CHAPTER 6
Fundamentals of Valuation

A. Introduction to Common Stock Analysis

The purpose of security analysis is to derive inputs for portfolio analysis. That is, the securities analyst provides information to the portfolio manager enabling the manager to determine how much of each of the securities to purchase and sell. Securities analysts seek and analyze information concerning expected cash flows and risks associated with securities. Ultimately, analysts are concerned with the valuation of stock. Portfolio managers are particularly interested in obtaining inputs regarding security expected returns (anticipated dividends and price appreciation), risk levels and relative movement of securities. Earlier, we characterized these inputs from a statistical perspective as Expected Return, Variance and Covariance. Most securities analysts are particularly interested in locating underpriced or overpriced securities. Many will hope that their analyses will enable them to find information that is not properly reflected in stock prices.

Basic approaches to valuation include discounted cash flow analysis and relative analysis. Discounted cash flow analysis is based on the cash flows a firm is expected to produce for its investors along with the timing and risk of these cash flows. Because forecasting these cash flows is usually quite difficult as is deriving discount rates, many analysts rely heavily on relative valuation. Here, the analyst derives a value for shares based on the characteristics of the company, its peer companies and the values of its peer companies. Sometimes firms have unused or inefficiently employed assets, or might be in process of restructuring. Such assets may be put to better use by management of another firm, hence, it is often useful to value the firm as though it were to be purchased outright, taken over or liquidated. Some firms have patents, copyrights, unexploited assets and other options that may be very difficult to value using standard discounted cash flow analysis, but may be valued using contingent claims analysis or option pricing methodology.

Many investors will distinguish among types with respect to their return, risk and fundamental characteristics. For example, shares of *blue chip* stock are issued by large, well-established corporations such as ExxonMobil and Proctor & Gamble. Blue chips topically have stable earnings and dividend records and are frequently industry leaders. On the other hand, *speculative stocks* generally do not have this record of earnings success and stability, but may be regarded as having strong potential for price appreciation. Prices of *cyclical stocks* such as Georgia Pacific and Caterpillar tend to vary with the level economy-wide output**.** *Income stocks* such as many utility company shares tend to emphasize stable or increasing dividend payouts and are frequently interest rate sensitive. Investors in income stock (such as retirees and certain non-profit endowments) often have a particular need for current income. On the other hand, *growth stocks* emphasize capital appreciation at the expense of dividends. Investors in growth stocks are generally not dependent on the current income generated by their investments and may be motivated by tax considerations to defer income. Some investors distinguish growth stocks that typically have high P/E (Market Price/Book Earnings) ratios from *value stocks* that typically have lower P/E ratios and Market Value to Book Value ratios. There is some statistical evidence to back up the claim that value stocks outperform growth stocks on a risk-adjusted basis. *Small*

cap, and in particular, *micro cap* stocks are issued by smaller publicly traded firms. Many investors pay particular attention to these companies feeling that they frequently are not followed as closely by the market as the issues of larger companies. Thus, these investors believe that more bargains exist among the small caps. There does exist substantial evidence indicating that small cap stocks outperform the issues of larger firms.[1]

[1]Much of this paragraph is based on Gitman and Joehnk [1993].

B. Introduction to Fundamental Analysis

The focus of fundamental analysis is to value the future cash flows generated by a stock. The cornerstone book for fundamental analysis is *Security Analysis*, written by Benjamin Graham and David Dodd in 1934. Several subsequent revisions have since been published, and many successful stock market participants (including Warren Buffet) have used it as a foundation for their own stock selection strategies. However, it is interesting to note that Graham himself in a 1976 interview in the *Financial Analysts Journal* argued against use of his own methodology because he felt that the stock market had become too efficient. By this point, he had co-developed with James Rea a new securities analysis methodology described in a paper in the *Journal of Portfolio Management* 1977. Nevertheless, the fundamental approaches are certainly useful for valuing less liquid and private firms and are still used by most analysts for larger public firms. Here, we will introduce a fairly common approach to fundamental analysis.

The "Top-Down" Approach

The "top-down" approach to fundamental analysis involves projecting the performance of a given stock using a three-step series of forecasts:

1. Forecast the *performance of the entire economy*. This is important because one might expect economic performance to affect the performance of any given stock. Economic analysis may be used to determine the business cycle and where the economy might be at a point in time with respect to the business cycle. Economic analysis may be based on an overall macroeconomic analysis, considering governmental fiscal and monetary policy, trade conditions as well as factors affecting business production and consumer behavior. Econometric models are important tools used to forecast Gross National Product (GNP). Leading indicators such as those provided by the U.S. Bureau of Labor Statistics are also useful forecasting tools. Among the important data to forecast would be output data (such as GNP or GDP), employment data (such as unemployment rates), consumer sentiment (provided by research centers), inflation, trade deficits or surpluses, inflation, interest rates, business inventory levels and government budget deficits or surpluses. As firms globalize their operations and sources of revenues, it has become more important to develop forecasts for the world economy. At a minimum, a global or international forecast is necessary to the extent that the firm operates on a global level or that the economic forecasts apply to the countries that the firm conducts business in.
2. Forecast *industry or sector performance* given overall economic performance. The analyst may be interested in the future performance of this industry relative to other industries. The analyst should consider technology and labor conditions along with competition within the industry as well as regulation and financial and operating circumstances. Some analysts may pay particular attention to the life cycle or growth cycle for that particular industry. One difficult consideration here is defining the industry of the firm, especially if it operates in several industries. Industry classification codes such as the SIC code (Standard Industry Classification) and the *NAICS* code (North American Industry Classification System) are useful definition tools. Many analysts rely on or consider seriously the opinions of advisory services such as Standard and Poors and Value Line for industry-wide forecasts.

3. Forecast individual *stock performance* given overall economy performance and industry performance. Individual stock projections are likely to use financial statement analysis and statistical procedures. Analysts are also likely to make rather subjective assessments regarding the quality of management in terms of experience, track record and planning efforts. The analyst will also attempt to evaluate the quality and marketability of the firm's products and services. Of particular interest to the fundamental analyst are the sales projections and stability along with impacts on profit margins, asset mix and liquidity, and financial structure. Financial ratios are most useful in the analysis of most of these characteristics. In many instances, analysts will attempt to construct pro-forma income statements and balance sheets (along with cash flow or flow of funds statements) to aid in their projections. Our focus here will be on forecasting individual stock performance.

The "Top-Down" Approach is based on the assumption that firm value is a function of firm characteristics, which is a function of the firm's industry which itself is a function of the economy as a whole. Hence, one forecasts first the economy, then the industry, followed by the firm itself. The "Bottom-Up" Approach is based on the assumption that the economy depends on industries which depends on individual firms in those industries. Hence, one initiates forecasting with individual firms. The "Comparables" Approach discussed shortly attempts to determine firm value as a function of relationships between comparable firm values and accounting statement characteristics.

C. Growth Models

The fundamental analyst attempts to determine the intrinsic value of stock. An investor makes a payment for a stock and, in return for her investment, receives dividends from the firm. One might argue that any payment received by shareholders of a corporation will be in the form of some type of dividend. Such dividends might be of a cash form, product, stock or even a liquidating dividend. Therefore, one might value common stock as a function of anticipated future dividends. Any capital gain or stock sales proceeds received by an investor might themselves be regarded as a function of dividend payments to be paid after the sales date. Hence, a proper forecast and discounting of dividend payments should lead to a proper stock valuation model. The fundamental analyst's problem is to determine the appropriate inputs for the valuation model. The following is the most general of the simple dividend discount models:

$$P_0 = \sum_{t=1}^{\infty} \frac{DIV_t}{(1+k)^t} \tag{1}$$

There are a number of problems with the model proposed by Equation 1:

1. First, the firm may not be paying dividends now and may not anticipate paying any in the foreseeable future. In this scenario, it might be convenient to substitute earnings or free cash flows for dividends in the numerators of Equation 1. Thus, EPS or FCF per share can be substituted for dividends in any of these dividend-based expressions. We will discuss these shortly.
2. Dividends may be difficult to estimate into the longer-term future. First, the discount rate should be risk adjusted to account for this uncertainty. In many instances, a cost of equity value used as a discount rate will adjust for this. Second, an n-year holding period and "target price" might be specified. So, if it is more convenient to forecast a selling price in n years than it is to forecast dividends into he longer-term, one might substitute the following for Equation 1:

$$P_0 = \sum_{t=1}^{n} \frac{DIV_t}{(1+k)^t} + \frac{P_n}{(1+k)^n} \tag{1a}$$

3. If a constant compound growth rate can be substituted for dividends, it may be computationally efficient to use some form of a perpetuity model to value stock. The following is an example of a one-stage perpetual growth model:

$$P_0 = \frac{DIV_1}{k-g} \tag{2}$$

Suppose an investor has the opportunity to invest in a stock currently selling for $100 per share. The stock is expected to pay a $1.80 dividend next year (at the end of year 1). In each subsequent year forever, the annual dividend is expected to grow at a rate of 4%. All cash flows

are to be discounted at an annual rate of 6%. Should the stock be purchased at its current price? The following is computed from Equation 2:

$$P_0 = \frac{\$1.80}{(.06 - .04)} = \$90$$

Since the $100 purchase price of the stock is more than its $90 value, the stock should not be purchased. This one-stage growth model, also known as the Gordon Growth Model requires three inputs, Div_1, k and g. The model is quite sensitive to each of these three inputs and to errors in estimating them. The growth rate, which should be stable to use the model, is frequently the most difficult input to estimate. However, if the growth rate can be estimated and is expected to be stable, the model may work reasonably well. For example, if economic growth were estimated to be 4%, and the company were expected to grow at the economy's rate (e.g., in some cases, a mature company that processes food), the model may work well.

