Chapter Summary

Chapter 8 *Valuation Techniques for Equity Securities*

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Chapter 8 *Valuation Techniques for Equity Securities*

8.1 Discounted Cash Flow Modeling

A. The History and Variety of DCF Models

The connection between the academic and practitioner approaches to common stock valuation, if there is one, is the discounted cash flow model. The use of discounted cash flow (DCF) methods to value securities goes back centuries, e.g., Poitras (2000, ch.4). Despite the ability to do such calculations for equity claims, the widespread recognition and acceptance of these methods by academics and some practitioners to value common stocks does not seem to predate John Burr Williams The Theory of Investment Value (1938). For example, Graham and Dodd (1934) give no explicit discussion or recognition of discounted cash flow valuation for equities. The basic notion advanced in Williams (1938) was that the present value for a business or a security, such as a stock or bond, can be determined by discounting the future stream of expected cash inflows minus expected cash outflows at the appropriate rate of interest. This basic model was adapted and expanded in Gordon (1962) where the valuation of companies in regulated industries was a central concern. In recognition, the constant growth version of the discounted dividend form of the discounted cash flow model is often referred to as the 'Gordon growth model', e.g., Damodaran (1994, p.99).

To review the derivation of ***the basic DCF model*** for the security investor assume for the moment that the future is known with certainty and that perfect market assumptions apply. In the present context, this means there are no taxes and the term structure of discount rates is flat. Given this, consider the problem of determining the current price of a common stock. Assume that the stock to be valued is purchased at price *P(0)* and held for one period and then sold. This current price can be modeled as the discounted value for the sum of the dividend to be received in the next period (*Div(1)*) and the price *P(1)* received from selling the stock. Assuming the dividend is paid at the point the stock is sold:

$$P(0) = \frac{Div(1) + P(1)}{1 + k} \quad \rightarrow \quad k = \frac{P(1) - P(0)}{P(0)} + \frac{Div(1)}{P(0)}$$

This is the '***basic valuation equation***', sometimes referred to as the 'absence of arbitrage' condition. In effect, the (expected) return on the stock can be decomposed into two parts: the (expected) capital gain and the (expected) dividend yield. Dropping the assumption that future cash flows are known with certainty, leads to the result that $k = E[R_S]$, the expected return on the stock.

Accounting for randomness in the future cash flows by taking expectations conditional on information available at $t=0$, the ***discounted dividend model*** is derived by making a progressive substitution for prices:

$$E[P(1)] = \frac{E[P(2)] + E[Div(2)]}{1 + k} \quad \rightarrow \quad P(0) = \frac{E[Div(1)]}{(1 + k)} + \frac{E[P(2) + Div(2)]}{(1 + k)^2}$$

$$P(0) = \sum_{t=1}^{T} \frac{E[Div(t)]}{(1 + k)^t} + \frac{E[P(T)]}{(1 + k)^T} \quad \rightarrow \quad P(0) = \sum_{t=1}^{\infty} \frac{E[Div(t)]}{(1 + k)^t}$$

The relevance of other perfect markets assumptions follows appropriately. For example, introducing taxes requires a distinction to be made between the stream of expected dividends and the expected capital gain, which will be taxed at different rates. Combining this with differences in the relative riskiness for these two types of cash flows leads to the possibility that different discount rates might be required for dividends and capital gains. In addition, relaxing the assumption of a flat term structure of discount rates requires different k's to be used to discount cash flows occurring at different points in time.

Despite impressions to the contrary, e.g., Cunningham (2000, p.93), Williams (1938) did not originate the discounted cash flow model for security analysis. Rather Williams popularized acceptance of the approach.[1] Prior to Williams, informed opinion was generally against the validity of the model. Macaulay (1938, p.130-2) captures the basic notions of using discounted cash flow analysis to value both stocks and bonds:

> Because the good that the common stock offers to its purchaser is an expectation of future money payments, the relation of its present-money price to its future-money payments is as unmistakably an interest phenomenon as is the relation of the present-money price of a bond to its future-money payments. In the fullness of time the stock will have a 'realized' or 'actual' yield just as will the bond. And, though the stock makes no 'promise', as does the bond, and therefore has no 'promised' or 'hypothetical' yield, its price discounts *estimated* future payments as truly as does the price of a bond.

What disturbed Macaulay about this approach to common stock valuation was not the basic formulation but, rather, the difficulties of determining the future cash flows for stock:

> It is the absence of promises and the high degree of uncertainty as to what the stock will pay, with the resulting inadequate forecasting, that obscures the interest relation. The fundamental difference between an ultra high grade extremely long term bond and a low grade common stock is that the future-money returns of the bond can be forecast with more assurance than can those of the stock.

For Macaulay, the application of discounted cash flow techniques to assess the value of stocks, i.e., value as measured using model price vs. market price, depends fundamentally on the "*forecasting* of future payments".

Macaulay objected quite strongly to the practicality of using DCF methods to value stocks:

> The 'assumption of payment', which must be made before the promised or 'hypothetical' yield of a bond can be calculated ... may, as we have seen, be a mere mathematical fiction for all except the highest grade of bonds. But, for common stocks it is not only a mathematical fiction but also an economic absurdity. Even if the chance that the promises contained in a bond will be kept is negligibly small that the promises are little more than mere words, they are at least *definite* words and, as such, can stand the strain of mathematical manipulation.

That Macaulay understood the mathematical and analytical basis of the DCF techniques that are credited to Williams and Gordon is evident. For example:

> If it be assumed that a share of common stock selling for $100 is to return $4 per annum *forever*, it may be thought of as having a promised or 'hypothetical' yield of 4 per cent per annum. But, if the payments are to cease at the end of sixty years, the hypothetical yield must be less than 3 ½ per cent per annum. If they are to cease at the end

> of 46 years, the yield must be less than 3 per cent per annum. If at the end of 35 years, the yield must be less than 2 per cent per annum. If they continue for just 25 years, the yield will be exactly zero per annum. With still shorter periods, the yields are negative.

Macaulay understood clearly that the return (yield) on a stock combined both the dividend yield and the capital gain resulting in the stock 'yield' depending on two variables. "Sudden and great changes in the calculated 'yields' of a stock can occur not only because of changes in price but also because of changes in the dividend rate".

