 to 2004 indicating that Vincent is better able to meet its interest commitments.

10. D

Compute the retention ratio as follows:

\[
\text{Retention ratio} = 1 - \text{Payout ratio}
\]

where:
payout ratio = \[
\frac{\text{dividends per share}}{\text{earning per share}}
\]

earnings per share = \(\frac{532}{260} = \$2.05\)

\[
\frac{0.58}{2.05} = 28.3\%
\]

retention rate = \(1 - 0.283 = 71.7\%\)

11. C

P/E ratio equals stock price divided by earnings per share.

\[
\text{EPS} = \frac{510}{260} = \$1.96
\]

\[
\text{P/E} = \frac{30}{1.96} = 15.31
\]

12. A

Sustainable growth equals ROE times retention rate.

\[
g_{2003} = 0.288 \times 0.717 = 20.7\%
\]

\[
g_{2004} = 0.232 \times 0.694 = 16.1\%
\]

13. C

The firm’s dividends are expected to grow at a rate of 6% forever, so we can use the constant growth dividend valuation model.

\[
P_0 = \frac{D_1}{k - g} = \frac{3.00 (1.05)}{0.15 - 0.05} = \$31.50
\]

14. B

Using a timeline:

\[
D_0 = 1.25 \quad D_1 = 1.28 \quad D_2 = 1.31 \quad D_3 = 1.37
\]

\[
P_3 = \$20.49
\]

Since dividend 3 is at the beginning of the infinite period of constant growth, we can use it to find the price at time 2 by growing D2 at the assumed constant rate to find \(D_3\).
### 15. D

Supernormal growth can last a few years, but not normally 15 to 20 years. The dividend discount model can be rearranged as:

\[
\frac{D_1}{P_0} = k_e - g
\]

Thus, 12% ≠ \((k_e - g)\). By definition, if \(k_e < \frac{D_1}{P_0} + g\), where \(k_e = \text{required return and } \frac{D_1}{P_0} + g = \text{an investment's total return, the stock is considered a good buy (under-priced).}

### 16. A

\(k_e\) must be greater than \(g\) for the constant growth dividend valuation model to work.

### 17. C

\(g = \text{ROE} \times \text{retention rate} \)

\(g = 0.20 \times 0.70 \)

\(g = 14\%\)

\(D_0 = \text{current dividend} = \text{EPS} \times \text{payout ratio} \)

\(D_0 = 10 \times 30\% \)

\(D_0 = 3.00 \)

\(D_1 = D_0(1 + g) \)

\(D_1 = 3.00(1.14) \)

\(D_1 = 3.42\)
\[
\text{Intrinsic value } = \frac{D_1}{k - g}
\]

where:

\[
D_0 = \text{current dividend} = \text{EPS} \times \text{payout ratio} = 11 \times 40\% = 4.40
\]

\[
\text{ROE} = \frac{\text{EPS}}{\text{Book Value}} \times (1 - \text{payout}) = 12\% (1 - 0.4) = 7.2\% \text{ g} = \text{ROE}
\]

\[
D_1 = D_0(1 + g) = 4.4(1 + 0.072) = 4.72
\]

\[
k = \text{required return} = 11\%
\]

\[
P_0 = \frac{D_1}{k - g} = \frac{4.72}{0.11 - 0.072} = 124.21 = 124
\]

19. C

\[
D_1 = D_0(1 + g); D_2 = D_1(1 + g); D_3 = D_2(1 + g): \text{Supernormal growth}
\]

\[
\text{fair price in year 3: } \frac{D_4}{k - g}
\]

\[
D_0 = \text{EPS} \times \text{payout ratio} = 8 \times 0.35 = 2.80
\]

\[
D_1 = 2.80(1 + 0.25) = 3.50; PV = 3.50/(1.16) = 3.02
\]

\[
D_2 = 3.50(1 + 0.25) = 4.38; PV = 4.38/(1.16)^2 = 3.25
\]

\[
D_3 = 4.38(1 + 0.25) = 5.48; PV = 5.48/(1.16)^3 = 3.51
\]

\[
P_3 = \frac{5.48(1 + 0.10)}{(0.16 - 0.10)} = 100.47; P_0 = \frac{100.47}{(1.16)^3} = 64.37
\]

\[
\text{price} = 64.37 + 3.51 + 3.25 + 3.02 = 74.15 = 74
\]

20. D

P/Es rise as the company’s growth rate, g, rises, assuming dividend payout and risk are unchanged.

