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**BUSINESS VALUATION MODELS**

This paper deals with the basic theory underlying valuation models. It begins by discussing such concepts as free cash flow, cost of capital, and expected growth rates, as they are basic to an understanding of valuation theory.

The ultimate goal of a corporate manager is to maximize the wealth of shareholders. Shareholders wealth is the value of the firm 's collective assets. To maximize the shareholders wealth, in general, is equivalent to maximizing the value of the firm. Therefore, it is imperative that the corporate officers know how to determine the value of the firm.

Determining the value of a company is a difficult task, since there are various definitions of "value", depending on the needs and usage of different users.

"Value" can be considered from two different perspectives. The first is market value, which reflects what investors are willing to pay for a firm, which can be determined simply by multiplying the price per share by the number of shares outstanding. Financial economists often argue that the stock market is efficient, and therefore, the market value of the firm should be the price the firm would bring if sold in the market today.

Although the stock market as a whole is considered to be efficient, many financial analysts feel that individual stocks and firms are seldom fairly valued. Therefore, a second method, which is based on the present value of expected cash flows, or what we call intrinsic financial value, has been suggested.

Under efficient market hypothesis, we expect the market value to reflect the intrinsic financial value. However, in recent years, valuation of most firms in mergers and acquisitions, have resulted in errors, and undervaluation of the companies. As a result, these two values have not been the same, and the focus of this paper will be on the techniques of determining the intrinsic financial value.

**THE BASICS OF INTRINSIC FINANCIAL VALUE**:

In finance, the intrinsic value of a firm is the present value of a firm's expected free cash flows over a very long period- in theory, to infinity. Since this is obviously impossible, there is a need to develop modifications (or simplifications) of this model, in order to implement it for practical purposes of valuation.

This paper will discuss three simplifications of the free cash flow method of valuations that are, in fact, suitable for practical application. This simplification is based on the growth patterns of the companies. In general, companies' growth patterns, which can be identified from their industrial life cycle, may be classified as: (1) supernormal or generally non-constant growth, (2) normal or constant growth, and (3) zero growth.

The industrial life cycle is a representation of an industry's life as it goes through four stages of growth, shown in Appendix A, Figure 1. The initial pioneering stage or supernormal growth stage, the super-decline, maturity or normal growth stage, and the last stage is a decline phase, where usually the companies face extinction.

From Figure 1, it is possible to determine the period of superior growth by ascertaining where the company of interest stands with respect to the cycle. However, a word of caution in respect to the life cycle theory: it provides only a framework, and has some deficiencies. Firstly, the theory is a highly idealized, and more or less a subjective point of view, of how companies or industries grow and mature. Secondly, there is no guarantee that a specific industry or a group of companies will systematically pass through these life cycles. Finally, there is nothing inherent in theory, that provides a way of identifying in advance when a company or an industry will pass from one stage to another.

However, it can be stated that the normal growth companies can be characterized as those expected to grow at rates in line with the economy, while supernormal growth companies are characterized as those that grow at superior rates.

The distinction factors between the models are as follows. First, we expect super growth companies to have high retention rates and high profitability rates, as measured by rate of return on investment or some combination of the two. Second, we expect normal growth companies to have low retention rates of profit and/or relatively lower profitability rates. Correspondingly, we expect companies sustaining high growth rates to pay zero or relatively lower dividends, and normal growth companies to pay higher dividends.

**VALUATION MODELS**

In theory, there are several valuation models. These models are Discounted Cash Flow, Market/Book Value, and P/E ratio, which could be used to estimate the value of a firm.

The most commonly used approach to valuing a firm is the expected free cash flow (FCF) method of valuation. The principles of valuation of a company requires the following. First, the expected free cash flows to all classes of the capital providers be calculated according to the economic setting of the company, its industry, and the economy as a whole, which determines the size and duration of the expected free cash flows. The second principle requires that the discount rate be consistent with the risk of the expected free cash flows. The consistency between the valuation models, discount rates, and appropriate expected free cash flows is shown in Figure 2.

**VALUATION TECHNIQUES FOR A FIRM**

# Discounted Cash Flow

**I. Weighted Average Cost of Capital (WACC) Approach:**

The Weighted Average Cost of Capital estimates a company’s value by discounting its **unlevered** **free cash flows** using a **constant** weighted average cost of capital. This method requires the calculation of four variables shown in equation (1):

**1**) Unlevered free cash flows (UFCF)

**2**) Unlevered terminal free cash flow (UTFCF)

**3**) Expected future growth rate (g)

**4**) Weighted Average Cost of Capital, RWACC )



Equation 1 can also be stated as:





and the cost of capital is equal to: 

**1. Unlevered Free Cash Flows (UFCF):**

The unlevered free cash flow which is defined as net operating profit after tax (NOPAT) plus various adjustments and addbacks such as depreciation, deferred taxes, as well as certain necessary expenditure, (net working capital-NWC or capital expenditure-CE deducted,) as a more dependable measure of the firm's valuation than profits or earnings after tax. Changes in profits or earnings can occur without any corresponding changes in cash flows. Michael Jensen( 1988) defines the concept of the free cash flow as, "cash flow in excess of that required to fund all projects that have positive net present values when discounted at the relevant cost of capital". The basic measurement of unlevered free cash flow (UFCF) is as follows:

EBIT

Less: Cash Taxes on EBIT

Plus: Depreciation and Amortization

**Operating Cash Flow** **(OCF)**

Less: Increase in Net Working Capital (a)

Less: Increase in Capital Expenditures (a)

Less: Increase in other operating Assets (b)

reduced by increase in other non-interest bearing liabilities

**Unlevered Free Cash Flow (UFCF)**

The UFCF reflects the firm’s true operating cash flow after all required investments. The UFCF is not affected by the company’s capital structure. The capital structure will affect the discount rate, hence value.