Though he clearly recognized the mechanics of the Gordon dividend growth model, Macaulay did not fully develop the mathematics for the formula completely. However, it is apparent that Macaulay (1938, p.132) more than understood the nuances of the intuition. The discussion of the model is sufficiently interesting to warrant detailed examination:

> If such an assumption were made as that the dividend payments were to increase in geometric progression, the future that could be neglected would be still more distant. One of the strangest rationalizations of unending price rise that appeared in the months immediately preceding the stock market culmination of 1929 was evolved by a Wall Street economist. He presented to the directors of the investment trust with which he was associated statistical evidence that the wealth of the country increased in the long run about 3 per cent per annum. He then argued that corporations as a class should be expected to share in this growth at this rate and hence that their dividends should be expected, over the long run, to increase at least 3 per cent per annum; that is to say in such a series as $4.12, $4.24, $4.37, etc., or $4(1.03), $4(1.03)^2, $4(1.03)^3, etc. He then suggested that, with increasing financial stabilization in the country, these future dividends would eventually be discounted at a rate that would not exceed 3 per cent per annum. But, he continued, if distant enough payments were assumed, discounting them at this rate would give very high prices for the stocks. The suggestion was even made that, as there seemed to be no necessary time limit to the 3 per cent rate of growth in wealth, there should logically be no 'ceiling' whatever for stock prices. The phantasy was strangely reminiscent of the Petersburg Paradox in the mathematical theory of probability.

This discussion is remarkable, in providing evidence both that Macaulay understood the Gordon dividend growth model and that the basics of the model were known within the investment industry. In particular, Macaulay understood one of the conventional limitations of the model.

To see this, observe that the motivation for the Gordon growth model is to provide a simplification of the general form of the discounted dividend model, where determining the price involves evaluating the infinite sum of discounted dividends, a clearly impractical exercise. One immediate simplication is provided by the case where the dividend is assumed to be constant into perpetuity, i.e., $Div(t) = \bar{D}$ for all t.[2] In this case, the discounted dividend model reduces to the perpetuity pricing model discussed in sec. 4.1 and the resulting stock pricing model is: $P(0) = \bar{D} / k$. This pricing model is sometimes called ***the preferred stock pricing model***. Because the dividend does not change, the preferred stock pricing model can be solved for the yield $k = \bar{D} / P(0)$ and this yield compared to the yield on other 'fixed income' securities, much as in traditional yield spread analysis (see sec. 6.3). As Macaulay recognized, this model does not work for common stocks because both the dividend payment and the price are variable making the result of the yield calculation too 'fuzzy' for practical applications.

The ***Gordon dividend growth model*** permits the dividend to change over time according to the assumption: $D(t+1) = D(t)(1 + g)$, where g is the assumed constant growth rate in dividends. Dropping the expectation for ease of notation and substituting this result into the general form of the discounted dividend model produces the simplified DCF model:

$$P(0) = \sum_{t=1}^{\infty} \frac{Div(t)}{(1 + k)^t} = \sum_{t=1}^{\infty} \frac{D(0)(1 + g)^t}{(1 + k)^t}$$

$$= \frac{D(0)(1 + g)}{(1 + k)} \left[1 + \frac{1 + g}{1 + k} + \frac{(1 + g)^2}{(1 + k)^2} + \frac{(1 + g)^3}{(1 + k)^3} + \dots \right]$$

$$= \frac{D(0)(1 + g)}{(1 + k)} \left[\frac{1}{1 - \frac{1 + g}{1 + k}} \right] = \frac{D(1)}{k - g}$$

By assuming that the dividend grows at a constant rate over time the Gordon growth model is able to provide a simple common stock valuation model: $P(0) = D(1) / (k - g)$. The example that Macaulay provides refers to the situation where $g \rightarrow k$ which gives "a very high price level for stocks".

In the context of the Gordon growth model with $g \rightarrow k$, Macaulay develops an interesting implication:

> If the dividends were \$4(1.03), \$4(1.03)^2, \$4(1.03)^3, etc. ... and if these dividends were discounted at 3 per cent per annum, the price of a share of the stock that was to pay the dividends, should be just four times the *number of payments* that were to be made; in other words, four times the *number of years* that the succession of dividends was to continue.

Though this result is relatively obvious from inspection of the original sum, this result is not so obvious from inspection of the $D(1) / (k - g)$ formulation of the model. Over time, a number of developments of the basic Gordon growth model have appeared that introduce more complicated patterns for future dividend payments. For example, Malkiel (1963) has a two stage model where dividends grow at a constant rate for a finite number of years and then grows at a rate typical of other firms in the economy thereafter (see end of chapter questions). Molodovsky et al. (1965) has a three stage model where dividends initially grow at a constant rate, then decline over a second period to be followed by a constant steady state dividend payment thereafter. While theoretically appealing, such developments lack practical applications in all but the most specialized situations.

The Gordon growth model makes the precise statement that common stock pricing depends on three variables: the dividend to be received next period, $Div(1) = D(1)$; the expected return on the common stock, k; and the long term growth rate of dividends, g. In terms of expected returns the model maintains that: $E[R_S] = k = (D(1)/P(0)) + g$ and $(D(1) / P(0)) = (k - g)$. Returning to the 'basic valuation equation', this implies that the expected capital gain is equal to the expected growth rate of dividends. While this might seem to be quite unrealistic, it does have a reasonable interpretation. If the *P/E* ratio does not change over time, the growth rate in earnings will equal the growth rate in dividends if the dividend payout ratio does not change over time. Under these assumptions, g will be translated into the capital gain. Yet, if these assumptions are adopted, then the model can be manipulated to produce other interesting results that can be used to interpret widely used valuation measures.

More precisely, assuming for the moment that the Gordon growth model is correct, it is possible to manipulate the model to provide precise statements for two important valuation measures, the price-earnings (*P/E*) ratio and the price-to-book value (*P/BV*) ratio. In turn, these values can be used to provide an interpretation for *g*. To convert the Gordon model to *P/E* form requires the ***'clean surplus' equation*** for earnings: *E(t) = Div(t) + RE(t) = Div(t) + (BV(t) - BV(t-1))*, where *E(t)* is earnings available to common stockholders, *RE(t)* is the retained earnings and *BV(t)* is the book value of equity, all observed at time *t* and expressed on a per share basis. In keeping with currently accepted accounting practice, e.g., Bernstein (1989, p.747), the clean surplus equation requires that all items involving gain or loss in income are accounted for in the period in which these items occur. In effect, *E(t)* is either paid out in dividends or is retained earnings and accounted for by changing the book value of equity. Though there are some accounting qualifications to this condition (see sec. 8.2), the clean surplus equation is sufficient for present purposes.

