annuity paid twice a year for the next five years.

- Interest Rate Risk on a Bond—interest rates change constantly in the financial markets, thus investors face *interest rate risk* continuously with their investments. Interest rate changes affect investors who hold bonds in two ways—when interest rates change, (1) the market value of the bond changes and (2) so does the rate at which the interest received by investors can be reinvested. The following table shows what would happen to the value of the bond we examined earlier ($60 interest payment annually and five years until maturity) if interest rates *immediately* after the bond was purchased are as follows:

Market Rate, r_d	Bond Value, V_d	
4%	$1,089.04	
6	1,000.00	
8	**920.15**	– current market value
10	848.37	
12	783.71	

Notice that the value of the bond is inversely related to the market rate—if the rate increases, the value decreases. The reason for this is because investors receive a fixed amount of future cash flows (interest) when they buy bonds like the one we are examining here. If the market rates change, the bond's value changes such that if an investor purchases the bond after the rate change, he or she will earn a YTM equal to the market rate of return. Consider what would happen if you purchased the bond when the market rate was 8 percent, thus you paid $920.15. As soon as the purchase was completed the market rate jumped to 10 percent, so you decide to sell the bond so that you can invest in a different bond that earns 10 percent rather than 8 percent. Because you paid $920.15 for the bond and only held it for a short time, you might think you can sell it for the same price. Who do you think would be willing to buy the bond? The answer is *NOBODY*, because investors can now earn 10 percent on similar risk bonds and if they purchased your bond for $920.15 they would only earn 8 percent. As a result, you must adjust the price of your bond so that it now generates a 10 percent return—that is, you would have to drop the price to $848.37. Because the *price* of the bond changes each time market interest rates change, we have what is termed *interest rate* ***price*** *risk.*

Given the preceding discussion, you might think that when interest rates increase, bondholders are unhappy because the prices of their bonds decrease. But, although the price of the bond in our example would drop to $848.37 if interest rates increased from 8 percent to 10 percent, you would now be able to invest the interest payment received from the bond every year at 10 percent compounded annually rather than 8 percent. In this case, we have what is termed *interest rate* ***reinvestment*** *risk*. And, as you can tell, its effect is opposite that of interest rate price risk. That is, if market interest rates increase (decrease) the prices of bonds decrease (increase), but investors are able to reinvest any income received from the bonds at the higher (lower) rates.

Stocks (Equity)—Characteristics and Valuation (Chapter 7)

- Preferred Stock—generally pays a constant dividend similar to a bond, but the firm cannot be forced into bankruptcy if the dividend is not paid, which is similar to common stock—often called a hybrid security

- Par value—(1) the amount that is paid to stockholders in the event the company is liquidated, assuming that the funds are available, and (2) the dividend generally is stated as a percent of the par value.
- Cumulative dividends—a feature that requires the firm to pay preferred dividends that were not paid in previous periods before any common stock dividends are paid.
- Maturity—does not have a specific maturity.
- Priority to assets and earnings—preferred dividends are paid after interest on debt is paid, but before common stock dividends are paid; in the event of liquidation of the company, preferred stockholders are paid after debt obligations are repaid but before common stockholders receive any liquidation proceeds.
- Control of the firm—preferred stockholders do not having voting rights; the exception is when preferred dividends are not paid for a particular (extended) period of time.
- Convertibility—like bonds, preferred stock can contain a provision that permits investors to convert into the common stock of the firm.
- Other provisions—(1) call premium—the amount that the firm has to pay if it calls in preferred stock, (2) sinking fund—used to repurchase and retire some preferred stock at periodic intervals, and (3) participating preferred—receives a stated minimum dividend and then participates with common stockholders in the distribution of earnings in excess of some stated amount.