(a) Increase in net working capital and capital expenditure: Investment in net working capital is often estimated by finding the relationship of net working capital to sales. Increase in working capital equals net working capital at the end of the year less net working capital at the beginning of the year. Generally, **capital expenditure** could be the summation of capital expenditure required, net of replacement of exiting capacity. The formula for these two items is:

**Capital Investments = CE +  NWC**

where CE is capital expenditure in fixed assets.

With identified components of free cash flows, we can express the Unlevered free cash flow as follows1:

**UFCF = OCF - (CE +  NWC)**

**(b)** Increase in other operating assets reduced by increase in other non-interest bearing liabilities sweeps up any other assets or non-interest bearing liabilities that are related to the operations of the business. These would exclude any current assets or adjustment or special investments 2.

**2. Terminal Free Cash Flows:**

Unless there are specific plans or reasons for terminating the business in the near-term, the assumption of "on-going concern" will require estimating the value of the unlevered free cash flows for an indefinite period. In practice, one makes a detailed projection of free cash flow for a period of years, usually 5-10 years, and then estimates the present value of the free cash flow beyond that period by calculating the terminal free cash flow. The calculation of the UFCF and UTFCF, in general, depends on the assumption of the expected future growth rate.

The valuation of the business is usually sensitive to the estimate of the terminal free cash flows (TFCF). There are several approaches for arriving at that value.

1) Book Value: A simple approach for estimating terminal value would be the summation of the net fixed asset and net working capital at the end of terminal year, T.

2) Market Value to Book Value Ratio: This method requires calculation of the market value/book value ratio (MV/BV), which is multiplied by the “end of the period cash flow” (FCFT):

TFCF= (MV/BV)(FCFT)

3) Discounted Terminal Free Cash Flows: This method assumes that the projected cash flow continues beyond the forecast period (T) forever. Equation 2 shows the estimation of the terminal free cash flow beyond the forecast period, as long as the growth rate is less than the discount rate.

Assuming that free cash flow is increasing at a constant growth rate (gT) after T period, and so long as the growth rate is less than the cost of capital, the terminal free cash flow is estimated by equation (2).

**FORECASTING CASH FLOW**

The projection of Free Cash Flows begins with a projection of sales. This projection should take into consideration:

1. An assessment of the company’s recent historical finance performance.
2. An adjustment of historical financial performance for non-recurring and non-operating income and expense items.
3. Certain assumptions regarding the company’s prospects for the future.

In case of a take over, the forecast of future cash flows should reflect the expected results of the target company assuming that it is managed by the acquirer. Therefore, we must take into account:

1. Expected overhead reductions
2. Severance payments
3. Shut downs costs
4. Economies of scale or synergies
5. Changes in business strategy (different pricing policy, different level of service, and marketing strategy)
6. Net proceeds from divestitures

It would be important to note that a great deal of guesswork would be involved in estimating expected FCF for the above mentioned methods. Many factors might enter the estimation of the cash flows, non-the-less; the FCF model represents a fairly accurate position of the company's future financial prospects.

Techniques used to forecast free cash flows and terminal free cash flow vary widely in degree of sophistication. The simplest method is to look at the historical rate of growth and extrapolate this growth into the future. For example, if sales have been growing at a certain rate in recent years, then the future sales figure could be projected by that rate. If we assume that the various items of the balance sheet and income statement, such as direct costs, general and administrative costs will continue to maintain their historical relationship to sales, then based on pro forma financial statements, free cash flows can be projected annually.

It is important that we understand clearly what is meant by the term growth rate when used in the context of valuing a company. To value a company, we need to know how the FCF and TFCF are going to be estimated.

In general, the growth of free cash flows and terminal free cash flow are based on the profitability of the business operation and expected growth of the free cash flows. A company's free cash flows can grow in a variety of ways. It can grow by borrowing money, issuing common stocks, retention of expected profits or merging with another company. In all of these cases the firm's free cash flows is growing and this "growth" potential has important implication in valuing the company. Since growth expectations are unobservable, one needs to resort to proxies to assess the sort of growth, that an analyst expects a company or a group of companies to have. There are several growth models that will be discussed in subsequent sections3.

**Conclusion:** The technique of using a constant weighted average cost of capital for valuation is widely applied in practice. The usual capital budgeting approach requires that prospective investments offer a return in excess of some “hurdle rate”.

What is often overlooked is that the WACC will be constant **only** if the firm maintains a constant debt to capital ( or debt/equity) ratio in market value terms, and the risk of the investments remains constant. There are a number of situations in which a firm does not intend to maintain a fixed debt-to-value structure. In these cases, the WACC changes over time. Each year’s cash flow could have a different WACC! For example, in a levered buyout, a firm’s owners begin with a heavy debt load, but are expected to pay off outstanding principal according to a specific timetable, and often very rapidly. The firm’s debt/equity ratio declines each year. Under these circumstances, **Adjusted Present Value** is the most practical method to value cash flows.