Letting *b* represent the dividend payout ratio (*Div(t) / E(t)*), i.e., *b E(t) = Div(t)*, substituting this result into the Gordon growth model produces the ***simplified DCF P/E ratio***:

$$P(0) = \frac{b\ E(1)}{k - g} = \frac{b\ E(0)(1 + g)}{k - g} \qquad \rightarrow \qquad \frac{P(0)}{E(0)} = \frac{b\ (1 + g)}{k - g}$$

Taking the dividend payout ratio to be fixed over time produces: *D(t+1) = bE(t+1) = b E(t) (1 + g)* → *E(t+1) = E(t)(1 + g)*. In words, with a constant dividend payout ratio, the constant growth in dividends assumption translates into an assumption about the constant growth in earnings. To derive the price to book ratio involves observing that *(E(t) / BV(t-1)) = ROE(t)*, where *ROE(t)* is the return on equity at time *t*. (Though it is more conventional to use *BV(t)* in defining *ROE(t)*, this definition will not be used here.) Making the appropriate substitution produces the ***simplified DCF P/BV ratio***:

$$\frac{P(0)}{BV(0)} = \frac{b\ \dfrac{E(1)}{BV(0)}}{k - g} = \frac{b\ ROE(1)}{k - g}$$

It follows that the price to book value ratio will depend on the dividend payout ratio, the *ROE*, the expected return on the stock and the growth rate in earnings.

A number of different variations on the DCF model can be derived.[3] English (2001, p.334-5) uses the clean surplus relationship, *BV(t) = BV(t-1) + E(t) - D(t)* to develop the following the ***abnormal earnings form of the DCF model*** (see end of chapter questions):

$$P(0) = \sum_{t=1}^{\infty} \frac{D(t)}{(1 + k)^t} = \sum_{t=1}^{\infty} \frac{E(t) - \Delta BV(t)}{(1 + k)^t}$$

$$= BV(0) + \sum_{t=1}^{\infty} \frac{(ROE(t) - k)\ BV(t-1)}{(1 + k)^t} = BV(0) + \sum_{t=1}^{\infty} \frac{AE(t)}{(1 + k)^t}$$

where $AE(t) = (ROE(t) - k)\ BV(t\text{-}1)$ is the "abnormal earnings attributable to equity in period t" and BV is expressed on a per share basis. Ritter and Warr (2002, p.36) refer to this form the DCF model as the "***residual income model***" while Penman (2001, chap.6) uses "***residual earnings model***". Ritter and Warr make numerous adjustments to the model to account for the impact of inflation and the use of accounting accruals. Dechow et al. (1999) provides a detailed examination of this model while Penman and Sougiannis (1998) compares this DCF model with the free cash flow and dividend discount variants. This formula has intuitive appeal because it relates the current price to the initial value of capital raised, reflected in $BV(0)$ adjusted for the ability of the firm to earn more (or less) on invested capital (ROE) than the cost of maintaining the capital stock, as reflected in k. This formulation captures the idea that securities with superior investment potential create wealth ($ROE > k$) as opposed to destroying wealth ($ROE < k$).

Another useful manipulation of the basic Gordon growth model formulation provided by English (2001, p.353-4) follows from making a substitution for the dividend payout ratio, b, using the clean surplus relationship: $D(t) = b\ E(t) = (E(t) - (BV(t) - BV(t\text{-}1))$. Observing that constant growth in dividends with a constant dividend payout gives $BV(t) = (1 + g)BV(t\text{-}1)$ (see end of chapter questions), it follows:

$$b = \frac{E(t) - gBV(t-1)}{E(t)} = 1 - \frac{g}{k}\left(\frac{k\ BV(t-1)}{E(t)}\right)$$

Recalling that the definition for $AE(t)$ requires, $k\ BV(t\text{-}1) = E(t) - AE(t),$ the expression for b can be manipulated to get:

$$b = \frac{1}{k}\left[k - g + g\left(\frac{AE(t)}{E(t)}\right)\right]$$

Substituting this result into the P/E ratio expression associated with the Gordon growth model produces the ***abnormal earnings form of the P/E ratio***:

$$\frac{P(0)}{E(0)} = \frac{1+g}{k}\left\{1 + \left(\frac{AE(1)}{E(1)}\right)\left[\frac{g}{k-g}\right]\right\}$$

Compared to the simple Gordon growth model formulation of the P/E ratio, by making the connection between P/E and the ability to generate 'abnormal earnings' this formulation is more revealing.

The relationship between the P/E ratio and growth of the firm is a subject that receives attention in almost every introductory investments textbook, e.g., Bodie et al. (1999). The conventional starting point is the '***present value of growth opportunities***' ($PVGO$) formulation of the P/E ratio. The simplifying, if somewhat confusing, assumption is made that there is benchmark 'firm' that is able to generate a constant stream of earnings into perpetuity that are fully paid out to common shareholders, i.e., $b = 1$. The value of this firm would be $P(0)^* = E(1) / k$. The definition of the $PVGO$ reflected in the stock price for any given firm follows appropriately as: $P(0) = P(0)^* + PVGO$. Expressed as a P/E ratio, this formulation is: $(P(0) / E(1)) = (1 / k)\ [\ 1 + (PVGO / P(0)^*)]$.

Hence, the *P/E* ratio will be higher for firms with higher growth opportunities. Within this framework, it can be shown that $g = ROE\,(1 - b)$ and, substituting into the Gordon growth model *P/E* ratio gives: $(P(0)/E(1)) = (b \,/\, \{ k - (1 - b)(ROE)\})$. In this case, firms with higher *ROE*, which reflects growth opportunities, will have a higher *P/E* ratio. If accurate, these types of formulas would provide precise information about the relationship between *P/E* and growth opportunities.

One application of the different formulas for the *P/E* ratio is to illustrate the behavior of the ***"PEG" ratio***, or *P/E* to growth rate ratio. This ratio is sometimes used as a crude rule of thumb to determine under/over valuation for a common stock. For example, a PEG rule could be formulated as: if the PEG ratio is less than one then the stock is undervalued because the 'cost of growth' as measured by the *P/E* is less than the actual growth. The *AE* form of the *P/E* can be used to show that this rule is difficult to apply in practice, even when simplifying assumptions are made, i.e.:

$$\frac{P(0)}{100g\;E(0)} = \frac{PEG}{100} = \frac{1}{100}\left[\frac{1+g}{kg} + \frac{1+g}{k}\,\frac{AE(1)}{E(1)}\,\frac{1}{k-g}\right]$$

Scaling by 100 follows from recognizing that the PEG rule assumes the growth rate is expressed as a percentage whole number. It follows that if $AE(1) = 0$ because, say, the firm is in 'competitive equilibrium', then if $k = g = .1$ the PEG rule will be approximately correct. However, if $k = g = .05$, then the PEG will equal 4. Even without examining cases where $AE(1) \neq 0$, the PEG ratio rule can be seen to have significant limitations.