Now, consider the scenario where the stock's dividends cannot be expected to grow at the same rate forever. In this second scenario, suppose the stock's dividends grow at an annual rate of g_1 for n years and then at a rate of g_2 forever afterwards. The single stage growth model represented by equation (2) must be revised to account for two stages of growth. The first stage will be represented by an n year growing annuity at rate g_1 and the second stage will be a growing perpetuity at a different growth rate g_2. This second stage of cash flows is a deferred perpetuity that will be discounted a second time (by dividing by $(1+k)^n$) because it will not start until after the first n year period ends:

$$(3) \qquad P_0 = DIV_1\left(\frac{1}{k - g_1} - \frac{(1+g_1)^n}{(k-g_1)(1+k)^n}\right) + \frac{DIV_1(1+g_1)^{n-1}(1+g_2)}{(k-g_2)(1+k)^n}$$

Now, suppose an investor has the opportunity to invest in a stock currently selling for $100 per share. The stock is expected to pay a $3 dividend next year (at the end of year 1). In each subsequent year until the seventh year, the annual dividend is expected to grow at a rate of 20%. Starting in the eighth year, the annual dividend will grow at an annual rate of 3% forever. All cash flows are to be discounted at an annual rate of 10%. Should the stock be purchased at its current price? The following Two Stage Growth Model can be used to evaluate this stock:

$$P_0 = DIV_1\left(\frac{1}{k - g_1} - \frac{(1+g_1)^n}{(k-g_1)(1+k)^n}\right) + \frac{DIV_1(1+g_1)^{n-1}(1+g_2)}{(k-g_2)(1+k)^n}$$

$$P_0 = \$3\left(\frac{1}{.1 - .2} - \frac{(1+.2)^7}{(.1-.2)(1+.1)^7}\right) + \frac{\$3(1+.2)^6(1+.03)}{(.1-.03)(1+.1)^7} = 92.8014519$$

Since the $100 purchase price of the stock exceeds its 92.8014519 value, the stock should not be purchased. This two-stage model may work well for a company with established markets and brands, but where the industry is expected to enter a phase of lower growth associated with its maturity.

The three-stage growth model (used extensively by investment advisory services such as Value Line, Inc.) is developed as follows:

$$P_0 = DIV_1\left(\frac{1}{k-g_1} - \frac{(1+g_1)^{n(1)}}{(k-g_1)(1+k)^{n(1)}}\right) + DIV_1\left(\frac{(1+g_1)^{n(1)-1}(1+g_2)}{(1+k)^{n(1)}(k-g_2)} - \frac{(1+g_1)^{n(1)-1}(1+g_2)^{n(2)+1}}{(k-g_2)(1+k)^{n(1)+n(2)}}\right)$$
$$+ \frac{DIV_1(1+g_1)^{n(1)-1}(1+g_2)^{n(2)}(1+g_3)}{(k-g_3)(1+k)^{n(1)+n(2)}}$$

This model is three parts:

1. An n(1) year growing annuity at a growth rate of g_1
2. An [n(2)-n(1)] year growing annuity starting after n(1)-1 years of growth at rate g_1 and one year at rate g_2. This second annuity, discounted a second time for n(1) years grows at rate g_2.
3. A perpetuity growing at rate g_3. This perpetuity is discounted for n(1)+n(2) years because it starts after the second growing annuity terminates.

Now, suppose an investor has the opportunity to invest in a stock currently selling for $100 per share. The stock is expected to pay a $5 dividend next year (at the end of year 1). In each subsequent year until the third year, the annual dividend is expected to grow at a rate of 15%. Starting in the fourth year, the annual dividend will grow at an annual rate of 6% until the sixth year. Starting in the seventh year, dividends will not grow. All cash flows are to be discounted at an annual rate of 8%. Should the stock be purchased at its current price?

$$P_0 = \$5\left(\frac{1}{.08-.15} - \frac{(1+.15)^3}{(0.08-.15)(1+.08)^3}\right) + \$5\left(\frac{(1+.15)^{3-1}(1+.06)}{(1-.08)^3(.08-.06)} - \frac{(1+.15)^{3-1}(1+.06)^{3+1}}{(.08-.06)(1+.08)^6}\right)$$
$$+ \frac{\$5(1+.15)^{3-1}(1+.06)^3(1+0)}{(0.08-0)(1+.08)^6} = \$92.0171078$$

Since the $100 purchase price of the stock exceeds its $92.0171 value, the stock should not be purchased.

Each of the dividend growth models that we presented thus far has assumed that the firm will pay dividends, stock value will be based on these dividends and that all dividends into perpetuity will have been considered. This assumption can be quite sensible; the price an investor should be willing to pay for stock should be based on the value of what she receives (including whatever cash flows that subsequent shareholders receives if the shares are sold) from the firm. However, from a more practical perspective, most investors do not anticipate holding the stock forever. How might we value the stock when the investor's anticipated holding period is finite? We refer back to Equation 1.a.

Suppose Stock A were expected to pay a $10 dividend in each of the next three years and then be sold for $100 at the end of three years. We can value the dividends as a constant three-

year annuity and then add the present value of the anticipated selling price to obtain a value of $82.61:

$$PV_A = \frac{\$10}{(1+.18)^1} + \frac{\$10}{(1+.18)^2} + \frac{\$10+\$100}{(1+.18)^3} = \frac{\$10}{.18} \cdot \left[1 - \frac{1}{(1+.18)^3}\right] + \frac{\$100}{(1+.18)^3} = \$82.61$$

Thus, the value of the stock equals the sum of present values of its anticipated dividends and selling price.

Consider a second example where a firm is expected to pay dividends to shareholders of $100,000 in one year. Subsequent cash flows are expected to grow at an annual rate of 20 percent until the end of the fourth year and then at 3 percent until the end of the 10th year. All cash flows are discounted at 10 percent. Table 4 illustrates the cash flows, their present values and cumulative present values

Table 4:
Two-Stage Growth Model Illustration

Cash Flow Series to Year (t):

Computations

Year	CF(t)	PV[CF(t)]	SUM(PV's)	
1	100000	90909.1	90909.09	
2	120000	99173.6	190082.6	
3	144000	108189	298272	
4	172800	118025	416296.7	**First Stage PV**
5	177984	110514	526810.8	
6	183324	103481	630292.1	
7	188823	96896.2	727188.3	
8	194488	90730.1	817918.3	
9	200323	84956.3	902874.7	
10	206332	79550	982424.7	**Total PV**

Using Equation 4 above, this present value can be computed as follows:

$$P_0 = 100{,}000\left(\frac{1}{.1-.2} - \frac{(1+.2)^4}{(.1-.2)(1+.1)^4}\right)$$
$$+100{,}000\left(\frac{(1+.2)^{4-1}(1+.03)}{(1+.1)^4(.1-.03)} - \frac{(1+.2)^{4-1}(1+.03)^{6+1}}{(.1-.03)(1+.1)^4(1+.1)^6}\right) = 982{,}425$$

The example above ignores cash flows anticipated after the second stage. This is appropriate only if the firm is not expected to produce cash flows after the 10^{th} year; we assume in this example that the firm has no value after 10 years. If this were not true, we would estimate the firm's value 10 years from now and discount it, adding this discounted terminal value to the present values of the cash flows obtained for the first 10 years.

However, there are more problems. For example, valuing dividends is complicated by the fact that many firms will not pay predictable dividends at any point in the foreseeable future. How should such firms be valued? One alternative is to substitute earnings (EPS) for dividends and construct an earnings growth model. Here, we simply substitute earnings for dividends into our perpetual dividend growth models. The rationale for this is that shareholders have a claim on earnings whether they are paid out in dividends or retained by the firm. Thus, if earnings forecasts seem more reliable or practical than dividend forecasts, the analyst may prefer to use an earnings-based growth model.

What if earnings are negative and are not anticipated to become positive in the foreseeable future? Since equity value for corporations cannot be negative, perhaps the firm can be valued based on free cash flows (discussed shortly), option value (discussed in the next chapter) or based on liquidating or takeover value (also discussed in the next chapter).

Finally, earnings as reported on accounting statements may not reflect a firm's ability to generate value for its shareholders. For example, firms may realize negative earnings for tax purposes while still creating shareholder value. Another substitute for dividends in growth models is Free Cash Flows (FCF), defined as follows:

FCF = NIAT + Depr + Amort - Change in non-cash WC - Spending on Capital Equipment

Where *FCF* represents free cash flows, *NIAT* net income after taxes, *Depr* and *Amort* are depreciation and amortization charges and *WC* is working capital. There are many other ways to calculate free cash flows. These methods often change from industry to industry as per convention and may include adjustments for debt. Nonetheless, the Free Cash Flow model is more commonly used for DCF analysis than dividends or earnings.

The fundamental analyst is interested in determining the intrinsic or "true" value of a stock. The purpose of the discount models above is to translate cash flow and other forecasts into values against which to compare stock prices. These models are usually quite simple to structure on spreadsheets or even calculators. The real difficulty in applying these models is to determine appropriate inputs. For example, the analyst using these models must determine appropriate dividend forecasts and growth rates along with discount rates. Alternatively, the analyst may project returns on investment or internal rates of return. In any case, as usual, forecasting is the difficult part of the analyst's job.

D. Setting The Discount Rate

The firm's cost of capital is sometimes used to set discount rates for valuation. Depending on the circumstances, either the firm's marginal or overall cost of capital might be used for this purpose. The firm's cost of capital can sometimes be determined fairly easily from its accounting statements. However there are two major weaknesses associated with this approach. First, the firm's accounting statement data may not reflect true economic values. Accounting techniques for dealing with depreciation, book values and earnings may cause accounting statement values to differ significantly from true economic values. A second problem with this approach is that it does not necessarily account for the risk of the firm. The firm's discount rate will be a function of current payments required to sustain capital rather than a function of the characteristics of the firm's operations.

Cost of capital is the money the firm must pay to raise capital (funds to finance its investments) relative to the capital raised. Thus, cost of raising capital is measured as a percentage (or proportion) of the funds raised. Capital that the firm raises will be reflected on the right-hand side or capital side of the firm's balance sheet; payments necessary to sustain this capital will be reflected on the firm's income statement. A firm's cost of capital can be determined by dividing the payments required to sustain capital by the amount of capital raised.

A component cost of capital is the cost to the firm of raising money from a particular source. The sum of money obtained from a particular source such as debt or equity will be reflected on the firm's balance sheet; the payments such as interest or dividends required to sustain this capital component will be reflected in the firm's income statement. For example, the firm's cost of debt is simply the interest payments required to sustain the firm's debt divided by the total amount of capital it has raised by borrowing money:

(1) $$k_D = i = \frac{INT}{DEBT} = \frac{INT}{D}$$

However, interest payments required to sustain debt reduce the firm's taxable income, thus reducing the level of income taxes it must pay. Therefore, the firm's after-tax cost of debt may be of greater importance:

(2) $$k_d = k_D(1-\tau) = \frac{INT(1-\tau)}{D}$$

where (τ) is the corporate income tax rate.