**II. ADJUSTED PRESENT VALUE**:

This is another technique of valuing a company. The APV and WACC use the same form of cash flows. With this method the value of the company is simply the summation of the present value of expected unlevered free cash flows to equity holders, and the present value of the tax benefit due to the amount of debt in the capital structure of the company. The value of the company using Adjusted Present Value (APV) can be expressed as4:

APV = Present value of all- + Present value of the side effects

equity finance Investment associated with the financing.



where UFCF is the unlevered free cash flows to the equity holders and rsu is the unlevered cost of equity

Adjusted present value is very flexible and accommodates any particular pattern of cash flows

and debt financing with its associated tax shields. With this method, we can specify the structure of debt financing and calculate the present value of the interest tax shields, and add it to the present value of expected unlevered cash flows to the equity holders. However, this process can be tedious if a large number of periods are involved. If we assume that debt is expected to be a constant proportion of the value of the firm, and that the income tax rate is constant, we can simplify the calculation to a certain degree.

There are two different approaches to APV if the debt ratio is constant over time. With the first approach, the present value of interest tax shields is calculated using the cost of debt5. With the second approach, because the debt ratio is expected to be constant, the interest tax shields are tied to the value of the firm and therefore are uncertain. Consequently, the unlevered cost of equity should be used to calculate the present value of the tax shields 6.(this model is not presented here)

**III. VALUATION OF EQUITY:**

In addition to valuing an entire company, the equity portion of a firm can also be valued by setting the second term in equation 5 to zero. That is:



This model is good only for a total equity financed company. If the company has debt in its capital structure, **the value of equity is based on levered free cash flows and levered cost of equity**. That is: 

The difference between equation (7) and (8) is due to the amount of debt in the capital structure of the company. The free cash flows to the equity investors must account for not only operating cash flow but also for any **net** return of principal (new debt issues - principal repayments) to debt holders. The LFCF is a measure of what a firm can afford to pay out as dividends. Below is the estimation of LFCF.

EBIT

Less: Interest payment

Less: Cash Taxes on EBIT

Plus: Depreciation and Amortization

**Operating Cash Flow** **(OCF)**

Less: Increase in Net Working Capital

Less: Increase in Capital Expenditures

Less: new debt issues minus debt repayments (**NDP**)

Less: Increase in other operating Assets

reduced by increase in other non-interest

bearing liabilities

Levered Free Cash Flow (LFCF)

**LFCF = OCF - (CE +  NWC+NDP)**

**3. Estimation of Growth Rates and Valuation Models7:**

The value of a firm is ultimately determined not by current cash flows but by expected future cash flows. The cash flows earned by the company in each period might change, depending on the stability of earnings, it’s future prospects for increasing or decreasing, or other factors. Obviously, there are many factors to consider when attempting to forecast future growth rates of the cash flows.

This section provides an explanation of how the growth rate is estimated.

**A. The Use of Historical Growth Rates**

There is a connection between past growth rates and expected future growth rates, but the reliability of this connection is open to question. This section explores various ways of using historical growth rates to predict future growth.

**Using Average Growth Rates from the Past**

This approach uses the average growth rate from the past as the predicted growth rate for the future. There are several estimation issues related to coming up with an average growth rate. Some of these are discussed herein.

**1. Arithmetic Average versus Geometric Average**

The average growth rate can be very different depending upon whether it is an arithmetic average or a geometric average. The arithmetic average is the mean of past growth rates, while the geometric average takes into account the compounding effect. The latter is clearly a much more accurate measure of true growth in past earnings, especially when year-to-year growth has been erratic. This can be illustrated with a simple example.

The following are the earnings per share at XXX Company, starting in 1989 and ending in 1994:

**Illustration 1: Using arithmetic average versus geometric average**

**Year EPS Growth Rate (percent)**

1989 $0.66

1990 0.90 36.36

1991 0.91 1.11

1992 1.27 39.56

1993 1.13 - 11.02

1994 1.27 12.39

Arithmetic average = (36.36% + 1.11% + 39.56% - 11.02% + 12.39%)/5= 15.68%

Geometric average = ($1.27/$.66)1/5 - 1 = 13.99%

The geometric average will be lower than the arithmetic average, and the difference will increase with the variability in earnings.

An alternative to the standard calculation of the arithmetic average is a weighted average, with growth rates in more recent years being weighted more heavily than growth rates in earlier years. This would lead to a much lower estimate of the average for XXX.

**2. Estimation Period**

The average growth rate is sensitive to the starting and ending periods for the estimation. Thus, the growth rate in earnings over the last five years may be very different from the estimated growth rate over the last six years. The length of the estimation period is subject to the analyst's judgment, but the sensitivity of historical growth estimates to the length of the period should be a factor considered in deciding how much to weigh these past growth rates in predictions.

The following table provides earnings per share at XXX, starting in 1988 instead of 1989 and uses six years of growth rather than five to estimate the arithmetic and geometric averages.

**Illustration 2: Sensitivity of historical growth rates to the length of the estimation period: XXX**

**Inc.**

**Time (t) Year EPS Growth Rate (percent)**

1 1988 $0.65

2 1989 0.66 1.54

3 1990 0.90 36.36

4 1991 0.91 1.11

5 1992 1.27 39.56

6 1993 1.13 -11.02

7 1994 1.27 12.39

Arithmetic average = 13.32%

Geometric average = ($1.27/$.65)1/6 -1 = 11.81%

The growth rate drops significantly if earnings per share starting in 1988 are used rather than earnings per share starting in 1989, with the arithmetic average dropping from 15.68% to 13.32%.