P/Es fall as the company’s dividend payout ratio (D/E) falls, assuming growth prospects and risk are unchanged.

P/Es fall as the company’s required return (k) rises, assuming dividend payout and growth remain unchanged.

P/Es fall as investor risk aversion rises (which causes k to rise), assuming dividend payout and growth
remain unchanged.

21. B

The legal contract between the firm and the bondholders is known as the indenture. A debenture is a non-collateralized bond and thus will not have specific assets pledged to the issue.

22. B

Debentures are always subordinated (have lower rank than) mortgage bonds that are backed with the firm’s fixed assets, so the bonds that are least likely to be paid in a bankruptcy are the subordinated debentures.

23. A

A negative covenant prohibits or restricts the issuer from certain actions. An affirmative covenant requires the issuer to perform some action. Requiring Jefferson Inc. to provide periodic reports to the trustee is an example of an affirmative, not a negative covenant.

24. C

Through the use of a sinking fund, an issuer makes deposits in an account with the trustee. Over time the account accumulates enough funds to retire the bonds all at once or over time. Thus the likelihood of repayment of principal increases with the use of a sinking fund.

25. C

Callable bonds do not have to be called. When they are, the holders of the bonds must surrender them to the firm. Management typically calls bonds when interest rates have fallen and the bonds can be replaced with a new issue with a lower coupon rate.

26. A

GigantiCo has issued $520 million in bonds. The bonds will be retired in equal amounts over 20 years. Therefore, 520/20 = $26 million of principal will be retired each year. After seven years, the amount of outstanding principal is 520 – (26 x 7) = $338 million. This is the amount outstanding at the end of the year. Interest is paid based on year seven’s beginning balance of 338 + 26 = $364 million. Interest is therefore 364 x 0.045 = $16.38 million.

27. D

Compute the coupon payment as follows:

\[
\text{semiannual coupon} = \left( \frac{0.065}{2} \right) = $65.2
\]

Compute the total interest (i.e., the sum of all coupon payments) as follows:

\[
\text{total interest} = 20 \text{ years} \times 2 \text{ coupons per year} \times $65 = $2,600
\]

28. B

Since Mendleson expects rates to fall in the future, it would be advantageous to CBX to issue callable bonds so that the debt can be replaced at a lower interest rate in the future. All other choices are
29. B

Convertible bonds usually have lower coupon rates than nonconvertible bonds. All other statements are correct.

30. C

The bondholder receives the call price (either par or premium) plus any accrued interest earned through that date. Accrued interest is calculated as follows:

\[
\text{accrued interest} = \text{coupon payment} \times \left( \frac{\text{days accrued}}{\text{days in coupon period}} \right)
\]

\[
= \left( \frac{\$1,000 \times 0.095}{2} \right) \times \left( \frac{180 - 85}{180} \right)
\]

\[
= 47.50 \times 0.52778
\]

\[
= 25.07
\]

Therefore the call price plus accrued interest yields a price of $1,050 + $25 = $1,075 to the investor.

31. B

Only Treasury securities are explicitly backed by the full faith and credit of the U.S. government. Some agency securities (issued by federally related institutions) are implicitly but not explicitly backed by the full faith and credit of the U.S. government.

32. A

An upward-sloping yield curve means that as the maturity of Treasury bonds increases, the yield required on the bonds increases. Therefore, investors are requiring extra compensation for taking on the uncertainty associated with long-term bonds. The forecasted yield curve shows that long-term yields are falling while short-term yields are rising, reflecting less uncertainty about long-term rates relative to short-term rates.

33. A

Any type of bond could potentially have a sinking fund. Only municipal securities have interest exempt from federal taxes, interest paid from the tax authority of a municipality (such as the city of Phoenix), and a pre-tax yield lower than that on a comparable Treasury bond.