There is not complete agreement about what is to be considered a DCF model. To the capital budgeting purists, a DCF model discounts the net cash flows. In this case, the variable being discounted is cash flow and is to be interpreted in a cash accounting sense. Given that the only cash payments received by the buy-and-hold common stock investor are dividends, this leads to the discounted dividend model and its variants, such as the Gordon model. Others expand the DCF universe to include cash flows that involve accrual accounting numbers, as in the residual income models, or involve a combination of accrual and cash flow accounting, as in the ***free cash flow to equity model*** or the EVA models These models seek to provide a more representative cash flow measure that captures a specific objective. Whether these techniques are successful at achieving that objective is unclear, with conflicting academic evidence on the issue. The free cash flow to equity model (*FCFE*) aims to measure the return to equity above the amount required to: maintain existing production levels; or, alternatively, to keep the firm on a particular growth path. The EVA models seek to discount the future "economic profit" generated by the firm.

To derive the *FCFE* DCF model, observe that the cash flow in this case is free cash flow (see sec. 8.2). Discounting of these cash flows leads to the general form of this DCF model:

$$P(0) = \sum_{t=1}^{\infty} \frac{FCFE^{*}(t)}{(1 + k)^{t}}$$

where $FCFE^*(t)$ is $FCFE(t)$ expressed on a per share basis. Recognizing that constant growth in dividends with a constant dividend payout does not ensure that *FCFE* will also grow at the same rate, it is possible to assume that *FCFE* grows at a constant rate g_f such that $FCFE(t) = FCFE(t-1)(1 + g_f)$, this produces the simplified free cash flow valuation model: $P(0) = \{FCFE^*(0)(1 + g_f)\} / \{k -$

$g_f\}$. Under appropriate assumptions, it is possible to assume $g = g_f$ though this may not be plausible in many situations (see end of chapter questions). Similar analysis can be applied to the EVA models.

B. Damodaran on Simplified DCF Valuation

It is not too difficult to inspect the simplified DCF models of stock valuation, such as the Gordon growth model, and dismiss these models based on superficial analysis of the model structure. For example, without simplifying assumptions such as 'constant growth' the model is difficult to implement due to the larger number of terms that have to be estimated and calculated. Where the simplifying assumption of constant growth in dividends (earnings) is used, the empirical behavior of dividends (earnings) does not support the assumption that dividends (earnings) grow at a constant rate over time. In addition, the market practice of low or no dividend payout would seem to argue against straight forward application of DCF models where the cash flows are dividends. There are problems with obtaining estimates of k; there are problems with obtaining estimates of $D(1)$, and so it goes. However, consistent with Friedman's 'positivist' approach, it does not follow that just because the assumptions of a model seem impractical or unrealistic, that the model is necessarily invalid. Before dismissing the model out of hand, it would be appropriate to examine the performance of the model in practice.

A search for the 'best practices' approach to implementing the simplified DCF models leads to Damodaran (1994) where the implementation of the Gordon model and other types of DCF models reaches a relatively sophisticated stage of evolution.[4] Aswath Damodaran is a professor at the Stern School of Business at New York University (NYU) specializing in executive education and the author of a number of books along these lines. Given the just-around-the-corner proximity of the NYU business school campus to Wall Street, it is likely than many individuals in the New York financial community have been directly exposed to these ideas and have used, or attempted to use, the models in practical situations. Damodaran (1994) goes carefully over the appropriate procedures for estimating the discount rate, the cash flows and the growth rates. This background is then used to implement the dividend discount model and the free-cash-flow-to-equity discount model. Valuation results are provided for the common stocks of the firm types where the DCF model would be most likely to work.

Damodaran (1994, p.2-4) starts with six '***valuation myths***' that are useful to take into account in assessing the validity of the DCF technique. These myths are: "Since valuation models are quantitative, valuation is objective"; "A well-researched and well-done valuation is timeless"; "A good valuation provides a precise estimate of value"; "The more quantitative a model, the better the valuation"; "The market is generally wrong"; and, "The product of a valuation – the value – is what matters, the general process of valuation is not important". While it would be difficult to find many sources that adhere to or propose these "myths", dispelling the myths allows Damodaran to set a relatively low bar for the DCF modeling procedure. What follows is a sometimes insightful discussion and an honest attempt to implement the dividend discount model, both in Gordon model form and in two-stage and three stage form (see questions at the end of chapter questions). To do this specific companies are selected that are compatible with doing actual valuations with the dividend discount model.

The original Gordon model (Gordon 1962) was developed for valuation of companies in regulated industries. At that time, these types of companies included telephones and public utilities. The regulation of rates provided these companies with stable and relatively predictable cash flows. With this historical application in mind, a more modern ***application of the Gordon dividend growth model*** to Southwestern Bell illustrates the procedure followed by Damodaran (1994):

> Southwestern Bell has earnings per share of $4.33 in 1992 and paid out 63% of its earnings as dividends. Its earnings and dividends had grown at 6% a year between 1988 and 1992 and were expected to grow at the same rate in the long term. The beta for the stock was 0.95. The T-bond rate at the time of the analysis was 7% ...
>
> Cost of equity = 7% + 0.95 x 5.5% = 12.23%
>
> Value of equity = $2.73 x 1.06 / (0.1223 - 0.06) = $46.45
>
> SW Bell was selling for $78.00 on the day of this analysis (May 1993).

Damodaran (1994, p.103) then uses the $78.00 stock price to solve for g in the Gordon model as 8.43%. This is interpreted as the expected growth rate embedded in the current price which is 2.43% higher than the estimated historical growth rate.

There are many subtle features involved in this valuation. Consider the cost of equity that is estimated using a form of the capital asset pricing model (CAPM): $k_i = E[R_i] = r + \beta_i \{E[R_M] - r\}$. While it is conventional to use a short-term interest rate, such as the 3 month Treasury bill rate, for the riskless interest rate (r) in the estimating the CAPM, Damodaran uses the 30 year Treasury bond rate. This choice is made consciously with a rationale that "takes a strict view of matching the duration of the riskfree security with the duration of the asset being analyzed". Without stating how the duration of a common stock is calculated, Damodaran continues with the rationale: "At a practical level, in periods when the term structure follows historical patterns in the relationship between short rates and long rates and when the beta is close to one, all three variants will produce similar results" (p.26). This is confusing because, if beta is close to one, then the riskless rate used will not matter in an arithmetic sense (as it will cancel out in the CAPM). However, in an estimation sense this will not be correct. It is not clear how "historical patterns" in yield curve slope will save the situation. All this is left unexplained in Damodaran (1994, ch.3).

Another feature of Damodaran's analysis is the ***estimation of the risk premium on the market:*** $\{E[R_M] - r\}$ (see sec. 3.3). Damodaran estimates this value by using the difference of the annualized geometric means for a stock market index (10.08%) and the Treasury bond rate (4.58%) over a 1926-1990 sample. This difference of 5.5% is used as the stock market risk premium to estimate the cost of equity from the CAPM that, in turn, is used as the discount rate (k) in the Gordon model. Damodaran recognizes that the difference of the geometric mean is smaller than the difference of the arithmetic means (12.13% - 4.90% = 7.23%). The rationale for this choice is stated as: "where cash flows over a long time horizon are discounted back to the present, the geometric mean provides a better estimate of the risk premium" (p.22). Consistency would appear to require that geometric averages be used to estimate g but, despite recognition of this point (p.68), it appears as though an arithmetic average is used. In addition, though there is no reference given to the specific stock market index used to calculate the geometric mean, comparison with evidence in Bodie et al. (1999)

reveals that the index is the S&P Composite Index.