**3. Linear and Lag-Linear Regression Models**

The arithmetic average weighs percentage changes in earnings in each period equally, and ignores compounding effects in earnings. The geometric average considers compounding effects, but focuses on the first and the last earnings observations in the series--it ignores the information in the intermediate observations and any trend in growth rates that may have developed over the period. These problems are at least partially overcome by using Ordinary Least Squared regressions of earnings per share against time. The linear version of this model is:

EPSt = a + bT

where EPSt = earnings per share in period t

T = time period

The slope coefficient on the time variable is a measure of earnings change per time period. The problem, however, with the linear model is that it specifies growth in terms of dollar EPS and is not appropriate for projecting future growth, given compounding.

The log-linear version of this model converts the coefficient into a percentage change:

In(EPSt ) = a + bT

where In(EPS t ) = natural logarithm of earnings per share in period t

The coefficient b on the time variable becomes a measure of the percentage change in earnings per unit time. The earnings per share from 1988 to 1994 are provided for XXX, and the linear and log-linear regressions are done below.

**Illustration 3: Linear and log-linear models of growth: XXX Company**

:

**Time(t) Year EPS In(EPS)**

1 1988 $0.65 -0.43

2 1989 0.66 -0.42

3 1990 0.90 -0.11

4 1991 0.91 -0.09

5 1992 1.27 0.24

6 1993 1.13 0.12

7 1994 1.27 0.24

Linear regression: EPS = 0.5171 + 0.1132T

Log-linear regression: In(EPS) = -0.55536 + 0.1225T

The slope from the log-linear regression (0.1225 ) provides an estimate of growth rate of 12.25% in earnings. The slope from the linear regression is in dollar terms. The prediction for 1995 from each regression is as follows:

Expected EPS (1995): linear regression = 0.5171 +0.1132(8) = $1.42

Expected EPS (1995): log-linear regression = e(-0.55536 + 0.1225 (8))= $1.53

**4. Dealing with Negative Earnings**

Measures of historical growth are distorted by the presence of negative earnings numbers. The percentage change in earnings on a year-by-year basis is defined as:

**Percentage changes in EPS in period t = (EPSt - EPSt-1 )/EPSt-1**

If EPSt-1 is negative, this calculation yields a meaningless number. This extends into the calculation of the geometric mean. If the EPS in the initial time period is negative or 0, the geometric mean is not meaningful.

Similar problems arise in log-linear regressions, since the EPS has to be greater than 0 for the log transformation to exit. There are at least two ways of trying to get meaningful estimates of earnings growth for firms with negative earnings. One is to run the linear regression of EPS against time specified in the previous regression, then the growth rate can be approximated as follows:

Growth Rate in EPS = b / average EPS over the time period of the regression

This assumes that the average EPS over the time period is positive. Another approach to estimating growth for these firms, suggested by Arnott (1985), is as follows:

**Percentage change in EPS = ( EPSt - EPSt-1 )/Max( EPSt , EPSt-1 )**

Note that these approaches to estimating historical growth do not provide information on whether these growth rates are useful in predicting future growth. It is not incorrect and, in fact, may be appropriate to conclude that historical growth rate is "not meaningful" when earnings are negative, and to ignore it in predicting future growth.

**Illustration 4 Dealing with negative earnings**

**Time(t) Year EPS Iog(EPS) Growth Rate Modified Growth Rate**

1 1988 $3.56 1.27

2 1989 1.77 0.57 - 50.28% - 50.28%

3 1990 1.07 0.07 - 39.55% - 39.55%

4 1991 0.67 - 0.40 - 37.38% - 37.38%

5 1992 0.08 - 2.53 - 88.06% - 88.06%

6 1993 (0.10) NMF - 225.00% - 225.00%

7 1994 0.34 - 1.08 - 440.00% 129.41%

Approach 1: Using the slope coefficient from the linear regression

EPS = 3.1114- 0.5139T

Average EPS (1988-1994) = $1.06

Growth rate = -0.5139/1.06 = - 48.48%

Approach 2: Using the minimum or maximum of earnings as the denominator

Arithmetic average, using modified growth rates = -51.81 %

**4. Per Share *versus* Total Earnings**

The growth rate in net income can be misleading for firms that have issued substantial amounts of new equity during the estimation time period. The funds raised from these equity issues will generate income that, in turn, will create growth in total net income. Hence, it makes sense to adjust income for the number of shares issued and to look at growth in earnings per share, rather than net income.

The number of shares to be used in calculating earnings per share is also an issue since accountants measure earnings per share relative to both the actual number of shares outstanding (primary EPS) as well as in terms of the potential number of shares that could be outstanding, assuming conversion of warrants and convertible bonds (diluted EPS). The primary earnings per share, using the actual number of shares outstanding, is the appropriate number to use in calculating earnings growth. The potential dilution effects of convertible bonds and warrants on value can be better assessed using option pricing models to value these securities.

**5.Time Series Models to Predict Earnings per Share**

Time series models use the same historical information, as the simpler models described in the previous section. They attempt to extract better predictions from this data, however, through the use of sophisticated statistical techniques.