34. B

Commercial paper can only be issued by corporations with the highest credit ratings, which tend to be relatively large, well-established firms.

35. C
Interest rate risk (also called price risk) is the risk of increasing interest rates decreasing the price of the bond. Liquidity risk is the possibility of being unable to sell the bond quickly and at a fair price. Liquidity risk is measured by the bid/ask spread on the bond.

36. B

An upgrade in the credit rating would have a favorable impact on the value of the bond and is, therefore, not a risk.

37. A

As interest rates rise, the price of a bond (which includes principal and interest payments) will decrease. The reinvestment income generated by the reinvestment of coupon payments as they are received will increase, however. An increase in interest rates is unlikely to result in a decrease in the risk premium, especially if there has been no change in the credit quality of the issue.

38. C

When the coupon rate and the required return are the same, the bond will sell at par.

39. B

This is equivalent to a zero-coupon bond and is calculated just like a lump sum present value calculation. Keystrokes:

-1,000 FV
10 x 2 N
8/2 I/Y
CPT PV = $456

Please note that it is market convention to compute the value of zero-coupon bonds using a semiannual periods assumption.

40. A

Bond price without accrued interest. Keystrokes:

-1000 FV
-100/2 PMT
12/2 I/Y
10*2 N
CPT PV = $885

41. B

When required return (YTM) is below a bond’s coupon rate, the bond price rises above the face value so that it sells at a premium. Weld Corp. and Alton Inc. have YTMs that are lower than their coupon rate. When the YTM is greater than the coupon rate, the bond will sell at a discount (price is less than par value). Thus the current yield, which is the coupon payment divided by the market price, will be greater than the coupon rate, which is the coupon payment divided by the par value.

42. A
As the maturity of a fixed-income investment increases, the bond’s price sensitivity to changes in interest rates increases. When maturity increases, the number of periods of discounting increases, causing the present value of the cash flows to be more sensitive to the interest rate used to discount the cash flows. Since Waldon LLC has the longest-maturity bonds and the other features of the bonds are all equivalent, Waldon LLC will have the highest interest rate sensitivity.

43. A

As the size of the interim cash flows decreases, the investor receives a smaller proportion of the total cash flows sooner rather than later. Therefore, the cash flows are more susceptible to the effects of discounting over time. As interest rates change, the change in bond price will be more sensitive for bonds with smaller coupon rates. The BCS Corp. bonds have a smaller coupon rate but are otherwise comparable to the FWX Corp. bonds.

44. B

A discount bond is a lump sum to be received in the future. In this case the investor will receive $1,000 in ten years. To receive this cash flow, the investor must pay $615 for the bond now. Compute the required return using the present value of a lump sum formula as follows (note we are using annual discounting, not semiannual):

\[
PV = \frac{FV_n}{(1 + i)^n}
\]

where inputs equal:

- \(PV = 615\)
- \(FV_{10} = 1,000\) (input -1000 in calculator)
- \(n = 10\)

\[
615 = \frac{1,000}{(1 + i)^{10}}
\]

solve for \(i\):

\[
(1 + i)^{10} = \frac{1,000}{615}
\]

\[
(1 + i) = 1.626^{0.1} = 1.0498
\]

\[
i = 0.0498 = 5\%
\]

45. B

A bond with a longer maturity and lower coupon will have greater price movement for any given change of interest rates. The price movement will be the inverse of the interest rate movement. In this particular
problem, the higher interest rates cause the bond price to fall. Since the Ethan bonds have a longer maturity (everything else equal), their price will fall more than Allen’s bonds.