- <u>Common Stock</u>—common stockholders are the "owners" of the firm
  - Par value—common stock does not have to have a par value; the par value of common stock refers to the minimum amount for which a stockholder is personally liable, which means that investors who purchase the stock for more than its par value cannot lose any more money than what they invest in the stock.
  - Dividends—dividends are not guaranteed; they do not have to be paid. However, any income left after paying interest on debt and preferred stock dividends "belongs" to common stockholders, and this amount is provided to stockholders as dividend payments, reinvestment in the firm (through retained earnings), or both.
  - Maturity—there is no specific maturity
  - Priority to assets and earnings—common stockholders are "last in line" when it comes to distribution of earnings and liquidation proceeds; common stockholders are paid after (1) debt holders, and (2) preferred stockholders.
  - Control of the firm (voting rights)—common stockholders have the right to vote to elect the firm's board of directors, who then appoint the officers. Many investors assign their voting privileges to another person; this is called a proxy.
  - Preemptive right—some common stock allows existing stockholders the right to purchase new issues of stock in the proportion that they own prior to a new issue; this permits stockholders to maintain the same percentage control of the firm after the stock is issued.
  - Types of common stock—many firms issue "classified" common stock, such as Class A, Class B, and so forth; in many cases, one class is voting stock and another class is non-voting

- <u>Equity Instruments in International Markets</u>

- American Depository Receipts (ADR)—certificates created by financial organizations that represent ownership in foreign stock; investors own the certificates, not the stock; the value of the certificate changes as the value of the underlying stock changes.
- Foreign Equity (Stock)
  - Euro stock—stock traded in countries other than the home country of the company
  - Yankee stock—stock of a foreign company that is traded in the United States

- <u>Stock Valuation—Dividend Discount Model (DDM)</u>—when we value stock, we use the same approach described for valuing bonds—that is, find the present value of all the cash flows expected to be received from the stock in the future. Thus, in equation form, the value of a share of stock can be written:

$$\begin{array}{c}\text{Value of}\\ \text{stock}\end{array} = V_s = \hat{P}_0 = \text{PV of expected future dividends}$$

$$= \frac{\hat{D}_1}{(1+r_s)^1} + \frac{\hat{D}_2}{(1+r_s)^2} + \cdots + \frac{\hat{D}_\infty}{(1+r_s)^\infty}$$

where $\hat{D}_t$ represents the dividend expected in Period t and r_s is the rate of return investors require to invest in similar risk equity investments. We usually apply the above equation to three different general situations: (1) firms that pay the same dollar amount of dividends—that is, the dividend remains constant such that there is no growth in dividends; (2) firms that pay dividends that grow at a normal, or constant, rate because the firm grows at the same rate—that is, the rate of growth is the same each year; and (3) firms that pay dividends that have different growth rates—that is, the rate of growth is nonconstant.

- *Valuing stocks with zero growth*—a *zero-growth* stock is one where all future dividends are expected to be the same, such that $\hat{D}_1 = \hat{D}_2 = \cdots = \hat{D}_\infty = D$, and

$$\hat{P}_0 = \frac{D}{(1+r_s)^1} + \frac{D}{(1+r_s)^2} + \cdots + \frac{D}{(1+r_s)^\infty} = \frac{D}{r_s}$$

Because a zero-growth stock has dividend payments that represent a perpetuity, as you can see from the bottom form of the equation, finding the value of such stocks is very simple. For example, if would like to invest in a stock that promises to pay a $6.00 dividend every year, beginning in one year and continuing until the firm stops business, which is never expected to occur, and the required return on similar risk investments is 12 percent, the market value of the stock should be $50 = $6/0.12. (This could be a preferred stock.)