The firm's cost of common stock (hereafter referred to as cost of equity) is determined by dividing the total income on which shareholders have a claim by the net worth of the company:

(3) $$k_e = \frac{NIAT}{EQUITY} = \frac{NIAT}{E}$$

The firm's net income after taxes (NIAT) can be split into two categories: dividends and retained earnings. The firm retains earnings with the expectation that future earnings will increase and that dividend payments will be able to grow. Retained earnings presumably will be re-invested by the firm and will result in a higher capital base and higher future earnings from which the firm may pay increased dividends. Therefore, the growth rate associated with a firm's dividend payments may be the firm's level of retained earnings divided by its equity:

(4) $$g = RE \div E$$

Thus, Equation (3) can be re-written as follows:

(5) $$k_e = \frac{DIV + RE}{E} = \frac{DIV}{E} + g$$

Equations (4) and (5) assume that NIAT in future periods will continue to be the same proportion of the firm's equity level. However, since the firm is retaining some of its earnings, its equity level will grow. Thus, NIAT will grow at a constant growth rate (g). Also, notice that the second part of Equation (5) can be derived algebraically from the growing perpetuity equation.

The firm's overall (or average) cost of capital is simply a weighted average of its component costs of capital:

(6) $$k_a = w_d k_d + w_e k_e$$

where k_d and k_e are the firm's costs of debt and equity. The terms (w_d) and (w_e) are the proportions of the firm's total capital derived from debt and equity:

(7) $$w_d = \frac{D}{D+E}; w_e = \frac{E}{D+E}$$

This average cost of capital can also be determined by summing the income available to both creditors (bondholders) and shareholders and dividing by the total amounts they have invested in the firm:

(8) $$k_a = \frac{NIAT + INT}{D+E} = \frac{NOI}{Assets}$$

This average cost of capital is frequently used as a discount rate. The firm should accept only those investments that exceed its cost of raising capital to finance them.

Marginal cost of capital is the cost to the firm of raising the next unit of money. For example, the firm's marginal cost of capital is increasing if the interest rate on its debt increases as it borrows additional funds, assuming that the firm does not sell equity. The opportunity cost of capital to the firm is the return the firm forgoes by not investing in the next best alternative project. For example, if the firm forgoes investing in marketable securities for a return of ten percent in favor of investing in a particular machine at some other return level, then the

opportunity cost of capital to the firm is the foregone ten percent. Thus, the opportunity cost of capital is not necessarily how much the firm must pay for capital; it is the return the firm forgoes by not employing capital in the next best available project.

Cost of Capital: Illustration

Consider the Pierce Company whose accounting statements are presented in Table 9. From Equations (1) and (2), we find that the firm's before and after tax costs of debt are 10 percent and 7.5 percent, respectively. Pierce's cost of equity is 15 percent, determined from either Equations (3) or (5). The growth rate associated with its dividends is simply 10 percent from Equation (4). The company's average cost of capital is 13.33 percent, determined from either Equation 6 or Equation 8.

Table 9:
Pierce Company Accounting Statements

Pierce Company Income Statement, 2006

Sales	$2,000,000
Cost of Goods Sold	500,000
Gross Margin	1,500,000
Fixed Overhead Costs	500,000
Earnings Before Interest and Taxes (EBIT)	1,000,000
Interest Payments	200,000
Earnings Before Taxes (EBT)	800,000
Taxes @ τ=.25	200,000
Net Income After Taxes (NIAT)	600,000
Dividends	200,000
Retained Earnings	400,000

Pierce Company Balance Sheet: December 31, 2005

ASSETS		CAPITAL	
Current Assets	$1,000,000	Debt	$2,000,000
Fixed Assets	5,000,000	Equity	4,000,000
Total Assets	6,000,000	Total Capital	6,000,000

Cost of Capital and the Capital Asset Pricing Model

If capital markets are perfectly efficient such that the Capital Asset Pricing Model (CAPM) held, and all corporate bonds were risk-free investments, the firm's cost of capital could be determined from statistical data such as variances of returns, correlation coefficients, risk-free and required market returns. Thus, if the CAPM holds, we can determine what the firm's average and component costs of capital should be. For this reason, this statistical approach to determining cost of capital can be referred to as the CAPM or market price approach to determining cost of capital. In this case, the firm's cost of capital figures should be the same whether they are

computed from the above statistical data or from accounting statement data as in the previous section. Among the most important assumptions underlying the following analyses are:

1. The corporation pays no income taxes.
2. Debt is entirely risk-free.
3. There are no transactions or bankruptcy costs. Thus, if the firm should find that its assets are exceeded by its debt, it will neither incur lawyers' and accountants' fees associated with bankruptcy, nor will it suffer any loss of goodwill from its customers or suppliers.
4. The firm's investment policy is unaffected by its financing policy.

These assumptions are not realistic; however they simplify the following analyses, particularly those involving the determination of optimum capital structure. After a simplified version of a capital structure analysis is provided, many of the unrealistic assumptions will be relaxed, permitting development of a capital structure model under more realistic conditions.

If corporate bonds can be considered to be risk-free investments, bondholders will be repaid regardless of the firm's profit or loss level. If the firm should find that its asset level is exceeded by its debt level, bondholders will still be repaid. This risk-free debt assumption in ensured by requiring that shareholders accept unlimited liability for the debts of the corporation. Since debt is risk-free, its return should equal the risk-free rate of return:

(1) $k_d = r_f$

The firm's overall (or average) cost of capital will be equal to the average of total returns required by both bondholders and shareholders. This will be the required return on the firm's assets, or total investment level. We know from the Capital Asset Pricing Model that the rate of return required by investors on Firm (i's) stock is determined:

(2) $rr_i = r_f + \beta_i(r_m - r_f)$,

where β_i is the Beta associated with Firm (i's) return-on-equity and σ_i is the standard deviation of Firm i's returns-on-equity as follows:

(3) $$\beta_i = \frac{\sigma_i}{\sigma_m} \cdot \rho_{i,m}$$

The standard deviation associated with a firm's return-on-assets is determined as follows:

(4) $$\sigma_{ROA} = \sqrt{\sum_{i=1}^{n} (ROA_i - E[ROA])^2 P_i}$$

This standard deviation can be used to determine the Beta associated with the firm's return-on-assets ($_{ROA}$):

(5) $$\beta_{ROA} = \frac{\sigma_{ROA}}{\sigma_m} \cdot \rho_{ROA,m}$$

The term ($\rho_{ROA,m}$) is the correlation coefficient between the firm's returns on asset levels and returns on the market portfolio. ($_{ROA}$) is often referred to as the Beta of the unlevered firm. This unlevered firm Beta can be used to determine the total return required by both bondholders and shareholders:

(6) $rr_a = k_a = r_f + \beta_{ROA}(r_m - r_f)$,

which should equal the firm's overall cost of capital. The Beta of the levered firm's equity on an after-tax basis can be determined from the unlevered firms beta (beta of assets) as follows:

(7) $$\beta_i = \beta_{ROA} \times [1 + (1\text{-}t) \times D/E]$$

where t is the corporate tax rate.

E. Financial Statement Analysis: An Introduction

Financial statement analysis will usually involve the comparison of financial statement figures based on either a cross-section of different firms or based on a time-series of statements. Among the tools used by the analyst are common-size statements where income statement items are expressed as a percentage of revenues and balance sheet items are expressed as a percentage of assets. Standardizing statement balances enable simplified comparisons either across firms or over time. Financial ratios are also most important and will be discussed in detail later. The construction of pro-forma statements will also be discussed here.

There exist numerous sources for financial statement data. Data will be available from publicly traded companies in annual reports or 10-K reports filed with the S.E.C. Standardized hard copy (paper) statements may be purchased from companies such as Moody's, Standard and Poors, Commerce Clearing House, Value Line and Dun and Bradstreet. Examples for sources of such standardized reports include *Moody's Handbook of Common Stocks*, *Value Line Investment Survey, FactSet, StockVal, WRDS* and *Standard and Poor's Industry Survey*. Computerized data sources such as Yahoo.com, *Compustat* and *CD Disclosure* are available at many libraries and can download data to computer-based spreadsheets. However, users should be aware that these data bases (paper or computer) may exclude firms, particularly those no longer in existence, may be missing recent data, may contain recording errors, may record statement accounts inconsistently across firms and may altogether exclude important accounting statement items.

Some analysts are concerned with the distinction between value and growth stocks. Growth stocks may be thought of as those with exceptional growth potential. Some analysts use historical earnings or returns growth as the indicator for growth stocks. Presumably, stocks with high historical rates of growth may be expected to realize higher growth rates in the future. Value investors are concerned with the market price of the stock relative to some other indicator of value such as book value. The book to market value of a stock is often taken as an indicator of the relative value of the stock. Higher book to market value is perceived as indicating a good buy.

Pro-forma Statements

A pro-forma statement is compiled based on forecasted or projected values. For example, a pro-forma statement for 2008 compiled in 2007 lists accounts whose values were forecasted in 2007. The following portrays a historical balance sheet for 2007 along with a pro-forma balance sheet for the Marlowe Company dated December 31, 2008 and a pro-forma income statement for 2008. Because one rarely predicts with certainty, account balances actually realized may differ from the forecasted levels given in the pro-forma statements. Thus, the analyst may rely on a combination of "best outcome", "worst outcome" and "most likely" outcome statements. Computer based simulations and spreadsheets provide an efficient means of generating multiple potential outcome scenarios.

The sales forecast might involve use of regression techniques along with analyses of economy-wide and industry factors. The analyst must distinguish between variable and fixed costs and determine the extent to which these costs are fixed or variable. Balance sheet and

income statement items must also reflect any capital investments and acquisitions projected by the firm.