46. C

Using a business calculator, the inputs are:

\[
PMT = 6\% \times 1,000 = \frac{\$60}{2} = \$30
\]

\[
m = 2
\]

\[
n = 10 \text{ years} \times 2 = 20 \text{ years}
\]

\[
i = \frac{5\%}{2} = 2.5\%
\]

\[
FV = \$1,000
\]

\[
PV = \$1,077.96 = \$1,078
\]

Alternatively:

\[
PV_A = PMT \left[ \frac{1}{\frac{1}{m}} \left( 1 - \frac{1}{\left( 1 + \frac{i}{m}\right)^{mn}} \right) \right] = 30 \left[ \frac{1}{\frac{1}{2}} \left( 1 - \frac{1}{\left( 1 + \frac{0.05}{2}\right)^{20}} \right) \right] = 467.70
\]

\[
PV = \left( \frac{PV_A}{\left( 1 + \frac{i}{m}\right)^n} \right) = \frac{1,000}{\left( 1 + \frac{0.05}{2}\right)^{20}} = 610.27
\]

bond price = \(PV_A + PV = 467.70 + 610.27 = 1,077.97 \approx \$1,078\)

47. D

Accrued interest is the interest owed an investor between interest payment dates. Any accrued interest (interest owed to the seller that hasn’t been received yet) must be paid to the seller by the buyer of the bond. Statement D says the seller pays the buyer.

48. B

The lower the coupon and the longer the maturity of a bond, the greater its price will react to a change in interest rates. The 6% coupon (lower coupon) and 20 years to maturity (longer maturity) will have the greatest impact on a bond’s value in this problem.

49. C

Calculate the current yield on each bond series as follows:

\[
\text{current yield} = \frac{\left( \$1,000 \times 0.065 \right)}{\$964.47} = \frac{\$65}{\$964.47} = 6.7\%
\]
current yield_B = \frac{913.54 \times 0.07}{913.54} = \frac{70}{913.54} = 7.7% 

50. A

Both of Brighton Company’s bond issues are selling in the market at a discount to face value. Recall the following relationship for a discount bond: Nominal yield < Current yield < Yield to maturity. Choice A violates this relationship and is therefore untrue.

51. B

Calculate the yield to maturity for Brighton Company’s bonds as follows:

<table>
<thead>
<tr>
<th>Series A</th>
<th>Series B</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-964.47 PV</td>
<td>$-913.55 PV</td>
</tr>
<tr>
<td>$32.50 PMT</td>
<td>$35.00 PMT</td>
</tr>
<tr>
<td>20 n</td>
<td>30 n</td>
</tr>
<tr>
<td>$1,000 FV</td>
<td>$1,000 FV</td>
</tr>
<tr>
<td>CPT I/Y = 3.5 \times 2 = 7.0%</td>
<td>CPT I/Y = 4.0 \times 2 = 8.0%</td>
</tr>
</tbody>
</table>

52. C

The YTM on Bonds A and D are stated on an annual basis since they have annual coupon payments. Therefore we should convert the YTM on Bonds B and C to annual yields and rank the bonds accordingly as follows:

\[ \text{YTM}_B^{\text{annual basis}} = \left(1 + \frac{0.065}{2}\right)^2 - 1 = 6.6\% \]

\[ \text{YTM}_C^{\text{annual basis}} = \left(1 + \frac{0.079}{2}\right)^2 - 1 = 8.1\% \]

Once all yields are stated on an annual basis, we observe that Bond C has the highest YTM.

53. D

The YTM does not assume that the price will increase over time. It does assume that the bond can be held until maturity, that all cash flows will be received as expected, and that cash flows can be reinvested at an interest rate equal to the YTM.

54. B

American options may be exercised at any time up to and including the contract’s expiration date, while European options may be exercised only on the contract’s expiration date. If the profit from the option increases as the price of the underlying stock increases, the option must be a call option. Since Hibbert’s option can be exercised immediately or in the future and has a value directly related to the price of the stock, she must be holding an American call option.

55. A

If the exercise price of a put option is greater than the stock price, the put option is considered in-the-money. In contrast, if the exercise price of a call option is greater than the stock price, the call option is
considered out-of-the-money.

56. B

An option contract gives the owner the right, but not the legal obligation, to buy or sell an underlying asset at a predetermined future date at a predetermined price. The seller is obligated to transact if the owner desires to do so.

57. B

If Jim expects the price of the stock to fall, he should hold a long put option with a strike price greater than $27. The stock is expected to fall from $35 to $27, an $8 decline. Therefore the put option will be in-the-money and will have a payoff of at least $30 – $27 = $3 at expiration.