Damodaran (1994, p.103) explicitly recognizes that:

> the Gordon growth model is best suited for firms that are growing at a rate comparable to or lower than the nominal growth in the economy and that have well-established dividend-payout policies that they intend to continue into the future. The dividend payout of the firm has to be consistent with the assumption of stability, since stable firms generally pay substantial dividends. (The average payout for large stable firms in the United States is about 60%).

As illustrated in the use of SW Bell, large utilities qualify as examples of a 'large stable firm'. Another example used by Damodaran to illustrate a large stable firm that is not a utility is Exxon. In this case:

> Exxon has earnings per share of $3.82 in 1992 and paid out 74% of its earnings as dividends that year. The expected growth rate in earnings and dividends, in the long term, was expected to be 6%. The beta for Exxon was 0.75 and the T-Bond rate was 7% ... Cost of equity = 7% + 0.75 x 5.5% = 11.13% ... Value of equity per share = 2.83 x 1.06 / (0.1113 - 0.06) = $58.47. Exxon was selling for $65.00 on the day of this analysis (May 1993).

Though the estimated value and the observed stock price are reasonably close, the analysis begs an obvious question about selection bias. Was Exxon selected more-or-less at random from the available group of 'large stable non-utility' firms, or was Exxon selected because the Gordon growth model produced the most plausible price estimate from a group of such estimates?

The choice of Exxon as an example of a large stable firm suitable for application of the Gordon growth model seems misplaced because of the sensitivity of Exxon's earnings to developments in the oil sector. A more plausible type of firm would be a brewery such as Budweiser (BUD). Consider a valuation of Exxon, now Exxon-Mobil (XOM), in March 2003. The beta is relatively unchanged at 0.91but the long Treasury bond rate has fallen to 5.375%. Solving for the cost of equity using the 5.5% long run risk premium on the market gives: 10.38% = 5.375% + 0.91(.055). Observing that the previous three years of dividends increase from .83 to .88 to .91 cents per share (2.68% dividend yield in the current year), gives a growth rate of g = 4.4%. Dividend growth is used in favor of the more variable earnings growth. Using earnings over the three years, the dividend payout is less than 50%. Evaluating the Gordon growth model estimate of the price of the stock gives: (.91)(1.044)/(.1038 - .044) = 15.89. This does not compare favorably to the observed stock price of $34.37. Raising the growth rate to 5.4% (or lowering the market risk premium by 1/.91%) only raises the price estimate to $19.08. Solving for the growth rate that is consistent with the observed price gives g = 7.7%.

How does Damodaran use the Gordon growth model to value a foreign stock? As another case of a '***stable large firm***', Damodaran (1994, p.105) selects the second largest German bank, Dresdner Bank. It is estimated that Dresdner "maintained a growth rate of 5% in earnings and dividends between 1983 and 1992, and was expected to grow at this rate in the long term". The analysis continues that Dresdner:

> was also expected to have earnings per share of 34.05 DM in 1993 and to pay out 47.62% of its earnings as dividends. It had a beta of 0.87 in 1993, measured relative to the Frankfurt DAX. The ten-year bond rate in Germany at the end of July 1993 was 6.42% and the risk premium for stocks over bonds was assumed to be 3.5% ... Cost of equity = 6.42% + (0.87 x 3.5%) = 9.45%

Value of equity per share = 16.21 DM x 1.05 / (0.0945 - 0.05) = 383.01 DM

Dresdner Bank was trading at 408 DM per share in July 1993.

Similar to the Exxon and SW Bell estimates, Damodaran obtains a relatively close estimate of the observed stock price for Dresdner using the Gordon growth model. After examining the constant growth Gordon model, Damodaran (1994, ch.6) goes on to consider two-stage and three-stage dividend growth models (see end of chapter questions), again obtaining reasonably accurate estimates of selected observed stock prices.

Damodaran's favorable, if relatively limited, application of the discounted dividend model to specific stocks is supported by Sorensen and Williamson (1985) which provides an *ex ante* application of the dividend discount model to 150 stocks in the S&P Composite Index. Valuation using a form of the dividend discount model was done in Dec. 1980 and the stocks were held for two years with the result that stocks identified as 'undervalued' significantly outperformed 'overvalued' stocks. Further evidence in support of using the dividend discount model to identify undervalued stocks is provided by Haugen (1990) which examines the 1979-1991 performance of a fund that used the dividend discount model to select undervalued stocks. Over the 1979-1991 period, the quintile of stocks judged by the fund to be most undervalued using the dividend discount model outperformed the most overvalued by 1253% to 434%. Based on an examination of this evidence Damodaran (1994, p.124) concludes: "The dividend discount model outperforms the market over five-year time periods, but there have been individual years when the model has significantly underperformed the market".

As with other adherents of modern Finance, Damodaran is not immune to the progress of received opinion. Confronted with a growing list of anomalies to the efficient markets hypothesis, modern Finance has shifted attention to assessing the differences between "value" and "growth" stocks. This distinction is defined by Dimson et al. (2002, p.139):

> Since the earliest days of security analysis, experts stressed the potential benefits of buying at a price that is reasonable to fundamentals. The oldest yardstick is probably the price-to-dividend ratio, or its reciprocal, the dividend yield. But long ago, Graham and Dodd (1934) also urged investors to look for "a reasonable ratio of market price to average earnings," and further advised that "the book value deserves at least a fleeting glance by the public before it buys and sells shares". Stocks that trade at high dividend yield (a low price-to-dividend ratio), or a high earnings yield (a low price-to-earnings ratio), or a high ratio of book value of equity to the market value of equity, are often referred to as value stocks. Stocks that trade at a low dividend yield, low earnings yield, or low book-to-market are typically regarded as growth stocks.

Though a strong proponent of the discounted dividend model, this '***value vs. growth***' sentiment is echoed by Damodaran (1994, p.125):

> The dividend-discount model weights expected earnings and dividends in near periods more than earnings and dividends in far periods, and it is biased towards finding low price/earnings-ratio stocks with high dividend yields to be undervalued and high price/earnings-ratio stocks with low- or no-dividend yields to be overvalued. Studies of market efficiency indicate that low P/E-ratio stocks have outperformed (in terms of excess returns) high P/E-ratio stocks over extended time periods. Similar conclusions have been drawn about high-dividend-yield stocks relative to low-dividend stocks. Thus the valuations of the model are consistent with the empirical irregularities observed in the market. It is unclear how much the model adds in value to investment strategies that use P/E ratios or

dividend yields to screen stocks.