Generally we can find the market value of the stock in such financial sources as *The Wall Street Journal*. Thus, often we use this information to determine the rate of return investors require when investing in similar types of investments. For example, suppose that a stock that pays a constant dividend equal to $3 per share currently is selling for $20 per share. We know the following must exist:

$$\$20 = \frac{\$3}{r_s}, \text{ which means that } r_s = \frac{\$3}{\$20} = 0.15 = 15.0\%$$

As a result, if a stock pays a constant dollar dividend, we can determine r_s as follows:

$$r_s = \frac{D}{P_0}$$

- *Valuing stocks with normal, or constant, growth*—if a firm has normal, or constant, growth, then the dividend it pays is expected to grow at a constant rate each year. This means that $\hat{D}_1 = D_0(1+g)^1$, $\hat{D}_2 = D_0(1+g)^2$, and so forth (g represents the constant growth rate). Thus, to find $\hat{P}_0$, we have the following:

$$\begin{aligned}\hat{P}_0 &= \frac{D_0(1+g)^1}{(1+r_s)^1} + \frac{D_0(1+g)^2}{(1+r_s)^2} + \cdots + \frac{D_0(1+g)^\infty}{(1+r_s)^\infty} \\ &= \frac{D_0(1+g)}{r_s - g} = \frac{\hat{D}_1}{r_s - g}\end{aligned}$$

The form of the equation given in the last line is an algebraic simplification that results because the growth rate, g, is constant.

Consider a company that just paid a $2 dividend. The company's dividend has grown at a rate equal to 4 percent each year for the last 20 years, a pattern that is expected to continue for the next 100 years. If the required rate of return on similar risk investments is 12 percent, what is the market value of the firm's stock? This firm's dividend is expected to grow at 4 percent each year for the next 100 years, so the stream of dividends received by stockholders will look like this:

Year	Dividend	Computation, g = 4%	PV of $\hat{D}_t$ @ 12%
1	2.080000	$\hat{D}_1 = \$2(1.04)^1$	1.857143
2	2.163200	$\hat{D}_2 = \$2(1.04)^2$	1.724490
3	2.249728	$\hat{D}_3 = \$2(1.04)^3$	1.601312
4	2.339717	$\hat{D}_4 = \$2(1.04)^4$	1.486933
5	2.433306	$\hat{D}_5 = \$2(1.04)^5$	1.380723
•	•	•	•
•	•	•	•
•	•	•	•
10	2.960489	$\hat{D}_{10} = \$2(1.04)^{10}$	0.953198
25	5.331673	$\hat{D}_{25} = \$2(1.04)^{25}$	0.313627
50	14.213367	$\hat{D}_{50} = \$2(1.04)^{50}$	0.049181
75	37.890509	$\hat{D}_{75} = \$2(1.04)^{75}$	0.007712

100	101.009896	$\hat{D}_{100} = \$2(1.04)^{100}$	0.001209
		Total	25.984278

Using a spreadsheet to compute the dividends and the present values of the dividends for 100 years, we find

$$\text{PV of} \sum_{t=1}^{100} \hat{D}_t = \$25.98$$

If we assume the dividends grow at a constant 4 percent *for an infinite period*, we can apply the *constant growth dividend discount model* as follows:

$$\hat{P}_0 = \frac{D_0(1+g)}{r_s - g} = \frac{\hat{D}_1}{r_s - g}$$

$$= \frac{\$2(1.04)}{0.12 - 0.04} = \frac{\$2.08}{0.08} = \$26.00$$

As you can see, this result is \$0.02 greater than the result found for the PV of the dividends that are expected to be paid for the next 100 years. This suggests that the PV of the dividends expected to be paid from Year 101 to Year ∞ is approximately \$0.02.

- *Expected rate of return on a constant growth stock*—if we rearrange the equation given for the constant growth model, we have the following:

$$\hat{r}_s = \frac{\hat{D}_1}{P_0} + g$$

$$\text{Expected rate of return} = \text{Expected dividend yield} + \text{Expected growth rate, or capital gains yield}$$

If we know the market value of the stock, P_0, the most recent dividend payment, D_0, and the rate at which future dividends are expected to grow, g, we can compute the rate of return that investors expect the stock to yield. For example, suppose a company's stock is currently selling for \$50, the latest dividend paid by the firm was \$2, and future dividends are expected to grow at 7 percent. The expected rate of return for this stock is

$$\hat{r}_s = \frac{\$2.00(1.07)}{\$50} + 0.07 = 0.0428 + 0.07 = 0.1128 = 11.28\%$$

In this situation, $P_0 = \$50$ and $\hat{D}_1 = \$2.14 = \$2.00(1.07)$.