58. D

The intrinsic value at the time of purchase is equal to the payoff (assuming immediate exercise). Thus, at the purchase date, the intrinsic value of the option was Max(0, 25 – 33) = Max(0, –8) = $0. The $4 premium reflected the option’s time value. The current profit is equal to the payoff: $25 – $23 = $2 minus the premium paid: $2 – $4 = –$2.

59. B

As the exercise price on a put option decreases, the probability that the index price will end up below the exercise price (i.e., the probability that the option will be in-the-money) decreases, and the value of the option decreases. All of the other answers would serve to increase the value of a European put option.

60. C

The writer of a call has potentially unlimited risk. The price of stock can rise infinitely high, causing the payoff of the call (which the writer will lose upon exercise) to become infinitely large.

61. A

Calculate the intrinsic value of the call as follows: stock price – exercise price = $23 – $20 = $3. To calculate the time value of the put option, we must first calculate the intrinsic value as: exercise price – stock price = $25 – $23 = $2. Next subtract the intrinsic value from the option premium to determine the time value: $5.30 – $2.00 = $3.30.

62. A

At the end of the day, all futures contracts are marked to market. It is the process of settling all futures contracts each day at the settle price. The seller and buyer of the contract recognize profits and losses every day. Therefore, at the end of the first day, the farmer owes $5 to the long position and will settle this debt because of the mark to market feature. At the beginning of the second day after the contract is initiated, neither party will owe anything to the opposite party.

63. D

At maturity, the futures price must equal the spot price. This is the concept of convergence.

64. C

Standardization promotes liquidity, and customization reduces liquidity. Futures contracts (which are standardized) have good liquidity, while forward contracts (which are customized) tend to be illiquid.
65. D
Michelle believes the price will decline but wants to sell her wheat harvest at the higher futures price. She should therefore take a short futures position. George believes the price of wheat will increase. Therefore he will want to buy the wheat at the lower futures price (a long futures position).

66. C
Calculate the payoff as ($445 – $430) x 1,500 = $15 x 1,500 = $22,500. Since the spot price (the current price in the market) is higher than the futures price stated in the contract, the long position has value and is owed payment from the short position (i.e., Jones owes money to the counterparty).

67. D
As you can see from the following table, each tick change represents a $0.01 x 2,000 = $20 change in value of the futures position. Therefore, at the end of Day 2 the value of the position has dropped a total of five ticks, or $100. This loss in value gets marked to market at the end of each day. Thus at the end of Day 2, the margin balance would have declined to $600 from the original $700 deposit.

<table>
<thead>
<tr>
<th>Day</th>
<th>Tick Change</th>
<th>Dollar Change</th>
<th>Settle Price</th>
<th>Gain/Loss</th>
<th>Margin Balance</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td>$35.00</td>
<td></td>
<td>$700.00</td>
</tr>
<tr>
<td>1</td>
<td>–3</td>
<td>–$0.03</td>
<td>$34.97</td>
<td>–$60.00</td>
<td>$640.00</td>
</tr>
<tr>
<td>2</td>
<td>–2</td>
<td>–$0.02</td>
<td>$34.95</td>
<td>–$40.00</td>
<td>$600.00</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>$0.03</td>
<td>$34.98</td>
<td>$60.00</td>
<td>$660.00</td>
</tr>
<tr>
<td>4</td>
<td>–5</td>
<td>–$0.05</td>
<td>$34.93</td>
<td>–$100.00</td>
<td>$560.00</td>
</tr>
</tbody>
</table>

68. C
Once again referring to the table in Answer 67, the total tick change after the four days of trading is –3 – 2 + 3 – 5 = –7. This represents a total decline in the margin account of $140. Thus, after four days of trading, the balance in the margin account declines to $560 from the original deposit of $700.

69. B
This privately negotiated settlement is known as an exchange for physicals. It is an uncommon method to close a futures position whereby two contract holders arrange to deliver the underlying asset and close out the futures positions off the floor of the exchange. This is the only situation in which trading can take place off the exchange floor.

70. C
The payoffs to options, forwards, and futures are zero sum games. In other words, when one party to the contract gains, the counterparty loses.