Decades after the DDM model was popularized by Gordon, proponents of modern Finance are still unable to make an accurate assessment of the validity of the model. Critics of the model correctly argue that the relevant variable to examine is cash that is returned to shareholders, which includes both dividends and net share repurchases (see end of chapter questions).

C. Expectations Investing

The inadequacies of the simplified discounted cash flow (DCF) models, such as the Gordon model, stem from an attempt to over-generalize the common stock valuation problem. While the basic notion that the 'true' stock price can be determined by appropriately discounting the expected net cash flows is fundamentally sound, the desire to develop general valuation formulas from this notion cuts the connection between the common stock and the specifics of the individual firm. Though there may be cases where the simplified DCF models provide a more than adequate estimate of the stock price, there are many other cases where the model gives misleading or incorrect results. Under the null hypothesis that a simplified DCF model such as the Gordon model is correct, it is possible to invert the model to solve for the growth rate that is consistent with the current stock price. This growth rate can then be compared with an estimate of the growth rate determined from, say, a fundamental analysis of the firm's operations to provide a framework for an investment decision. This type of exercise is a form of 'expectations investing'. As such, the natural progression from simplified DCF models to firm-by-firm fundamental analysis goes through the models such as the 'expectations investing' model

"***Expectations investing***" is a term coined by Rappaport and Mauboussin (2001) to characterize an investment strategy designed to "read market expectations and anticipate revisions to these expectations" as a "springboard for superior returns -- long term returns above an appropriate benchmark". The basic intuition for expectations investing is derived from the idea that: "Stock prices express the collective expectations of investors, and changes in these expectations determine your investment success" (Rappaport and Mauboussin 2001, p.2). This basic intuition is not new and can be found in prior contributions traceable to the beginnings of trading in joint stocks, e.g., the intuition is consistent with the intrinsic value approach of Graham and Dodd (1934). The approach is also consistent with the observation that a stock is worth what it will sell for in the market. This price reflects current 'collective expectations'. Assuming that there is some 'true' value for the stock that depends on expectations consistent with economic fundamentals, then by comparing the market's collective estimate of this value with the true value then changes in expectations can be identified and an expectations investing decision can be made. What makes the "expectations investing" approach of interest is the method of estimating the "collective expectations" that are reflected in the current price and the process of determining the revision in expectations using "competitive strategy frameworks".

In order to estimate "***collective expectations***", the expectations investing approach uses the general discounted cash flow model to work backwards from the current price to arrive at an estimate of the expectations reflected in the current price. Though this can be done using, say, a simplified DCF model, Rappaport and Mauboussin (2001) claim 'expectations investing' is "a sharp break from standard practice" because of the novel implementation of the DCF model. In addition, the method of estimating revisions in expectations, the 'competitive strategy framework', focuses on firm specific "operating value drivers", i.e., sales growth, incremental investment rate and operating profit margins, and industry characteristics, such as barriers to entry and competition for market share, adjusted for the "value determinant", the cash tax rate. Given that this process can be implemented, it is claimed that expectations investing avoids the numerous limitations of traditional security analysis associated with using accounting numbers and the like to estimate economic values. This is in sharp contrast to English (2001, p.xii), for example, where: "the numbers produced by the GAAP financial accounting system, especially earnings measures, are the most useful single tool in equity analysis."

The beginnings of this connection between DCF valuation and the implied market expectation used in Rappaport and Mauboussin is available in Rappaport (1986). The basic principle of expectations investing follows from the mechanics of the general DCF model: the current price of the stock is the sum of the discounted expected value of future cash flows. Following Rappaport and Mauboussin (2001, p.70):

> To accurately read the expectations wrapped in stock prices, you must think in the market's terms. The long-term discounted cash-flow model best captures the stock market's pricing mechanism. Yet investors justifiably think forecasting distant cash flows is extraordinarily hazardous. Credible long-term forecasts are difficult to make, and they only serve to reveal the forecasting investor's underlying biases. As Warren Buffett says, "Forecasts usually tell us more of a forecaster than of the future."

Given this, Rappaport and Mauboussin claim that the expectations investing procedure allows the user "to retain the discounted cash-flow model but frees you from the burden of cash-flow forecasts". The current stock price is used to "'read' what the market implies about a company's future performance".

While all this sounds exactly like what the doctor ordered, in practice the expectations investing process is a repackaged, if differently focused, type of fundamental analysis. There are a number of tip-offs in Rappaport and Mauboussin to the over-selling of the methodology, e.g., "be aware that reading expectations is as much an art as it is a science. The ability to read expectations improves with experience and industry knowledge" (p.71). To arrive at the cash flows to use in the DCF analysis, Rappaport and Mauboussin recommend the following process:

> You can consult a number of sources – Value Line Investment Survey, Standard & Poor's, Wall street reports (available directly or via services like Multex.com), and other research services – to establish a market consensus forecast for operating value drivers, that is, sales growth rate, operating profit margin, and incremental investment rate.

These "market consensus" estimates are then used to construct the cash flows using a pro forma procedure. But from the various possible measures available, what cash flows do Rappaport and Mauboussin suggest using in the DCF analysis?

As discussed in sec. 8.2, there are a number of possible candidates for the cash flows. Rappaport and Mauboussin (2001, p.21) make the following recommendation:

> Exactly what do we mean by "cash flows", and how does it determine shareholder value? ... Let's take a quick road

> trip. The shareholder-value road map shows the following relationships: Sales growth and operating profit margin determine operating profit; Operating profit minus cash taxes yields net operating profit after taxes (NOPAT); NOPAT minus investments in working and fixed capital equals free cash flow. Think of free cash flow as the pool of cash available to pay the claims of debt-holders and shareholders; Free cash flows discounted at the cost of capital determine corporate value; Corporate value plus nonoperating assets minus the market value of debt equals shareholder value.

In the end for Rappaport and Mauboussin it is expected "***free cash flow***" that is the appropriate cash flow variable to discount in order to determine firm value. With some adjustments, estimated firm value is the basis for determining the estimate of the share price. Even though Rappaport and Mauboussin recommend working backward from the price, there is still the reliance on pro forma accounting numbers to generate the free cash flow inputs. The problems for accounting numbers raised by 'economic value added' measures go unrecognized (see sec. 8.2).