Marlowe Company Balance Sheet: Dec. 31, 2007

Assets		Capital	
Cash	$77,703	Accounts Payable(AP)	$90,000
Marketable Securities	15,000	Notes Payable	65,000
Accounts Receivable(AR)	50,000	Taxes Payable	15,000
Inventory (INV)	5,000	Current Liabilities(CL)	170,000
Current Assets(CA)	$147,703		
		Term Loans	30,000
Land	7,000	Debentures	45,000
Plant (Net)	90,000	Total Debt(D)	245,000
Equipment (Net)	15,000		
Fixed Assets(FA)	$112,000	Common Equity Par	10,000
Total Assets	$259,703	Paid in Capital	20,000
		Retained Earnings	-15,297
		Total Equity (E)	14,703
		Total Debt plus Equity	$259,703

Pro-Forma Marlowe Company Income Statement, 2008

Sales (S)	$295,000
Income from Securities (ifs)	1,500
Total Revenue (TR)	298,500 S + ifs
Beginning Inventory (bi)	5,000
Production Cost (pc)	175,000
Ending Inventory (ei)	8,000
Cost of Goods Sold (CGS)	172,000 bi + pc - ei
Gross Margin (GM)	116,500 TR - CGS
Fixed Manufacturing Cost (fmc)	70,000
Inventory Carry Cost (ic)	50
Selling and Administrative Costs (sc)	20,000
Depreciation - Plant (depr-p)	10,000
Depreciation - Machines (depr - m)	3,000
Depreciation - Other (depr -o)	400
Earnings Before Interest and Taxes (EBIT)	13,050 GM-fmc-ic-sc-DEPR
Note Payable Interest (int - n)	11,000
Term Loan Interest (int - t)	3,000
Debenture Interest (int - d)	4,500
Earnings Before Taxes (EBT)	-5,450 EBIT - INT
Income Taxes (TAX)	-2,507 EBT * .46
Net Income After Taxes (NIAT)	-2,943 EBT - TAX
Dividends (DIV)	0
Add to Retained Earnings	-2,943 NIAT - DIV

Pro-Forma Marlowe Company Balance Sheet: Dec. 31, 2008

Assets			Capital	
Cash		$47,000	Accounts Payable(AP)	$70,000
Marketable Securities		10,000	Notes Payable	55,000
Accounts Receivable(AR)	70,000		Taxes Payable	0
Inventory (INV)		8,000	Current Liabilities(CL)	125,000
Current Assets(CA)		$135,000		
			Term Loans	42,240
Land		7,000	Debentures	55,000
Plant (Net)		80,000	Total Debt(D)	222,240
Equipment (Net)		12,000		
Fixed Assets(FA)		$99,000	Common Equity Par	10,000
Total Assets		$234,000	Paid in Capital	20,000
			Retained Earnings	-18,240
			Total Equity (E)	11,760
			Total Debt plus Equity	$234,000

Ratio Analysis

Among the most important tools to fundamental analysts are accounting statement ratios. This is because data taken from accounting statements are much more useful when they can be compared to other data. This is the purpose of ratio analysis: to compare accounting statement data. A financial ratio is simply one accounting statement value relative to another. Ratio Analysis is very useful for measuring performance and risk and for comparing the relative effectiveness of companies.

Figures 1 and 2 provide sample accounting statements for the Madison Company from which ratios may be computed. Various ratios are listed and determined for the Madison Company in Figures 3 and 4.

Ratios can be used to measure a number of important company characteristics. Various ratios can be categorized according to which characteristics they are intended to measure. One category of ratios is the liquidity group. These ratios are analyzed in an attempt to measure the firm's liquidity position; that is, they are used to determine a firm's ability to convert assets into cash in a short period of time. Firms must raise cash in order to operate. Even a firm that in the past has been highly profitable will be unable to operate effectively if it is unable to raise cash to compensate employees and to pay suppliers and taxes, etc. From Figure 3, we see that a sample liquidity ratio is the firm's current ratio. This ratio, simply current assets divided by current liabilities, may be used to measure a firm's ability to meet its short-run obligations. Current Assets are those assets that are generally convertible into cash within a fairly short period of time (frequently about one year). Cash, the most liquid of all assets and is likely to be a major component of these current assets.

A second ratio group is the profitability ratios. These ratios are used to determine the economic efficiency of the firm. An example of such a ratio is the firm's return-on-equity. This ratio measures profits awarded to shareholders relative to how much they have invested in the firm. A second profitability ratio is the firm's return-on-assets. This ratio measures cash flows

available to both shareholders and creditors compared to the total sum both have invested in the firm. Thus, this ratio measures the profitability of all of the money invested in the firm.

A third ratio group comprises the leverage ratios. This group of ratios is used to determine a firm's ability to meet its fixed obligations. These ratios are also very useful in determining the risk or variability associated with a firm's profits. An obvious example of a leverage ratio is the firm's debt-equity ratio. This ratio, simply the firm's debt level divided by its equity level, measures the firm's ability to fulfill its obligations to creditors. Degree of Operating Leverage and Degree of Financial Leverage ratios are very useful in the assessment of operating and financial risk.

The fourth group discussed here are the activity ratios. These ratios measure a firm's ability to perform certain activities. An example of such a ratio is the sales-turnover ratio. This ratio measures a firm's capacity to sell its products given a specified level of investment.

The fifth group of ratios, to be discussed later in this chapter, are market ratios. These ratios, including P/E and market to book ratios, focus on market values of shares or equity relative to certain accounting statement values. These ratios are particularly in stock valuation.

Figures 1 and 2 display accounting statements for the Madison Company. A variety of ratios for this company are computed in Figure 4. Ratios are defined and grouped in Figure 3.

The use of ratios requires some standards for comparison. Useful standards for comparison include ratios generated by the firm in previous periods, ratios generated by other firms and target levels set by the firm. Contrary to the beliefs of some individuals, there are no target ratio levels (such as the 2 to 1 current ratio sometimes mentioned) that may be universally applied across all firms in all situations. Often, the most difficult steps in ratio analysis are generating appropriate standards for comparison and inferring reasons for deviation from those standards.

Comparison of ratios across several time periods may provide useful information regarding firm trends. For example, declining profitability ratios over a long period of time may be indicative of serious problems within the firm. If over the same period inventory turnover ratios have been declining, perhaps an associated problem or even a cause for the declining profitability has been pin-pointed.

Ratios of one firm may be compared to those of another with similar operating characteristics. Comparison of a bank's liquidity ratios to those of an automobile manufacturer may be meaningless because the operating characteristics of the two types of firms are entirely different. Thus, it may be more practical to compare ratios among firms in the same or a similar industry. Several institutions, such as Dun and Bradstreet provide data useful for ratio comparison. For example, Dun and Bradstreet provides "average" ratio levels for firms in a number of different industries. Deviation from the "industry norm" by a firm may indicate one of the following: 1) a strength in the firm, 2) a weakness in the firm, or 3) a difference in the operating characteristics between the firm and the "industry norm." One must realize that a ratio that is higher than the norm is not necessarily better. This is obviously true for the debt-equity

ratio and perhaps less obviously true for the current ratio. A current ratio that is too low may indicate that the firm is not able to raise cash easily; a current ratio that is too high may indicate that the firm is not investing its funds in the most profitable assets (fixed asset investment is often more profitable than current asset investment).

An obvious standard for ratio comparison is a target level that may have been established by management of the firm. For example, a firm that is unable to attain its target 15% return-on-equity level may have operating problems, or it may simply have established an unrealistic target level. Presumably, a firm is successful if it is able to attain or exceed the target ratio levels established by its management.

Madison Company Income Statement, 2004

Cash Sales (S)	$2,000,000				
Credit Sales (CRS)	4,000,000				
Total Sales		$6,000,000			
Other Revenue		1,000,000			
Total Revenue (TR)					$7,000,000
Raw Materials Cost	1,900,000				
Direct Labor Costs	1,100,000				
Cost of Goods Sold (CGS)		3,000,000			
Gross Margin (GM)					4,000,000
Plant Operating Cost	800,000				
Maintenance Costs	500,000				
Managerial Salaries	400,000				
Other Fixed Costs	300,000				
Fixed Overhead Costs (FC)		2,000,000			
Less Depreciation (Depr.)	200,000				
Earnings Before Interest and Taxes (EBIT)					1,800,000
Interest on Current Debt	50,000				
Interest on Notes Payable	150,000				
Interest on Bonds Payable	650,000				
Total Interest Charges (INT)		850,000			
Earnings Before Taxes (EBT)				950,000	
Taxes (30%*EBT)		285,000			
Net Income After Taxes (NIAT)				565,000	
Dividends (Div)	282,500				
Retained Earnings					282,500
Shares Outstanding (#shs)	10,000 shs.				
Earnings Per Share		28.25			

Figure 1: Madison Company Income Statement, 2004

Madison Company Balance Sheet; Dec. 31, 2003

Cash	100,000	Accounts Payable(AP)	$500,000
Marketable Securities	300,000	Taxes Payable	50,000
Inventory (INV)	700,000	Wages Payable	50,000
Accounts Receivable(AR)	400,000	Current Liabilities(CL)	600,000
Current Assets(CA)	$1,500,000		
		Notes Payable	1,000,000
Equipment(Book Value)	200,000	Bonds Payable	5,000,000
Plant(Book Value)	3,000,000	Long Term Debt(LTD)	6,000,000
Land	4,000,000	Total Debt(D)	6,600,000
Fixed Assets(FA)	7,200,000	Common Equity Par	10,000
Total Assets	8,700,000	Cumulative Retained Earnings	2,090,000
		Total Equity (E)	2,100,000
		Liabilities and Equity (D&E)	8,700,000

Madison Company Balance Sheet; Dec. 31, 2004

Cash	100,000	Accounts Payable	$500,000
Marketable Securities	300,000	Taxes Payable	100,000
Inventory (INV)	500,000	Wages Payable	50,000
Accounts Receivable	600,000	Current Liabilities(CL)	650,000
Current Assets (CA)	$1,500,000		
		Notes Payable	1,000,000
		Bonds Payable	5,000,000
Equipment(Book Value)	900,000	Long Term Debt	6,000,000
Plant(Book Value)	3,500,000	Total Debt (D)	6,650,000
Land	3,500,000	Common Equity Par	10,000
Fixed Assets(FA)	7,900,000	Cumulative Retained Earnings	2,740,000
Total Assets	9,400,000	Total Equity	2,750,000
		Liabilities & Equity	9,400,000

Figure 2: Madison Company Balance Sheets

LIQUIDITY RATIOS

Current Ratio: $\frac{\text{Current Assets}}{\text{Current Liabilities}} = \frac{CA}{CL}$

Acid Test or Quick Ratio: $\frac{\text{Current Assets - Inventories}}{\text{Current Liabilities}} = \frac{CA - INV}{CL}$

Avg. Collection Period (days): $\frac{\text{Avg. Receivables} * 365}{\text{Credit Sales}} = \frac{AR * 365}{CRS}$

Receivables Turnover: $\frac{\text{Annual Credit Sales}}{\text{Avg. Receivables}} = \frac{CRS}{AR}$

Duration of Payables (days): $\frac{\text{Avg. Payables} * 365}{\text{Appropriate Purchases}} = \frac{AP * 365}{RM}$