**The Value of Past Growth in Predicting Future Growth**

Past growth rates are useful in forecasting future growth, but can seldom be considered sufficient information. In a study of the relationship between past growth rates and future growth rates, Little (1960) coined the term "higgledy piggledy growth," because he found little evidence that firms that grew fast in one period, continued to grow fast in the next period. In the process of running a series of correlation between growth rates in consecutive periods of different length, he frequently found negative correlation between growth rates in the two periods, and the average correlation across the two periods was close to 0 (0.02). An updated study using growth rates in two more recent five-year time periods-- 1981 - 1985 and 1986-1990-- find that the correlation coefficient in earnings growth, while positive, is still not significantly different from 0.

The value of past growth in predicting future growth is determined by a number of factors, including the following.

**1. Variability in growth rates**: The usefulness of past growth rates in predicting future growth is inversely related to the variability in these growth rates. This variability can be measured in a number of ways. A simple measure is the standard deviation in growth rates in past EPS:



where g  = standard deviation in growth rate in earnings per share

gt  = growth rate in earnings per share in year t

g = average growth rate in earnings per share over n periods

n = number of periods of historical data

In the linear and log-linear regressions of earnings per share described in the earlier section, the variability can be measured by the standard error of the coefficient estimates as well as the R-squared of the regression. In general, analysts should be cautious about using past growth rates in forecasting future growth rates if there is significant volatility in these rates.

**2. Size of the firm:** Since the growth rate is stated in percentage terms, the role of size has to be weighed in the analysis. It is easier for a firm with $10 million in earnings to generate a 50% growth rate than it is for a firm with $500 million in earnings. Since it becomes harder for firms to sustain high growth rates as they become larger, past growth rates for firms that have grown dramatically in size and profits, may find it difficult to sustain it in the future.

Amgen increased its net income from $19.1 million in 1989 to $430 million in 1994. The following table shows the growth in net income for Amgen from 1989 to 1994, in both percentage and dollar terms.

**Illustration 7.5: The effect of size on growth: Amgen**

**Year Net Income % Growth Rate  Net Income**

1989 $ 19.10

1990 86.30 351.31 $ 67.10

1991 186.30 116.13 100.10

1992 306.70 64.63 120.40

1993 354.90 15.72 48.20

1994 430.00 21.16 75.10

Geometric Average Growth Rate = 86.42%

Assuming that this growth rate continues for the next five years:

**Year Net Income % Growth Rate  Net Income**

1995 $ 801.60 86.42% $371.60

1996 1,494.32 86.42% 692.72

1997 2,785.67 86.42% 1,291.35

1998 5,192.98 86.42% 2,407.31

1999 9,680.63 86.42% 4,487.65

The dollar increase in net income needed each year to sustain an 86.42% growth rate becomes larger and larger and rises to $4.487 billion by 1999. Even if Amgen remains a well-run and successful firm, it will become progressively more difficult over time to deliver theses high growth rates.

**3. Cyclicality in Economy**: Historical growth rates for cyclical firms are strongly influenced by where in the business cycle the economy is at the time of the estimation. If historical growth rates for cyclical firms are estimated in the middle of a recession, the growth rates are likely to be very negative. The reverse is generally true if the estimation of historical growth is done at an economic peak. These growth rates are of little value. However, in predicting future growth, it would be more useful to estimate growth across two or more economic cycles for these firms.

**4. Changes in fundamentals:** *The* observed growth rate is the result of fundamental decisions made by the firm on business mix, project choice, capital structure, and dividend policy. If a firm changes in any or all of these dimensions, the historical growth rate may not be a reliable indicator for future growth. For instance, the restructuring of a firm often changes both its asset and its liability mix, and makes past growth rates fairly meaningless in predicting future growth.

The other problem with using past growth rates arises when the business in which the firm is operating changes, either as a result of market forces or government regulation. These changes in fundamentals may cause a shift upward or downward in growth for all companies in that business and have to be factored into predictions. For instance, pharmaceutical companies at the end of 1992 had enjoyed a decade of high growth as medical technology advanced and health care costs surged. Looking into the future, however, market forces and the potential for health care reform make it unlikely that these growth rates would continue.

**5. Quality of earnings:** All earnings growth is not equal. Earnings growth created by changes in accounting policy or acquisitions is inherently less reliable than growth created by increasing units sold, and should be weighted less in forecasting future growth.

**B. The Determinants of Earnings Growth**

While growth in a firm may be measured using history or analyst forecast, it is determined by fundamental decision that a firm makes on product lines, profit margin, financial leverage and dividend policy.

**Sustainable Growth, Retention Rate and Return On Equity**

It is a fairly direct and objective measure of the growth prospect of a company, although it suffers from the usual deficiencies associated with accounting data. However, it reveals the interdependence among financial policies when firms pursue a policy of a constant debt ratio and does not sell new stock. Under the assumption of no external equity financing, the assets of the firm can grow only as fast as it retains earnings (Higgins 1977).

The simplest relationship is:

**g = RR x ROE**

In this relationship, growth in earnings is an increasing function of both the retention rate and the return on equity. This relationship is also referred to as sustainable growth rate.

Alternative specification of sustainable growth that is consistent with the above equation is: 

**Internal Growth Rate** It is the maximum possible growth rate for a firm that relies only on internal financing. 

ROA is the return on asset.