The novelty of the general model of discounted cash flow valuation in Rappaport and Mauboussin (2001) is decidedly overstated. In recommending the use of free cash flow in the DCF analysis, Rappaport and Mauboussin do not differ substantively from, say, Damodaran (1994, ch.7) where the dividend discount model is extended to discounted free-cash-flow-to-equity (FCFE): "The primary difference between the dividend-discount models ... and the FCFE models ... lies in the definition of *cash flows* -- the dividend-discount model uses a strict definition of *cash flow* ... while the FCFE models uses an expansive definition of *cash-flow-to-equity* (the residual cash flow after meeting all financial obligations and investment)." Damodaran (1994, p.143) is less enthusiastic about FCFE vs. dividends as the cash flow measure than Rappaport and Mauboussin, though still mildly positive: "When firms have dividends that are different from the FCFE, the values from these two [discounted cash flow] models will be different. In valuing firms for takeovers or in valuing firms in which there is a reasonable chance of changing corporate control, the value from the FCFE model provides a better estimate of value."

Similar to the DCF modeling approach advocated by corporate finance textbooks, Rappaport and Mauboussin use estimates of the firm's weighted average cost of capital for the discount rate. Recognizing that Rappaport and Mauboussin want to estimate firm value and then make appropriate adjustments to arrive at the value of equity, this is not particularly novel. What is somewhat different in the expectations investing, DCF modeling process is the approach to the problem of determining the number of future periods to use in obtaining the current market price:

> The final value determinant is the number of years of free cash flows required to justify the stock price. We call this horizon the *market-implied forecast period* (it's also called the "value growth duration" and "competitive advantage period"). Practically, the market-implied forecast period measures how long the market expects a company to generate returns that exceed its cost of capital and consequently add no further value. The market implied forecast period for US stocks clusters between ten and fifteen years, but it can range from zero to as long as thirty years for companies with strong competitive positions.

It is the '***market-implied forecast period***' that Rappaport and Mauboussin adopted from Rappaport (1986). Rappaport and Mauboussin (2001, p.73-6) provide a practical application of the whole process to Gateway Computers where, for a valuation done in April 2000, the market-implied forecast period is estimated to be seven years.

The final Rappaport and Mauboussin (2001, p.110) observation needed to confirm the lack of novelty in the expectations approach arises with the suggested process for the "buy decision":

> Stated simply, whenever you estimate that the expected value is greater than the stock price, you have potential opportunity to earn an excess return. However, the prospect of an excess return is by itself not enough to signal a genuine buying opportunity. You must still decide whether the excess return is sufficient to warrant purchase.
>
> Your decision depends on two factors. The first is the stock price's percentage discount to expected value, or its margin of safety. The greater is the discount to expected value, the higher the prospective excess return – and the more attractive a stock is for purchase. Inversely, the higher a stock's price premium to its expected value, the more compelling the selling opportunity.
>
> The second factor is how long it will take for the market to revise its expectations. The sooner the stock price converges toward the higher expected value, the greater the excess return. By the same logic, when expected value is below the current stock price, the faster the price converges toward expected value, and the greater the urgency to sell the stock.

In advocating the "***margin of safety***" principle, Rappaport and Mauboussin are adhering to a Graham and Dodd prescription. In considering 'how long it will take for the market to revise its expectations', Rappaport and Mauboussin are doing little more than academic posturing. There is little in 'expectations investing' that provides guidance on the speed of expectations convergence.

All things considered, does expectations investing represent a novel approach to equity analysis that is a 'sharp break' from conventional approaches. Aside from the focus on "competitive strategy" analysis as a method for evaluating future firm performance, there does not seem to be much in expectations investing that is unconventional. Even the use of competitive strategy analysis is not overly novel when the drivers, such as sales growth and operating profit margins, are identified. The final nail in the expectations investing coffin concerns the valuation of Gateway Inc. (GTW), the firm that was used as the primary practical example to illustrate the relevant techniques. If there is 'more art than science' in expectations investing then, perhaps, this would have been supported in an insightful evaluation of this firm. The valuation was initially done for April 2000 when GTW was selling for $52. The implied-market forecast of seven years was determined by using a 'consensus' sales growth value of 20%, operating profit margin of 9%, cash tax rate of 35%, and incremental fixed-capital rate of 11% and an incremental working capital rate of -5%. Using these values, sales were projected to grow from $10.3 billion in 2000 to $30 billion in 2006.

Rappaport and Mauboussin (2001, p.103-110) revisit Gateway in early 2001, at a time that GTW is trading in the low twenties. To motivate the buy decision, Rappaport and Mauboussin apply expected value analysis to GTW, providing a sales growth rate range from 6% 'low' to 28% 'high', with a '***price implied expectations***' (PIE) growth of 20%. This leads to estimated low and high stock price values of $18.05 and $76. Simple expected value calculations are then recommended using, for example, 50% probability for PIE with 20% probability for the low growth rate and 30% probability for the high to recreate the $52 price observed in April 2000. The bearish 'non-consensus' value of $26.06 is produced with probabilities of 80% low, 15% PIE and 5% high. Rappaport and Mauboussin do not address the actual change in GTW from April 2000 to early 2001, where the stock price was even lower than the 'bearish non-consensus' value of $26.06. Even more disturbing, the next two years sales performance for GTW has witnessed a fall in sales from $9.6 billion (12/31/2000), to $6.08 billion (12/31/2001) to $4.17 billion (12/31/2002), a decline over the three years of -21.57% per year. Having done the expectations investing analysis on the verge of a major collapse in fundamentals for GTW, Rappaport and Mauboussin were unable to forecast the dramatic impending changes looming just ahead.

8.2 Interpreting Financial Statements

A. Financial Statement Analysis

One of the tenets of GDC (1962, p.105) is: "All security analysis involves the analysis of financial statements". Warren Buffett's recommendation of the discounted cash flow (DCF) model raises a legitimate question about how 'cash flows' are determined from the accounting and other information provided by the firm. Even Fisher's focus on the characteristics of the business requires interpreting information from the firm's financial statements in order to make assessments about the performance of the business. Penman (2001, p.12) makes the observation: "Payoffs from operations have to be measured. Are they cash inflows minus cash outflows (net cash flows)? Are they revenues minus expenses (net income)? If so, how is revenue measured and how is expense measured? Specifying and measuring the payoffs is critical to valuation [fundamental] analysis. It is an accounting issue". The subject of financial statement analysis is concerned with the various methods for extracting information from the financial statements of the firm. This includes both the current and past statements, as well as forecasts of future statements, i.e., pro forma analysis.

Under US generally accepted accounting principles (***GAAP***), the accounting statements that are typically available for analysis are: the ***balance sheet***, the ***income statement***, the ***cash flow statement***, and the ***statement of stockholders' equity***. In addition to these statements, there is also the footnotes and other supplementary information that is provided along with the four basic statements. Best practices in the preparation of the annual report for the firm is to expand and detail the information that is contained in the financial statements. For example, the annual reports of the major Canadian banks contain a detailed discussion of the various sources of risk that face the firm, including value-at-risk estimates for the range of major market risks facing the firm arising from interest rates, exchange rates and commodity prices. Though a strict interpretation of financial statement analysis includes only 'analysis of the financial statements', this 'analysis' can be greatly aided by considering or incorporating the discussion that is included in the body of the annual report, 10-K or other document that is being used as the source of the financial statements. When such information is considered, the analyst cannot lose sight of the possible biases that can arise if the various pronouncements of the firm's management are taken at face value.