Inventory Turnover: $\frac{\text{Cost of Goods Sold}}{\text{Avg. Inventory}} = \frac{CGS}{\text{Avg. Inv}}$

Net Working Capital to Total Assets: $\frac{\text{Current Assets - Current Liab.}}{\text{Total Assets}} = \frac{CA - CL}{TA}$

PROFITABILITY RATIOS

Return on Equity: $\frac{\text{Net Income After Tax}}{\text{Equity}} = \frac{NIAT}{E}$

Return on Assets: $\frac{\text{Net Income After Tax + Int.}}{\text{Assets}} = \frac{NIAT+Int.}{A}$

Gross Profit Margin Ratio: $\frac{\text{Sales - Cost of Goods Sold}}{\text{Sales}} = \frac{S - CGS}{S}$

Net Profit Margin Ratio: $\frac{\text{Net Profit After Tax}}{\text{Sales}} = \frac{NIAT}{S}$

LEVERAGE RATIOS

Financial Leverage: $\frac{\text{Debt}}{\text{Debt + Equity}} = \frac{D}{D + E}$

Debt-Equity Ratio: $\frac{\text{Debt}}{\text{Equity}} = \frac{D}{E}$

Times Interest Earned: $\frac{\text{Earnings Before Int. and Taxes}}{\text{Interest Payment}} = \frac{EBIT}{Int.}$

ACTIVITY AND OTHER RATIOS

Sales Turnover: $\frac{\text{Total Sales}}{\text{Total Assets}} = \frac{S}{A}$

Dividend Payout: $\frac{\text{Dividends}}{\text{Net Income After Tax}} = \frac{DIV}{NIAT}$

Figure 3: LIST OF RATIOS

LIQUIDITY RATIOS

Current Ratio: Current Assets / Current Liabilities = CA / CL = 2.31

Acid Test or Quick Ratio: (Current Assets - Inventories) / Current Liabilities = CA - INV / CA = 1.54

Avg. Collection Period (days): Avg. Receivables * 365 / Credit Sales = AR * 365 / CRS = 45.625 days

Receivables Turnover: Annual Credit Sales / Avg. Receivables = CRS / AR = 8 times per year

Duration of Payables (days): Avg. Payables * 365 / Appropriate Purchases = AP * 365 / Not Given = N/A

Inventory Turnover: Cost of Goods Sold / Avg. Inventory = CGS / Avg. Inv = 2.5

Net Working Capital to Total Assets: (Current Assets - Current Liab.) / Total Assets = CA - CL / TA = .0904

PROFITABILITY RATIOS

Return on Equity: Net Income After Tax / Equity = NIAT / E = .269

Return on Assets: (Net Income After Tax + Int.) / Assets = NIAT+Int. / A = .163

Gross Profit Margin Ratio: (Sales - Cost of Goods Sold) / Sales = S - CGS / S = .33

Net Profit Margin Ratio: Net Profit After Tax / Sales = NIAT / S = .094

LEVERAGE RATIOS

Financial Leverage: Debt / (Debt + Equity) = D / (D + E) = .707

Debt-Equity Ratio: Debt / Equity = D / E = 2.418

Times Interest Earned: Earnings Before Int. and Taxes / Interest Payment = EBIT / Int. = 2.11

ACTIVITY AND OTHER RATIOS

Sales Turnover: Total Sales / Total Assets = S / A = .689

Dividend Payout: Dividends / Net Income After Tax = DIV / NIAT = .5

Figure 4: FINANCIAL RATIOS FOR THE MADISON COMPANY
December 31,2004 or for Fiscal Year 2004

F. Ratio Analysis and Risk

The historical risk measures (standard deviation, variance and beta) discussed earlier are useful tools for measuring risk. However, they are rooted in history and often do not track important recent changes in firm borrowing levels and cost structures. Ratio analysis is very useful for gauging operating and financial risk. Corporate earnings variability can be traced to two sources: business risk and financial risk. Business risk is the risk the firm faces by operating or conducting business; its sources are variability or uncertainty of sales and costs as well as operating leverage. Operating leverage is related to the fixed costs relative to variable costs incurred by the firm in the production processes. Financial risk is related to the additional earnings variability a firm faces when it pays interest at a fixed rate on borrowed money.

Business Risk

Business risk is related to the risk of a firm's investment policy. This risk will be reflected in the variability (or uncertainty) of its revenue and cost levels. Note that this risk is entirely independent of the firm's financing policy; however, financing policy can magnify the impact of business risk on earnings variability.

The first source of business risk is variability or uncertainty with respect to sales levels. If a firm's future revenue levels are uncertain, net income after taxes (NIAT) will obviously be more difficult to forecast. A second source of business risk is uncertainty regarding the proportion of sales reflected in the firm's cost of goods sold level. This source of risk will be reflected in the variability of the firm's gross margin levels. The third source of business risk results from operating leverage. One measure of this risk, the degree of operating leverage, is equal to the firm's gross profit margin divided by its earnings before interest and taxes (EBIT):

$$(1) \qquad DOL = \frac{GM}{EBIT} = \frac{GM}{Sales - CGS - FC} = \frac{EBIT + FC}{EBIT}$$

Degree of Operating Leverage (DOL) may be measured on the basis of either past income statement data or expected income statement data. If management is attempting to determine profit variability from expected levels, it should use expected values for determining DOL (see Figures 1 and 2). If the firm wishes to determine potential variability from the previous year's profit level, management should determine DOL based on that year's income statement. The higher the level of the fixed costs faced by the firm, the higher will be its degree of operating leverage. For example, the Monroe Company in Figure 1 operates with no fixed costs; therefore, its DOL is equal to one. The Adams Company in Figure 2 has a DOL level equal to 1.75. Notice that both companies have exactly the same sales prospects in any possible outcome; however, since a greater proportion of the Adams Company costs are fixed, its earnings (NIAT) and return-on-equity are subject to greater variability ($\sigma_{Adams} > \sigma_{Monroe}$). Thus, operating leverage simply magnifies the impact of sales variability on NIAT and ROE variability. For a firm operating without debt, a proportional change in sales will affect a proportional change in NIAT directly related to the firm's degree of operating leverage:

(2) $$\%\,\Delta \text{NIAT} = \text{DOL} \times \%\Delta \text{ Sales}$$

Thus, a proportional change in Monroe Company sales leads to an identical proportional change in NIAT; a proportional change in the Adam Company sales level leads to 1.75 times as great a proportional change in its NIAT. This implies that a firm expecting unusually high sales levels may prefer to maintain a high level of fixed costs relative to variable costs (cost of goods sold); the resulting higher DOL level will cause the high sales level to increase NIAT even more. Conversely, a firm expecting an unusually low sales level may prefer to maintain a lower level of DOL, causing the low sales level to have a smaller unfavorable impact on NIAT. A firm with an uncertain sales level will find that increasing operating leverage will increase further its earnings variability.

Potential Monroe Income Statement Data

Outcome1		**Outcome 2**		**Expected Levels**	
Sales.....	$10,000,000	Sales.....…....$20,000,000		Sales..…….... .$15,000,000	
CGS (60%).....	6,000,000	CGS (60%).....	12,000,000	CGS (60%)….....	9,000,000
Gross Margin	4,000,000	Gross Margin....	8,000,000	Gross Margin..…	6,000,000
FC.....…….....…	0	FC.....	0	FC.....……....	0
EBIT.....….	4,000,000	EBIT.....…....	8,000,000	EBIT.....……....	6,000,000
INT .....……..	0	INT.....	0	INT.....……..	0
EBT .....…..	4,000,000	EBT.....…..	8,000,000	EBT....…...…...	6,000,000
Taxes(30%)…..	1,200,000	Taxes(30%)..….	2,400,000	Taxes(30%) …….	1,800,000
NIAT.....…..	2,800,000	NIAT.....	5,600,000	NIAT.....…..	4,200,000
#Shs: 10,000		#Shs: 10,000		#Shs: 10,000	
EPS: $280		EPS: $560		EPS: $420	

Note: Each outcome is equally likely to occur; that is, $P_1 = P_2 = .5$

Current Monroe Company Balance Sheet

Current Assets:	$10,000,000	Debt:	$0
Fixed Assets:	$18,000,000	Equity:	$28,000,000
Total Assets:	$28,000,000	Capital:	$28,000,000

Various Monroe Company Earnings and Statistical Data

Current Share Value= $28,000,000/10,000=$2800

$NIAT_1$ =$2,800,000; $NIAT_2$ = $5,600,000; E(NIAT) = $4,200,000

ROE_1 = 2,800,000/28,000,000 = .10

ROE_2 = 5,600,000/28,000,000 = .20

E(ROE) = 4,200,000/28,000,000 = .15

$$\sigma_{ROE} = \sqrt{\sum_{i=1}^{n} (ROE_i - E[ROE])^2 \cdot P_1} = \sqrt{[(.10 - .150)^2 \cdot .5] + [(.20 - .15)^2 \cdot .5]} = .05$$

DOL = E(Sales-CGS)/E(EBIT) = (15,000,000-9,000,000)/6,000,000 = 1 = DOL_{Monroe}

$\%\,\Delta \text{NIAT} = \text{DOL} * \%\Delta \text{ Sales}$; eg: 33% increase in NIAT results from a 33% increase Sales when INT=0

Figure 1 : Monroe Company Financial Data, Degree of Operating Leverage equal to one

Potential Adams Company Income Statement Data

Outcome1		**Outcome 2**		**Expected Levels**	
Sales.....	$10,000,000	Sales.....$20,000,000		Sales.….....$15,000,000	
CGS (30%).....	3,000,000	CGS (30%)…...	6,000,000	CGS (30%)…..	4,500,000
Gross Margin	7,000,000	Gross Margin....	14,000,000	Gross Margin..	10,500,000
FC.....….....	4,500,000	FC.....	4,500,000	FC.....…	4,500,000
EBIT.....…..	2,500,000	EBIT..... .	9,500,000	EBIT.....	6,000,000
Taxes(30%)...…..	750,000	Taxes(30%)…...	2,850,000	Taxes(30%)…...	1,800,000
NIAT.....…..	1,750,000	NIAT.....…..	6,650,000	NIAT.....…..	4,200,000
#Shs: 10,000		#Shs: 10,000		#Shs: 10,000	
EPS: $175		EPS: $665		EPS: $420	