**Return on Equity and Leverage**

The return on equity and, by implication, the growth rate is affected by the leverage decisions of the firm. In the broadest terms, increasing leverage will lead to a higher return of equity if the pre-interest, after-tax return on projects (assets) exceeds the after-tax interest rate paid on debt. This is captured in the following formulation of return on equity:

**ROE = ROA + D/E[ROA - Rd(1 - TC)]**

where ROA = EBIT( 1 - t)/BV of Total Assets

D/E = BV of Debt/BV of Equity

rd = Interest Expense on Debt/BV of Debt

**TC** = tax rate on ordinary income

BV = Book Value

Note that BV of Assets = BV of Debt + BV of Equity.

Using this expanded version of ROE, the growth rate can be written as:

**g = RR[ROA + (ROA - Rd( 1 - TC)D/S]**

The advantage of this formulation is that it allows explicitly for changes in leverage and the consequent effects on growth. It is a useful way of analyzing the effects of restructuring on growth and value. There are generally three dimensions to restructuring:

***1. Restructuring assets/projects****:* Asset restructuring generally takes the form of eliminating unprofitable projects and divisions and/or acquiring new assets. The objective in asset restructuring is to increase the firm's return on assets, which in turn increases growth. The changing of a firm's asset mix also leads to a change in the riskiness of the firm, which causes discount rates to shift. The net effect of these changes in growth and risk will determine the change in the firm’s value. The effect of changing ROA on growth can be obtained fairly simply using the growth formulation above: 

Thus, the effect of a change in the ROA on growth will depend upon the firm's retention rate (RR) and debt/equity ratio (D/S).

***2. Changing capital structure***: Another component in financial restructuring is a change in leverage--an increase or decrease in the debt financing in the firm. The effect on future growth can be captured by changing the debt/equity ratio and interest rate in the growth rate formulation, and recalculating the *growth rate. The* change in leverage will also lead to a change in risk-in*creases in leverage will increase risk while* decreases in leverage *will* reduce risk - and in discount rates. Again, the net effect can be either positive or negative.



*where  rd /D/E = change in interest rate as a result of the debt/equity change*

*New D/E= debt/equity ratio after the change in leverage*

***3. Change dividend policy*:** The final aspect of financial restructuring is changing dividend policy. A decrease (increase) in dividends will lead to an increase(decrease) in the retention rate and an increase in the expected growth rate. This has to be offset, however, by the effects of changing payout ratio on the expected dividends. The tradeoff usually takes the form of higher growth for lower dividends, and the net effect on value can again be either positive or negative.



In general terms, this formulation of expected growth rates ties value to corporate financial policy--capital budgeting, capital structure, and dividend policy decisions.

**Return on Assets, Profit Margin, and Asset Turnover**

The analysis of return on assets can be carried forward one step if it is related to profit margins and sales.

ROA = EBIT (1 - **TC**)/Total Assets

=EBIT (1 - **TC**)/Sales X (Sales/Total Assets)

=Gross Profit Margin X Asset Turnover

The return on assets is an increasing function of both the gross profit margin and the asset turnover. The relationship is made more interesting, however, by the tradeoff between the two variables--increasing profit margins will generally reduce asset turnover, and reducing profit margins will increase asset turnover. The net effect will depend upon the elasticity of demand for the product.

**Product Line Analysis**

One criticism that is often leveled at analysts is that by focusing on aggregates at the firm level, they might be missing significant trends in the profitability of individual product lines. Thus, a firm with an aging product line mix may look healthy in terms of historical growth and current profitability, but it is not likely to sustain this growth into the future. The analysis of growth for a firm can be made more complete by looking at its individual product lines and examining where they stand in terms of the product life.

The preceding section indicated that the relevant variables of interest are, the expected free cash flows (FCF), growth rate, cost of capital and the valuation model as expressed as in equation (1). As noted, this model can be simplified based on the life cycle theory into three growth models:

**VALUATION MODELS and GROWTH RATES**

The basic model for valuing a business is based on the present value of expected future free cash flows. This section explores the general model for different assumptions about future growth rate.

**ONE-STAGE GROWTH MODELS**

**1. Zero Growth Model**

The most basic simplification of the model applies to the case of zero growth. Assuming that sales and net income are expected not to grow at all, the value of the firm, based on equation (1), is:



This model states that the value V or present value of the perpetuity is simply the fixed free cash flow FCF, discounted by the cost of capital (r) of the company.

**2. Constant or Normal Growth Model**

This model developed for stock valuation by several authors, is probably the most simple and yet practical approach to valuation of companies. Specifically, this model applies to those companies which have reached the third stage of the industrial life cycles. At this stage, it is assumed that the companies are growing at a constant (normal) growth rate for an indefinite period of time.

With this assumption, the value of the firm, by simplifying equation (1) is: 

Few companies can reasonably meet the assumption of constant growth model. Young, developing firms are likely to experience different growth rates for several years initially and then settle down to a constant growth rate, perhaps after a period of five to ten years, thereafter. The formula for finding the value of the company under this condition is stated in equation (2).

**TWO-STAGE GROWTH MODEL:**

The general formula applied to two-stage growth model is:



**or** 

 and R is the cost of capital



In this equation, gS represent the super growth rate from t=1 through period T, and gT is the long-run constant growth rate after year T.