In one year, the price of the stock is expected to be:

$$\hat{P}_1 = \frac{\hat{D}_2}{(1+r_s)^1} + \frac{\hat{D}_3}{(1+r_s)^2} + \cdots + \frac{\hat{D}_\infty}{(1+r_s)^{\infty-1}} = \frac{\hat{D}_2}{r_s - g}$$

$$= \frac{\$2.14(1.07)}{0.1128 - 0.07} = \frac{\$2.2898}{0.0428} = \$53.50$$

Notice that in one year the value of the stock is the present value of the dividends expected to be paid for the remaining life of the firm, which is $\hat{D}_2, \hat{D}_3, \cdots, \hat{D}_\infty$.

Because the value of the stock is expected to increase to $53.50 one year from now, investors in this stock expect to earn a capital gains yield equal to:

$$\text{Capital gains yield} = \frac{\text{Ending value - Beginning value}}{\text{Beginning value}} = \frac{\hat{P}_1 - P_0}{P_0}$$

$$= \frac{\$53.50 - \$50.00}{\$50.00} = 0.07 = 7.0\%$$

The dividend yield investors expect equals:

$$\text{Dividend yield} = \frac{\hat{D}_1}{P_0} = \frac{\$2.14}{\$50} = 0.0428 = 4.28\%$$

Thus, the total expected rate of return for the stock is

$$\hat{r}_s = 7.0\% + 4.28\% = 11.28\%$$

which is the same result we found earlier.

- *Valuing stocks with nonconstant growth*—most firms do not growth at constant rates each year—that is, nonconstant growth exists. For such companies, because growth is not constant, we cannot apply the constant growth model. This suggests that we have to use the technique discussed in the time value of money section of the notes to find the present value of an uneven cash flow stream. Fortunately, however, we can simplify the computation by assuming that a firm that currently experiences nonconstant growth will begin constant growth at some future date. Consider, for example, a company that expects its growth during the next five years to be 18 percent, 16 percent, –6 percent, 10 percent, 8 percent and then growth is expected to level off to 6 percent, where it will remain from that point on. In this case, the firm has nonconstant growth for five years and then constant growth from Year 6 until Year ∞. Think about how to apply your knowledge of present value techniques and the techniques discussed in earlier to determine the value of the stock. In general terms, we would have to compute the value as follows:

$$\hat{P}_0 = \frac{\hat{D}_1}{(1+r_s)^1} + \frac{\hat{D}_2}{(1+r_s)^2} + \cdots + \frac{\hat{D}_N + \hat{P}_N}{(1+r_s)^N}$$

$$= \frac{D_0(1+g_1)}{(1+r_s)^1} + \frac{\hat{D}_1(1+g_2)}{(1+r_s)^2} + \cdots + \frac{\hat{D}_{N-1}(1+g_N) + \hat{P}_N}{(1+r_s)^N}$$

where N is the year in which nonconstant growth ends and thus constant growth begins.

According to this equation, we have to determine the dividends for each period in which the growth rate is nonconstant and find the present value of those dividends. We also have to find the price of the stock at some future date—that is, $\hat{P}_N$ —and compute the present value of this amount.