Note: Each outcome is equally likely to occur; that is, $P_1 = P_2 = .5$

Current Adams Company Balance Sheet

Current Assets:	$10,000,000	Debt:	$0
Fixed Assets:	$18,000,000	Equity:	$28,000,000
Total Assets:	$28,000,000	Capital:	$28,000,000

Various Adams Company Earnings and Statistical Data

Current Share Value= $28,000,000/10,000=$2800

$NIAT_1$ =$1,750,000; $NIAT_2$ = $6,650,000; E(NIAT) = $4,200,000

ROE_1 = .062; ROE_2 = .238; E(ROE) = 4,200,000/28,000,000 = .15

$\sigma_{ROE} = .088 = \sigma_{ADAMS}$

DOL=(15,000,000-4,500,000)/6,000,000=1.75=DOL_{ADAMS}

$\%\,\Delta NIAT = DOL * \%\Delta \text{ Sales}$; eg: 58% increase in NIAT from its expected level results from a 33% in sales from its expected level when there is no debt

Figure 2: Adams Company Financial Data, Degree of Operating Leverage equal to 1.75

Financial Risk

Financial risk results from the financing policy employed by the firm. The borrowing of money by the firm results in the assumption of fixed interest obligations that must be fulfilled regardless of the profitability of the firm. Thus, interest obligations affect variability of the firm's earnings in the same manner as fixed costs. In fact, as the firm borrows more money, it assumes more fixed interest obligations, subjecting its earnings to increased variability or uncertainty. The relationship between earnings variability and the borrowing of money by the firm can be measured by its Degree of Financial Leverage:

(3) $$DFL = \frac{EBIT}{EBT} = \frac{EBT + INT}{EBT}$$

The proportional change in profits induced by a proportional change in sales (holding fixed costs equal to zero) is directly related to the firm's DFL:

(4) $$\%\,\Delta NIAT = DFL \cdot \%\Delta \text{ Sales}$$

Consider the Van Buren Company whose financial data is portrayed in Figure 3 at the end of the chapter. Its sales and cost levels are identical to those of the Monroe Company in Figure .1. However, the Van Buren Company has financed fifty percent of its assets with debt; it has only half as much equity outstanding. Thus, the only differences between the two firms are their capital structures and resulting income statement effects arising from interest payments made by the Van Buren Company. Assumption of these interest payments by the Van Buren Company subjects its earnings to significantly greater variability:

$$(\sigma_{\text{VanBuren}} = .10) > (\sigma_{\text{Monroe}} = .05)$$

Thus, borrowing money increases a firm's earnings to an even higher level when sales levels are projected to be high; firm borrowing subjects earnings to even lower levels when sales are projected to be low.

The impact of debt on earnings variability can be demonstrated graphically. Consider Figure 4 where firm potential EPS levels are plotted against potential EBIT levels. The equation representing this relationship is:

$$EPS = \frac{(EBIT - INT)(1-\tau)}{\#shs.} = -\frac{INT(1-\tau)}{\#shs.} + \frac{(1-\tau)}{\#shs.} EBIT \tag{5}$$

When the firm is 100% equity financed (no debt), potential EPS levels range from zero to infinity given potential EBIT levels ranging from zero to infinity. As EBIT increases from zero, its EPS level increases at a rate equal to the slope of Equation 5:

$$(1-\tau)/\#\text{shs.}$$

However, if the firm has borrowed money, its potential EPS ranges from $\{-[\text{INT} \cdot (1-\tau)] \div \#\text{shs}\}$ to infinity, given that EBIT ranges from zero to infinity. We want the firm's asset and sales levels to remain unchanged so we can examine only the effects of a new capital structure. To maintain this constant asset level, an increase in the debt level must be accompanied by an equal decrease in the equity level. By maintaining offsetting debt and equity changes, we are able to examine the effects of manipulating the firm's capital structure alone. Since the firm has replaced equity with debt, the number of shares of company stock outstanding will decrease. This causes the slope of Equation (5) to increase from $\{(1-\tau) \div \#\text{shs}_0\}$ to $\{(1-\tau) \div \#\text{shs}_1\}$. (Notice that $\#\text{shs}_0 > \#\text{shs}_1$.) The slope increase induces greater EPS variability given EBIT variability. For example, if next year's EBIT were not known with certainty, perhaps its potential range could be determined. In Figure 4, management has determined that its EBIT will not be lower than $EBIT_1$ nor higher than $EBIT_2$. Given this range of EBIT, the firm's EPS levels will range from EPS_2 and EPS_3 if it is entirely equity financed. However, if the firm has borrowed money, its EPS levels, given the same range for EBIT will range from EPS_1 to EPS_4. This range of potential EPS levels for a firm with some debt financing is greater than the EPS range of a firm that is entirely equity financed. Thus, given sales or EBIT uncertainty,

debt financing will magnify the impact of this uncertainty on potential EPS variability. Therefore, shareholder risk increases as the level of firm borrowing increases.

Potential Van Buren Company Income Statement Data

Outcome1		**Outcome 2**		**Expected Levels**	
Sales	$10,000,000	Sales	$20,000,000	Sales	$15,000,000
CGS (60%)	6,000,000	CGS (60%)	12,000,000	CGS (60%)	9,000,000
Gross Margin	4,000,000	Gross Margin	8,000,000	Gross Margin	6,000,000
FC	0	FC	0	FC	0
EBIT	4,000,000	EBIT	8,000,000	EBIT	6,000,000
INT	3,000,000	INT	3,000,000	INT	3,000,000
EBT	1,000,000	EBT	5,000,000	EBT	3,000,000
Taxes(30%)	300,000	Taxes(30%)	1,500,000	Taxes(30%)	900,000
NIAT	700,000	NIAT	3,500,000	NIAT	2,100,000
#Shs: 5,000		#Shs: 5,000		#Shs: 5,000	
EPS: $140		EPS: $700		EPS: $420	

Note: Each outcome is equally likely to occur; that is, $P_1 = P_2 = .5$

Current Van Buren Company Balance Sheet

Current Assets:	$10,000,000	Debt:	$14,000,000
Fixed Assets:	$18,000,000	Equity:	$14,000,000
Total Assets:	$28,000,000	Capital:	$28,000,000

Interest rate on all debt is 21.429%

Various Van Buren Company Earnings and Statistical Data

Current Share Value= $28,000,000/10,000=$2800

$NIAT_1$ =$700,000; $NIAT_2$ = $3,500,000; E(NIAT) = $2,100,000

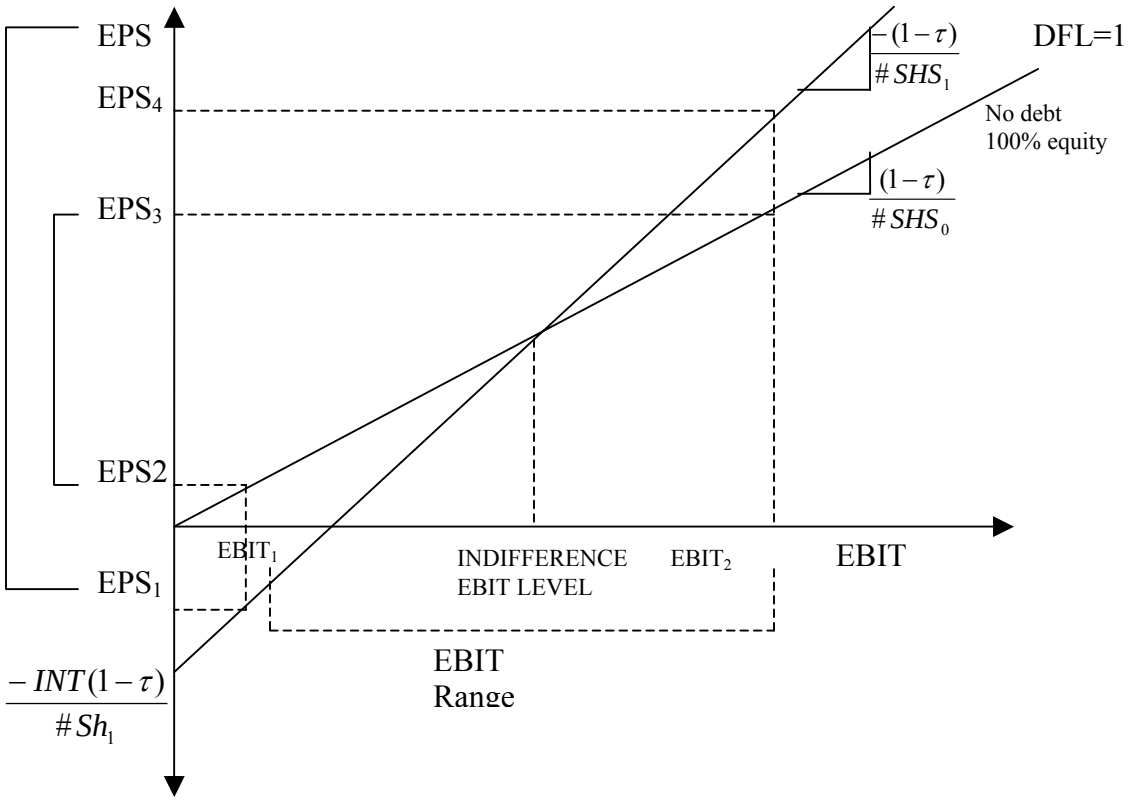
ROE_1 = .05; ROE_2 = .25; E(ROE) = .15

$\sigma_{ROE} = .10 = \sigma_{VanBuren}$

DFL=E(EBIT)/E(EBT)=$6,000,000/$3,000,000=2=DFL Van Buren

$\%\Delta NIAT = DFL * \%\Delta Sales$; eg: 67% increase in NIAT from its expected level results in a 33% increase in Sales from its expected level when there are no fixed costs.

Figure 3 : Van Buren Company Financial Data, Degree of Financial Leverage equal to 2



Notice that the range of EPS is wider with some debt financing given a range of EBIT than with 100% equity financing. Thus, debt financing results in increased risk to share holders.