It is important to note that the value of the company is a function of the present value of the two cash flows: (1) the present value of free cash flows from period 1 to T, which we will call V1, and the present value of free cash flows from period T +1 to infinity, referred to as V2.

V = V1 + V2

THREE-STAGE GROWTH MODEL

The two-stage and three-stage models differ essentially in the way that they allow for a shift in supernormal growth to growth in line with corporate maturity. The difference between the two models is that, unlike the two-stage model that assumes a sudden decline of super growth rate to normal growth rate, the three-stage model offers a more realistic portrayal of the gradual decline of super-growth rate to a normal growth rate.

Molodovsky, May, and Chottiner (1965)developed the three-stage dividend growth model based on the company's three- stage growth life cycle. The three-stage model allows for a gradual tapering of the super growth rate to a normal growth rate by provision of the middle stage growth rate. This middle stage growth rate offers a generally more realistic way of portraying the real world pattern of growth and decline than the two-stage model. Of course, by setting the middle stage growth equal to zero we will have the usual two-stage growth model.

If we modify this model based on free cash flows, a three-stage valuation model based on

Figure 1 shown as equation (9) can be expressed as:



Where t = 1,..., TS and j = 1,..., Td

Essentially the model assumes that free cash flow per share, **FCF,** will follow the life cycle pattern and go through the three stages of the growth rate. The cash flow will, in the first stage, grow at a super growth rate of **gs** for **Ts** periods, after which the growth rate declines linearly at **gj**, over **Td** periods (second stage), as it is calculated by equation 6, until it reaches a normal growth rate of **gn** for an indefinite period of time.

**4. COST OF CAPITAL:**

Valuation of any asset requires the determination of the proper discount rate. There are different approaches to defining the discount rate that are conceptually equivalent. This concept is closely linked to the financial concept of required rate of return. The required rate return is defined as the minimum rate of return necessary to induce an investor to buy and hold an asset.

The cost of capital is the minimum required rate of return that investors, bondholders and stockholders, will demand as compensation for the risk they bear if they are not to employ their savings elsewhere, in alternative, identically risky securities. That is, management must expect to earn on any new investments at least as much for the shareholders, as the shareholders can anticipate earning elsewhere.

The cost of capital for valuation models depend on the company and its capital structure. If a company has debt in its capital structure, then the appropriate cost of capital is:

**RWACC = Wd (1-t)Rd + Wp . Rp + Ws . Rs**

where rd = cost of debt

rp = cost of preferred stock

rs = cost of equity

However, for a firm with no debt (equity financed) in its capital structure the cost of capital is the same as the cost of equity.

**ESTIMATION OF THE COST OF EQUITY:**

There are several methods to estimate the cost of equity capital. These methods are: Comparable Companies, Discounted Cash Flow, CAPM, and Risk Premium Positioning.

1. **COMPARABLE COMPANIES METHOD**

The comparable method typically starts by selecting a sample of firms believed to be of comparable size, earnings, capital structure, and risk. The procedure used to select the comparable method varies widely, depending on the financial analysts' judgement of what factors indicates size, earnings, and risk. Sales, total assets, the line of business or other factors could be used. But there is no generally accepted way of defining comparable method.

Once the sample of comparable companies is determined, the financial analyst calculates the return on equity, ROE, for companies in the sample. ROE is the book rate of return to stockholders. The cost of capital for the company is inferred from this rate either as a simple average, or after some adjustments.

**2. DISCOUNTED CASH FLOW**

The discounted cash flow (DCF) method of calculating the cost of equity has been based on the Gordon model. It was the first widely used alternative to the comparable method, and remains the most widely used alternative today. A simple form of DCF is based on the sum of the expected dividend yield D1/P0 , and the expected growth rate of dividends in the future.

That is: 

To estimate the cost of equity one needs the current stock price, an estimate of expected dividends over the next period, and the estimated long-term growth rate of dividends. Dividends and the expected growth rate can be estimated in several ways.

The dividends for the next period can be estimated by multiplying this year's dividends by the estimated rate of growth. However, estimation of an expected growth rate, g, is a more difficult task. Two approaches are common.

**A.** Historical growth rates of dividends over some period. Sometimes post growth in earnings or book value per share is used as a proxy.

**B.** **Sustainable growth rate**, g, is estimated by multiplying

ROE by the retention rate (RR). That is

**g = ROE . RR**

**3. CAPITAL ASSET PRICING MODEL, CAPM**

In the CAPM, the rate of return on equity is based on the risk-free rate and risk premium which is measured by the Beta times the mark-risk premium. That is:

**rS = Risk-free rate + Beta(Historical Market Risk Premium)**

**Rs = RF + L ( RM - RF )** Equation 5

where **L** is the coefficient of systematic risk for a levered firm.

**rS** is the estimated cost of equity capital, **rF**, the risk-free rate, which is estimated as the average or expected rate of return on Treasury bills in the future, and **rm**is the rate of return on the market portfolio.