Because nonconstant growth ends in Year N, the dividend in Year N+1 is $\hat{D}_{N+1} = \hat{D}_N(1+g_{norm})$, where g_{norm} is the normal, or constant, growth rate. When nonconstant growth ends (constant growth begins), we can apply the constant growth dividend model to compute the value of the stock at that point:

$$\hat{P}_N = \frac{\hat{D}_N(1+g_{norm})}{r_s - g_{norm}} = \frac{\hat{D}_{N+1}}{r_s - g_{norm}}$$

Using this equation, we can compute $\hat{P}_N$, which represents the present value in Year N of the dividends that are expected to be paid in Year N+1 through Year ∞, by applying the constant growth model in the year in which dividends start to grow at a constant rate. To illustrate, let's continue with the situation that was introduced earlier—a firm expects its dividends to grow at nonconstant rates for the next five years and then to grow at the constant rate of 6 percent. If the firm recently paid a dividend equal to $1.00 and the required rate of return on similar risk investments is 12 percent, what should be the price of the stock? Using this information, the dividends for the next five years are expected to be:

Year	Dividend, $\hat{D}_t$	Computation	PV of $\hat{D}_t$ @ 12%
1	$1.1800	$\hat{D}_1$ = $1.0000(1.18)	$1.0536
2	1.3688	$\hat{D}_2$ = $1.1800(1.16)	1.0912
3	1.2867	$\hat{D}_3$ = $1.3688(0.94)	0.9158
4	1.4153	$\hat{D}_4$ = $1.2867(1.10)	0.8994
5	1.5286	$\hat{D}_5$ = $1.4153(1.08)	0.8674
			$4.8274

After Year 5, the expected growth rate will be 6 percent per year. As a result, in Year 6 through Year 100 the dividends will be:

Year	Dividend, $\hat{D}_t$	Computation, g = 6%	PV of $\hat{D}_t$ @ 12%
6	$1.6203	$\hat{D}_6$ = $1.5286(1.06)^1	$0.8209
7	1.7175	$\hat{D}_7$ = $1.5286(1.06)^2	0.7769
8	1.8205	$\hat{D}_8$ = $1.5286(1.06)^3	0.7353
9	1.9298	$\hat{D}_9$ = $1.5286(1.06)^4	0.6959
10	2.0456	$\hat{D}_{10}$ = $1.5286(1.06)^5	0.6586
⋮	⋮	⋮	⋮
25	4.9023	$\hat{D}_{25}$ = $1.5286(1.06)^{20}	0.2884
50	21.0401	$\hat{D}_{50}$ = $1.5286(1.06)^{45}	0.0728
100	387.5623	$\hat{D}_{100}$ = $1.5286(1.06)^{95}	0.0046
			$15.2412

Because the dividends grow at a constant rate after Year 5, we can apply the constant growth model at that point such that we have the following:

$$\hat{P}_5 = \frac{\hat{D}_6}{r_s - g_n} = \frac{\$1.6203}{0.12 - 0.06} = \$27.00$$

Thus, the value of the dividends expected in Year 6 through Year ∞ is $27.00 *at the end of Year 5*. Stated differently, this stock can be sold for $27 five years from today. If we find the present value of the stock price expected in Year 5, we have

$$\text{PV of } \hat{P}_5 = \frac{\$27.00}{(1.12)^5} = \$15.32$$

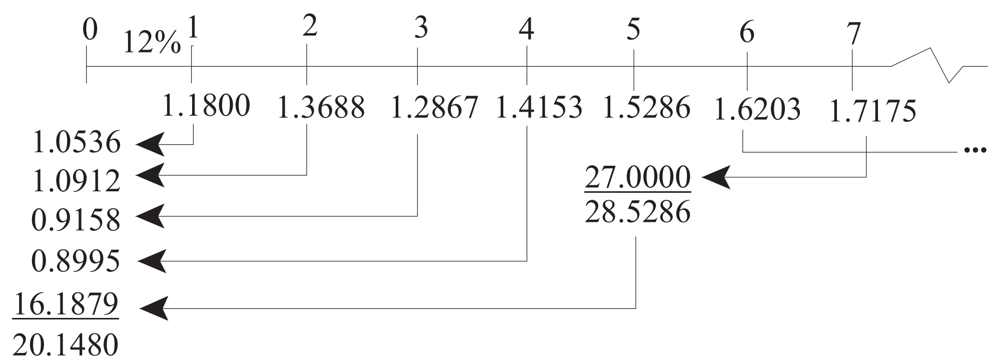
Again, notice that the result is nearly the same as the sum of the present values of the dividends expected in Year 6 through Year 100 shown in the table earlier. Thus, the present value of all the dividends expected in the future is

$$\begin{aligned} P_0 &= \text{PV of } \hat{D}_1 \text{ through } \hat{D}_5 + \text{PV of } \hat{D}_6 \text{ through } \hat{D}_\infty \\ &= \$4.8274 + \$15.32 = \$20.15 \end{aligned}$$

This is the price at which the stock should be selling today.