Figure 4: The relationship between EPS variability and the Degree of Financial Leverage

Potential Tyler Company Income Statement Data

Outcome1		Outcome 2		Expected Levels	
Sales	$10,000,000	Sales	$20,000,000	Sales	$15,000,000
CGS (30%)	3,000,000	CGS (30%)	6,000,000	CGS (30%)	4,500,000
Gross Margin	7,000,000	Gross Margin	14,000,000	Gross Margin	10,500,000
Fixed Cost	4,500,000	Fixed Cost	4,500,000	Fixed Cost	4,500,000
EBIT	2,500,000	EBIT	9,500,000	EBIT	6,000,000
INT	3,000,000	INT	3,000,000	INT	3,000,000
EBT	(500,000)	EBT	6,500,000	EBT	3,000,000
Taxes(30%)	(150,000)	Taxes(30%)	1,950,000	Taxes(30%)	900,000
NIAT	(350,000)	NIAT	4,550,000	NIAT	2,100,000
#Shs: 5000		#Shs: 5,000		#Shs: 5,000	
EPS: -$70		EPS: $910		EPS: $420	

Note: Each outcome is equally likely to occur; that is, $P_1 = P_2 = .5$

Current Tyler Company Balance Sheet

Current Assets:	$10,000,000	Debt:	$14,000,000
Fixed Assets:	$18,000,000	Equity:	$14,000,000
Total Assets:	$28,000,000	Capital:	$28,000,000

Interest rate on all debt is 21.429%

Various Tyler Company Earnings and Statistical Data

Current Share Value= $14,000,000/5,000=$2800

$NIAT_1$ = -$350,000; $NIAT_2$ = $4,550,000; E(NIAT) = $2,100,000

ROE_1 = -.025; ROE_2 = .325; E(ROE) = .15

$\sigma_{ROE} = .175 = \sigma_{Tyler}$

FPL=DOL*DFL=[(15,000,000-4,500,000)/6,000,000]* [$6,000,000/$3,000,000]=3.5

$\%\Delta NIAT = FPL \times \%\Delta Sales$; eg: 33% increase in Sales from its expected level leads to a 116% increase in NIAT from its expected level.

Figure 5: Tyler Company Financial Data, Fixed Payments Leverage equal to 3.5

G. Misreading and Misleading Financial Statements

In an ideal world, financial statements would be intended to give clear and accurate portrayals of economic value and information needed to make economic decisions. Unfortunately, it is not possible to follow through on this ideal, and financial statements are, in reality, subject to a myriad of complicated accounting rules and regulations, differences in interpretation and application, subject to omissions and, in the worst cases, deception. An equities analyst would certainly benefit from training in accounting, at a minimum, introductory and intermediate accounting along with financial statement analysis. There are a number of excellent books that deal with the subject, including those that are used to prepare candidates for the CFA certification.

Most analysts are aware that they must view income statements and earnings reports with at least some skepticism. For example, consider some of the abuses that occur with revenue recognition. To realize sales projections or revenue increases, a company may slash prices, relax credit standards and cut deals at the end of the quarter to off-load products to dealers when there is no underlying retail demand. These deliveries of goods still count as sales. Sometimes firms will ship their products on or close to Dec. 31 in order to record the sale for the year just ending. However, the company receiving the shipment after the new-year may record the purchase expense for the new-year. For example, under the leadership of "Chainsaw" Al Dunlap, appliance maker Sunbeam Corp. was forced to restate financial results for 1996 and 1997 after the firm was accused of using this type of phony accounting to boost profits. The company later filed for bankruptcy. At the root of this fraud was Sunbeam's having made side agreements with customers to accept product deliveries prematurely, where products were shipped to warehouses with rights to refuse the shipment. IBM (with its 2001 $340 million sale of optical transceiver business to JDS Uniphase on the final day of the quarter) and Xerox were among the many companies to have been accused of such practices.

The analyst should take care to examine sudden changes in sales levels, performing comparisons with peer firms and with prior years' data. Common size accounting statements (where sales are standardized at 100 and other income statement items are expressed as fractions of 100) are often helpful for such comparisons. Checks for relaxation in credit standards (e.g., significant growth in Accounts Receivable relative to sales) should be performed when suspicion arises.

Similar sorts of games have been played with operating expenses. The GAAP guideline known as the matching principle requires companies to match expenses with corresponding reported revenues. Companies have ignored this requirement, deferring current expenses or by capitalizing normal operating expenses as assets. This technique can temporarily boost current earnings. Enron, WorldCom and AOL (both by capitalizing expenses) and Cendant (whose $100 million restatement cost shareholders $15 billion in a single day) are among the firms that have been accused of these abuses.

Relatively recent bankruptcies related to accounting fraud include Enron, McKesson HBOC, ConAgra, Sybase, S3, Fine Host, Versatility, Physicians' Computer,

Medaphis, Parmalat, Centennial Technology, WorldCom, Norland Medical, Premier Laser, Altris Software, Micro Warehouse, Transcrypt, Sunbeam, Paracelsus, DonnKenny, RasterGraphics, Covad and TriTeal. However, much of the difficulty in interpreting financial statements is not related to fraud; it is simply difficult to use accounting statements to accurately reflect economic values. But, there may not be any better alternatives.

Balance sheets can also be affected by deception and questions of interpretation. Contingent liabilities are always a source of difficulty, especially when potential payoffs and their probabilities simply cannot be known. Footnotes should be carefully scrutinized. Special purpose entities, subsidiaries, pyramid structures and cross ownership should always be carefully examined.

Example: Cross-ownership and Share Value Inflation

Cross ownership exists when firms own shares of each others' stock. Firms often purchase shares for investment purposes and may own each other's shares to forge strategic alliances ad for other purposes. Cross ownership of shares is a very common phenomenon in many parts of the world such as in Japan with the keiretsu, Korea with the chaebol and in Europe with privately held companies. It has also been used to create deceptions of several types. For example, Enron Corporation created a number of "special purpose entities" that it used to place the parent firm's debt and equity securities. Such placements contributed to the fall of Enron. Parmalat, in a case that we will discuss later, used off shore subsidiaries to hide non-performing assets and certain liabilities. In the late 1990s (and even today), many companies in the telecommunications and cable industries hold shares of each other's stock. Such cross holdings inflated the book values of equity of these firms since the equity held by each company increased the book value of the equity held by other companies that hold its shares. This will be illustrated below. Pyramid schemes employing cross-ownership have long been used to create the perception of wealth that simply does not exist.

This example demonstrates the impact of cross-ownership of shares between companies and its apparent impact on share values. Each of the two firms will hold $5,000 in plant and equipment plus shares of stock in the other company. Consider a scenario where two firms, A and B own 90% of the shares of each other's stock. Balance sheets (partially completed) for each of the two companies, A and B, are given below:

Firm A

	Assets		Capital
Plant and Equip.	5,000		
90% of B stock	_____	Equity	_____
Totals			

Firm B

	Assets	Capital
Plant and Equip.	5,000	
90% of A Stock	_____	Equity_____
Totals		

The value of Company A equals $5,000 plus 90% of the value of Company B. To determine the value of Company A, we need to determine the value of Company B equity. This, in turn requires that we determine the value of Company A equity. Thus, we can value A and B as follows:

$$V_A = 5{,}000 + .9(5{,}000 + .9V_A)$$
$$V_B = 5{,}000 + .9(5{,}000 + .9V_B)$$

The solutions for V_A and V_B are \$50,000; that is, each firm is worth \$50,000, that is, \$100,000 total, even though the value of their productive assets totals only \$10,000. Cross-holdings have inflated each of the two companies' asset and equity levels by \$45,000. Another way to look at this balance sheet inflation caused by cross-holdings is to note that the value of Firm A equals \$5,000 plus 90% of the value of Firm B, which has \$5,000 in plant and equipment plus 90% of the stock in Firm A:

$$V_A = 5{,}000 + .9(5{,}000 + .9(5{,}000 + V_A))$$

which, since Firm A value equals \$5000 plus 90% of the value of Firm B:

$$V_A = 5{,}000 + .9(5{,}000 + .9(5{,}000 + (5{,}000 + V_B)))$$

or, more generally,

$$V_A = 5{,}000 \times (.9^0 + .9^1 + .9^2 + \ldots + .9^{\infty})$$

We can simplify this expression with a geometric expansion to obtain:[2]

$$V_A = 5{,}000/.1 = 50{,}000$$

Regardless, cross ownership has inflated the value of each company from \$5,000 to \$5,000/(1-.9) = \$45,000. Cross ownership, in and of itself, is not necessarily fraudulent or abusive, but it is a practice that analysts need to be aware of when examining accounting statements.

[2] Multiply both sides by $.9V_A$ to obtain $.9V_A = 5{,}000 \times (.9^1 + .9^2 + \ldots + .9^{\infty+1})$ and then subtract this equation from V_A to obtain $V_A - .9V_A = 5{,}000 \times (.9^0 - .9^{\infty+1})$. Simplify further to obtain $V_A(1-.9) = 5{,}000(1)$, which leads to $V_A = 5{,}000/.1 = 50{,}000$.

I. Comparables-Based Valuation

While we have spent much time on growth models and forecasting dividends, earnings and free cash flows, market-based ratios from comparable firms are used more frequently by equity analysts to derive firm values. The results of such comparisons seem less sensitive to estimation errors and require less forecasting ability. Using the Relative Valuation (Comparables) Approaches involves comparing the target firm to a group of other firms with similar operating circumstances. In some instances, there will be obvious firms to serve as comparisons. Many analysts rely on *Standard Industrial Classification* (SIC) or *North American Industry Classification System* (NAICS) codes to identify a target firm's peer group. Several institutions such as Dun and Bradstreet provide data useful for comparisons of ratios. For example, Dun and Bradstreet provides "average" ratio levels for firms in a number of different industries.

For valuation purposes, various market ratios will be most useful. For example, the P/E ratio (which is the same as market value of equity divided by net income after taxes) will price the target firm as a function of its net earnings. One might expect that firms with similar operating circumstances would have relatively comparable P/E ratios, implying that the market might be expected to value each dollar of earnings fairly consistently. Suppose that the Polk Company, the target of a bid might be regarded as being comparable to the Taylor, Fillmore and Pierce Companies:

Firm	P/E (Market to Net Income	Market to Book	Market to Sales
Taylor	25	0.9	0.8
Fillmore	28	1.1	0.7
Pierce	30	1.2	0.9
Average	27.67	1.067	0.8

The three most commonly used ratios are the P/E, Market to Book and Market to Sales ratios. The numerator of each the three ratios in the table, Market, is interpreted to be the market value of equity for the firm. Each of the denominators of the ratios may be taken from accounting statements of the three firms. Similarly, the Polk Company will generate accounting statement values from which the three ratios might be implied. The averages reported on the bottom line of the table might be taken as ratio values from which the market value of equity for the Polk Company might be computed. Suppose that relevant accounting statement data for the Polk Company is given in the following table:

Data	P/E (Market to Net Income	Market to Book	Market to Sales	
Average	27.67	1.067	0.8	
Accounting Statement Entry for Polk	NIAT: $450,000	Book Value of Equity: $10,000,000	Total Sales: $11,000,000	
Implied Market Value	12,451,500	10,067,000	8,800,000	**Average: 10,439,500**

With data from each of the three peer firms weighted identically, and values taken from Polk Company accounting statements, we find that potential values of the Polk Company are $12,451,500, $10,067,000 and $8,800,000. If we were to weight these values equally, we would value the Polk Company at $10,439,500. A share price for Polk can be obtained by dividing $10,439,500 by the number of outstanding shares.