If a firm has no debt in its capital structure, the unlevered beta is the business risk inherent in the cost of equity. That is:

**Rs = RF + U ( RM - RF )** equation 6

Under the assumptions of the CAPM the relationship between levered and unlevered betas can be stated based on the Hamada's relationship:

**L** = **U** **[1 + (1- TC) D/S]**

If the tax rate is equal to zero, t=o, then

**L** = **U** **[1 + D/S]**

This relationship is based on the asset beta of a firm, which is a weighted average of its debt and equity beta. That is  **asset = portfolio = debt (D/V) + equity (S/V)**

A firm’s asset beta reflects its business risk. The difference between its equity and asset beta reflects financial risk. More debt means more financial risk. Now, if a company decides to use more debt and less equity, this would not affect the firm’s business risk. There would be no change in the firm’s asset beta, and no change in the beta of a portfolio of all the firm’s debt equity security. The equity beta would change: V **asset** = D **debt** +**equity**

From this equation, we can write: **asset** = **asset** + [**asset** - **debt**] **D/S**

if **debt** =0

**equity** = **asset** **[1 + D/S]**

**ESTIMATION OF THE COST OF EQUITY**

The return on a share of common stock is from two sources:

**rs = capital gain yields + dividend yield**

The one period rate of return, then, is equal to: 

The beta coefficient can be estimated by an ordinary least-squares regression of rS on rm.

**4. RISK PREMIUM**

Risk Premium method is less used as a stand-alone method. This method is based on adding an explicit premium for risk to the current long-term interest rate, usually the interest rate on government bonds. The figure most often used for the market-risk premium (rm - rf) is a historical market risk premium of about 8.5%, based on work by Ibbotson & Sinquefield.10

**rs  = Bond Yield + Risk Premium**

APPENDIX A

Figure 1 is a representation of an industry life cycles as it goes through three distinct stages of growth.

The initial pioneering stage (super growth period), expansion stage (super-declining growth), and maturity stage (normal or constant growth) are characterized by varying growth patterns in sales, profit, or other measurements.

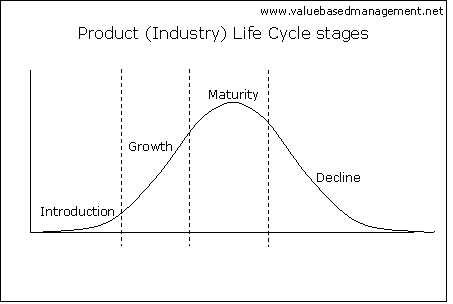
FIGURE 1- Industrial Life Cycle

STAGE I STAGE II STAGE III STAGE IV

Pioneering Expansion Maturity

(Super- (Super- (Constant Decline

Growth) declining) Growth)



RELATIONSHIP BETWEEN VALUATION, FREE CASH FLOWS, AND DISCOUNT RATE

VALUE OF A FIRM VALUE OF EQUITY

PORTION OF THE FIRM

TRADITIONAL ADJUSTED

CAPITAL BUDGETING PRESENT VALUE

(WEIGHTED AVERAGE

COST OF CAPITAL)

UNLEVERED UNLEVERED LEVERED

FORM OF FREE CASH FLOWS FREE CASH FLOWS TAX SHIELD NET FREE CASH FLOWS

RELEVANT INTEREST AND DEBT INTEREST AND + FROM TO EQUITY HOLDERS

FREE CASH SERVICE NOT DEBT SERVICE INTEREST (INTEREST & DEBT SERVICE

FLOWS INCLUDED NOT INCLUDED DEDUCTED)

FORM OF WEIGHTED UNLEVERED BEFORE REQUIRED

DISCOUNT AVERAGE COST OF TAX COST RATE OF

RATE COST OF EQUITY OF DEBT RETURN ON

CAPITAL LEVERED EQUITY

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Michael C. Jensen, "The Takeover Controversy: Analysis and Evidence", in John C. Coffee and et.al, ed, Knights, Raiders, and Targets, New York, Oxford University Press, 1988, p.321.

Robert C. Higgins, "How Much Growth Can a Firm Afford," Financial Management, Fall 1977, PP. 7-16.

**NOTES**

**1:** It is reasonable to assume that as the firm goes from high growth to stable growth, the relationship between capital spending and depreciation will change. In the high-growth phase, capital spending is likely to be much larger than depreciation. However, this difference should narrow as the firm enters its stable growth phase.

**2:**  This adjustment is often ignored in other definitions of Free Cash Flow, presumably on grounds of immaterially.

**3:** differing views on these items would results in different projections of future cash flow and hence value. Basing sales forecasts solely on past performance is like driving your car by looking in the rearview mirror. However, a total separation of the future from the past is illogical. Future performance of most businesses is influenced by what occurred in the immediate pat.

**4:** For more extensive discussion, see Richard Brealy and Stewart Myers, Principle of Corporate Finance ( New Yotk: McGraw Hill, 1990)

**5:** Ashton and D. Atkins, “Interaction of Corporate Financing and Investment Decision-Implication for Capital Budgeting: A Further comment,” Journal Of Finance, December 1978.

**6:** J. Miles and R. Ezzell, “ The Weighted Average Cost of Capital, Perfect Capital Markets and Project Life: A Clarification,” Journal Of Financial and Quantitative Analysis, September 1980.

**7:** This section is heavily drawn from Aswath Damodaran, Investment Valuation, 1996.

**8:** The original model developed by Molodovsky and et.al, was based on dividends streams. The author has modified this model based on free cash flows for valuation proposes

**9:** Molodovsky, Nicholas, C. May, and S. Chottiner, " Common Stock Valuation: Theory and Tables," Financial Analyst Journal, March- April 1965, pp. 104-123.

**10:** R. G. Ibbotson and R. A. Sinquefield, Stocks, Bonds, Bills, and Inflation: 1995 Yearbook.