The key to computing the value of a stock that experiences nonconstant growth is that we assume constant growth occurs at some point in the future—it might start in five years, 50 years, or 100 years. when nonconstant growth ends, we can apply the constant growth model to compute the value of the expected dividends from that point until the firm ceases to exist (i.e., ∞) and then find the present value of that amount. Prior to the point where nonconstant growth occurs, we have to compute the dividend for each year, find the present value of each dividend, and sum the results, just like we did when we encountered an uneven cash flow stream in time value of money problems.

On a cash flow time line, the current situation can be illustrated as follows:



- Other Stock Valuation Techniques—investors generally use more than one method to evaluate stocks
  - *Valuation using P/E ratios*—many investors like to use the price-to-earnings ratio to estimate the value of a stock; remember that the P/E ratio is

$$P/E \text{ ratio} = \frac{\text{Market price per share}}{\text{Earnings per share}} = \frac{P_0}{EPS_0}$$

If we can estimate the firm's earnings per share, a "normal" P/E ratio can be used to estimate the appropriate market value of the stock. For example, if a stock normally has a P/E ratio equal to 12, and analysts estimate that the company's EPS will be \$3 per share, then, using the P/E ratio approach the value of the stock would be estimated to be \$36 = \$3 x 12. In this case, we are saying that the stock normally sells for 12 times its EPS.

- *Evaluating stocks using the Economic Value Added (EVA) approach*—EVA is based on the concept that earnings should be paid to those who provide funds to the firm—that is, bond holders and equity holders—before the firm's true "economic" earnings can be determined. EVA is the amount by which the firm's value changes after compensating investors for the funds they provide the firm

  EVA = EBIT(1- Tax rate) – [(Invested capital) x (After-tax cost of funds as a percent)]

  To illustrate, suppose we have the following information about a firm:

EBIT	$8.2 million
Total capital = Long-term debt + Equity	$50.0 million
Marginal tax rate	40.0%
Debt/assets ratio	55.0%
Before-tax cost of funds	12.2%
Number of outstanding share of common stock	1.5 million

  EVA = $8.2(1 – 0.4) – [0.122(1 – 0.4)]($50.0) = $4.92 – $3.66 = $1.26

  Thus, the "true" income that the firm generated is $1.26 million. As a result, the firm can pay a common stock dividend equal to $0.84 = ($1.26 million)/(1.5 million shares) before its value is threatened.

- Changes in Stock Prices—we generally consider the stock market to be in equilibrium when the expected rate of return and the required rate of return are equal—that is, $\hat{r}_s$ = r. If the market is not in equilibrium, say, the required return, r_s, is greater than the expected return, $\hat{r}_s$, for a stock, then investors would not want to purchase the stock, which would cause its price to drop and its expected return to increase until $\hat{r}_s = r_s$; the opposite would occur if $r_s < \hat{r}_s$.

- Valuation Summary Questions—You should answer these questions as a summary for the chapter and to help you study for the exam.
  - In simple terms, how is value determined?
    - Valuing bonds
    - Valuing equity
  - What are the components of return in general?
    - What are the components of the return on a bond called? On a stock?
    - What is the yield to maturity (YTM)?
    - What is the relationship between YTM, coupon rate, and market value of a bond?
  - How does the price of a bond change over time? Does the price of a bond change over time even if interest rates do not change? Explain
  - What does it mean for the stock market to be in equilibrium?