Performance: DCF versus Comparables

We have discussed DCF and Comparables analysis in this chapter. Which works better? First, it is clear that most analysts make more extensive use of price multiples than DCF. However, as we will discuss later, in their study of 51 highly leveraged transactions, Kaplan and Ruback [1995] found that DCF analysis provided better estimates of value than price-based multiples, though the price-based multiples did add useful information to the valuation process. Some analysts have noted that the comparables approach does not provide a proper accounting for risk differences among companies and does not allow for differences in growth and super-growth opportunities. Such market-based comparisons may be vulnerable to short-term price fluctuations or temporary accounting statement changes.

Other research (e.g., Lie and Lie [2002]) has suggested that price multiples may be more useful for IPOs and other valuations where future cash flows are particularly difficult to estimate. However, highly comparable companies must still be made available for comparison. In addition, negative earnings, as is so common for IPO companies and their peers, can create bias or render the more simple comparisons meaningless.

References

Kaplan, Steven N. and Richard S. Ruback (1995). "The Valuation of Cash Flow Forecasts: An Empirical Analysis," *Journal of Finance* 50, no. 4 (September), pp. 1059-1093.

Lie, Eric and Heidi Lie (2002): "Multiples Used to Estimate Corporate Value," *Financial Analysts Journal* March/April pp. 1-11.

Weston, J. Fred, Kwang S. Chung and Susan E. Hoag (1990): *Mergers, Restructuring and Corporate Control*, Englewood Cliffs, New Jersey: Prentice-Hall.

Exercises

1. Suppose an investor has the opportunity to invest in a stock currently selling for $100 per share. The stock is expected to pay a $1.80 dividend next year (at the end of year 1). In each subsequent year forever, the annual dividend is expected to grow at a rate of 4 percent. All cash flows are to be discounted at an annual rate of 6 percent. Should the stock be purchased at its current price?

2. An investor believes that the dividend associated with Company X will be $15 per share next year and will grow at a compound annual rate of 20 percent for each of the following five years. For the five years following this period, he believes that dividends will grow at an annual rate of 5 percent, and then remain constant forever. He discounts cash flows at 8 percent. What should this investor be willing to pay for the stock based on his analysis?

3. Suppose an investor has the opportunity to invest in a stock currently selling for $100 per share. The stock is expected to pay a $3 dividend next year (at the end of year 1). In each subsequent year until the seventh year, the annual dividend is expected to grow at a rate of 20 percent. Starting in the eighth year, the annual dividend will grow at an annual rate of 3 percent forever. All cash flows are to be discounted at an annual rate of 10 percent. Should the stock be purchased at its current price?

4. The following are accounting statements for the Hudson Company:

Income Statement,1980

Sales...$500,000
Costs....300,000
EBIT.....200,000
INT.....100,000
EBT.....100,000
Taxes.... 20,000
NIAT..... 80,000

Balance Sheet, Dec.31,1980

ASSETS		CAPITAL	
		Debt.....	$800,000
		Equity.....	400,000
Total Assets..	$1,200,000	Total Capital....	1,200,000

Compute the following for the Hudson Company:
a. before-tax cost of debt
b. after-tax cost of debt
c. cost of equity
d. overall cost of capital

5. Using a graph depicting the relationship between EBIT and EPS, demonstrate how increased debt financing results in increases in shareholder's earnings variability.

6. The following are accounting statements for the Lee Company:

Income Statement,2004 Balance Sheet, Dec.31,2004

Sales……...$900,000	ASSETS	CAPITAL
CGS(56%)….500,000		
GM…….....400,000	Total	Debt..... $0
FC……...0	Assets..$800,000	Equity....800,000
EBIT……....400,000		Total
INT…….. 0		Capital...800,000
EBT…….....400,000		
Taxes……...200,000		
NIAT……...200,000		
#shs..... 800		
EPS..... 250		

The following are accounting statements for the Sherman Company:

Income Statement,2004 Balance Sheet, Dec.31,2004

Sales……..$900,000	ASSETS	CAPITAL
CGS(22%)..200,000		
GM…….....700,000	Total	Debt.....$400,000
FC…….....300,000	Assets..$800,000	Equity.....400,000
EBIT……..400,000		Total
INT..……..... 50,000		Capital..800,000
EBT……....350,000		
Taxes……..175,000		
NIAT…….....175,000		
#shs..... 400		
EPS..... 437.50		

For the questions that follow, assume that book values equal market values.

a. Compute the Degree of Operating Leverage for each of the two companies.
b. Compute the Degree of Financial Leverage for each of the two companies.
c. Compute the levels of Fixed Payments Leverage for both companies.
d. If 2005 sales levels were to increase to $1,200,000 for each of the two companies, what would be each of their NIAT levels? What would be each company's EPS level? (Assume Fixed Costs and Interest Payments remain constant.)
e. If 2005 sales levels were to decrease to $600,000 for each of the companies, what would be each of their NIAT levels? What would be each company's EPS level? (Assume Fixed Costs and Interest Payments remain constant.)
f. What will be each company's potential EPS variance in 2005? What will be the standard deviation associated with EPS over this period? Assume that each potential sales outcome is equally likely.
g. Which of the companies' stock is riskier?

7. Would a company making exactly the same dividend payment each year regardless of earnings show steadier earnings growth than a company paying dividends as a constant proportion of earnings?

8. Are highly leveraged companies more likely to go bankrupt than companies that are primarily equity-financed given that all companies' sales levels are subject to significant variability?

9. Companies operating in highly unstable environments resulting in significant revenue uncertainty are more capable of sustaining high levels of debt than are firms operating in stable environments. Is this statement true? Why or why not?

Solutions To Exercises

1. The following Single Stage Growth Model can be used to evaluate this stock:

$$P_0 = \frac{DIV_1}{(k-g)}$$

$$P_0 = \frac{\$1.80}{(.06-.04)}$$

Since the $100 purchase price of the stock is less than its $90 value, the stock should not be purchased.

2. Use the following Three-Stage Growth Model:

$$P_0 = \$15\left(\frac{1}{.08-.20} - \frac{(1+.20)^5}{(.08-.20)(1+.08)^5}\right) + \$15\left(\frac{(1+.20)^{5-1}(1+.05)}{(1+.08)^5(.08-.05)} - \frac{(1+.20)^{5-1}(1+.05)^{5+1}}{(.08-.05)(1+.08)^{5+5}}\right)$$

$$+\frac{\$15(1+.20)^{5-1}(1+.05)^5(1+0)}{(.08-0)(1+.08)^{5+5}} = 15[5.77924+6.48959+15.323] = 413.877$$

3. The following Two-Stage Growth Model can be used to evaluate this stock:

$$P_0 = DIV_1\left(\frac{1}{k-g_1} - \frac{(1+g_1)^n}{(k-g_1)(1+k)^n}\right) + \frac{DIV_1(1+g_1)^{n-1}(1+g_2)}{(k-g_2)(1+k)^n}$$

$$P_0 = \$3\left(\frac{1}{.1-.2} - \frac{(1+.2)^7}{(.1-.2)(1+.1)^7}\right) + \frac{\$3(1+.2)^7(1+.03)}{(.1-.03)(1+.1)^7} = 92.8014519$$

Since the $100 purchase price of the stock exceeds its $92.8014519 value, the stock should not be purchased.

4. a. $k_D = \frac{INT}{D} = \frac{100,000}{800,000} = .125$

b. $k_D = k_D(1\text{-}T) = .125(1\text{-}.2) = .1$

c. $k_E = \frac{NIAT}{E} = \frac{80,000}{400,000} = .2$

d. $k_A = w_e k_e + w_D k_D = .15 = (.33 \times .2) + (.67 \times .125)$

5. On Figure 4, given a range of potential EBIT levels, $EBIT_1$ to $EBIT_2$, the range of potential EPS levels with 100% equity financing is narrower (EPS_2 to EPS_3) then is the range for only 50% equity financing.

6. a. $DOL_L=1=GM_L/EBIT_L$ $DOL_S=GM_S/EBIT_S=700,000/400,000=1.75$
b. $DFL_L=1=EBIT_L/EBT_L$ $DFL_S=EBIT_S/EBT_S=400,000/350,000=1.1429$
c. $FPL_L=1=GM_L/EBT_L$ $FPL_S=GM_S/EBT_S=700,000/350,000=2$
d.

$$\Delta NIAT_L = (\%\Delta Sales \cdot FPL) \cdot NIAT_{00} = (.333 \cdot 1) \cdot 200{,}000 = 66{,}667; NIAT_{01} = 266{,}667$$

$$EPS_{L01} = \frac{NIAT_{L01}}{\#Shs} = \frac{266{,}667}{800} = 333.33$$

$$\Delta NIAT_S = (.333 \cdot 2) \cdot 175{,}000 = 116{,}667; NIAT_{S01} = \frac{291{,}667}{400} = 729.17$$

e.

$$\Delta NIAT_L = (-.333 \cdot 1) \cdot 200{,}000 = -66{,}667; NIAT_{L01} = 133{,}333$$

$$EPS_{L01} = 166.67$$

$$\Delta NIAT_S = (-.333 \cdot 2) \cdot 175{,}000 = -116{,}667; NIAT_{S01} = 58{,}333.33, EPS_{S01} = 145.83$$

f.

$$\sigma_L^2 = 6{,}943.89; \sigma_L = 83.33; \sigma_s^2 = 85{,}071.39; \sigma_s = 291.67$$

g. Sherman Company: its variance of returns is higher

7. No : Its Retained Earnings will be more variable. Fixed dividends are analogous to other fixed payments.

8. Yes : NIAT, Retained Earnings and Equity Value will all be more volatile. If Equity Value reaches zero, the firm will fail.

9. Not true: Highly levered firms are more likely to go bankrupt in bad years.