Following Penman (2001, ch2), analysis of financial statements requires discussion of both ***form*** and ***content***. Form deals with the manner that the statements, and parts of the statements, fit together. Content deals with the various line items that are reported in the statements. Except for specific items of interest, detailed consideration of content falls within the realm of accounting theory and practice, a topic that lies outside the scope of this discussion. For US companies, content is largely determined by the GAAP formulated by the Financial Accounting Standards Board (FASB). For securities that are publicly traded in US securities markets (including many large cap Canadian stocks), SEC rules ensure adherence to GAAP.[5] There are numerous excellent sources on GAAP for financial accounting, e.g., Bernstein (1989). Accounting principles for securities traded outside the US are subject to accounting rules for those jurisdictions, with the International Accounting Standards Board (IASB) providing guidance in many non-US jurisdictions. While there are some jurisdictions that do impose 'revealing' accounting standards, e.g., Canada and Singapore, it is unwise to expect the type of company information provided under US accounting standards to be available when foreign securities are being considered.

INSERT Table 8-e Ford Motor 2002 Income Statement

Though there are numerous constraints imposed by GAAP on financial accounting practices, ***GAAP is not a straightjacket***. There is some scope for working within GAAP to present accounts that are the most representative of the activities of the firm. This means that companies involved in different businesses or in more than one line of business will present accounts that do not have exactly the same content, e.g., because there is no information to report in certain content categories. There may also be some cosmetic differences in form. This is illustrated in Table 8-e that provides the "Sector Statement of Income" (income statement) for Ford Motor Company.[6] In addition to the consolidated form of the income statement, Ford also reports the sector income statement to recognize the two distinct parts of the business: automotive; and, financial services (about 80% Ford Credit and 17% Hertz). The typical form of the income statement is repeated for both of these parts, though the content items do differ. In addition to being the source of the important "net income" figure, i.e., the earnings generated by the firm for equity claimholders, the income statement contains numerous other items that can be used in the evaluation of company performance.

INSERT Table 8-f Statement of Operations US Steel

A model format for the income statement is given in Penman (2001, p.33), based on the financial statement of Dell Computer (DELL):[7]

Net Revenue – Cost of Goods Sold = Gross Margin
Gross Margin – Operating Expenses = Operating Income before Tax (EBIT)
Operating Income before Tax – Interest Expense = Income before Taxes
Income before Taxes – Income Taxes = Income after Taxes (and before Extraordinary Items)
Income before Extraordinary Items + Extraordinary Items = Net Income
Net Income – Preferred Dividends = Net Income Available to Common

In the Ford (F) income statement, 'net revenue' is replaced by 'sales' for the automotive component and 'revenues' for financial services. Other variations are also possible. For example: Alcan Inc. (AL) uses a general category for 'Revenues' and then provides subsections for 'Sales and Operating Revenues' and 'Other Income'; Transocean Inc. (RIG) reports a line item for 'Operating Revenues'; and US Steel Group (X) reports a general category for 'Revenues and other income' that includes 'revenues', 'income from investees', 'net gains on disposal of assets' and 'other income' (see Table 8-f). Banks use a somewhat different format. For example, the income statement provided in the annual report for the Royal Bank of Canada (RY), which is prepared under Canadian GAAP, has two general categories, one for 'interest income' and another for 'other income'. Each of these categories contains numerous subheadings that decompose income by source.

The basic problem of financial statement analysis is to translate accounting numbers into a viable economic interpretation of the operations of the firm. As such, the cash flows in DCF analysis can be interpreted as the economic profits generated by the firm. In economics, profits are defined as revenues minus costs. Subject to adjustments for accruals, revenues can usually be taken directly from the income statement. However, the precise cost items to include in the calculation of economic profits is not obvious. The income statement provides various possible methods of determining costs. Inclusion of all cash and accrual costs items results in ***the income statement accounting relationship***:

Revenue - Costs = Net Income.

After deduction for preferred dividends, this is the 'cash flow' or net income or 'earnings' available to common shareholders. Under clean surplus accounting, these earnings are either paid out as dividends or retained by the firm and used to make additions to the assets of the firm. Yet, there are legitimate reasons to consider other ways of calculating economic profits than earnings available to common. For example, 'depreciation costs' are a non-cash expense that is calculated according to accounting rules. The value used may or may not represent the economic depreciation of assets.

The various possible methods of calculating revenues minus costs is facilitated by the accounting procedures for reporting cost items. As such, the revenue item usually has considerably less components than the cost line. The components of cost almost always include four key items: cost of goods sold; selling general and administrative expenses; depreciation, depletion and amortization; and, income taxes. If the firm has engaged in borrowing activities then there will be another item associated with the 'interest expense' or 'net interest expense', with both interest revenue and interest expense usually being reported in the latter case. For example, in Table 8-e, Ford reports an interest expense item for both the automotive and financial services divisions, together with an interest revenue component for the automotive division. In Table 8-f, US Steel reports only an item for 'net interest and other financial costs'. Information about the sources of interest revenue can be obtained from the balance sheet and the notes to the financial statements. For companies involved in financial intermediation, such as commercial and investment banks, the handling of interest costs and expenses will be decidedly more complicated.

Other important cost items may appear depending on the company's type of business. For example, oil and gas companies such as Suncor (SU) will include a line item for 'exploration' and, possibly, 'royalties'. Technology companies, such as Genetech (DNA) or Intel (INTC), will include a line for 'research and development'. For companies that have been actively involved in mergers and acquisitions, e.g., Transocean, there will be an item for 'goodwill amortization'. There are also items that have a classification component. One such item is 'gain (loss) from the sale of assets'. US Steel classifies this item under revenue, while Transocean treats this as an expense. Both of these treatments involve accounting for this item in operating income before interest and taxes (EBIT). In certain situations, it is not straightforward to determine whether such items appear in EBIT or are subtracted afterward as 'extraordinary gains and losses'. This classification decision can have significant implications for analysis of profitability that uses measures such as EBIT and EBITDA.

INSERT Table 8-g Sector Balance Sheet of Ford Motor

INSERT Table 8-h Balance Sheet of US Steel

In sec. 7.1, the common stock valuation problem was related to the 'stock' and 'flow' interaction encountered in the theoretical economic analysis of the firm. The 'stock' of productive assets, both tangible and intangible, produces a 'flow' of earnings. The income statement relates to the accounting for the flow component and the balance sheet relates to the 'stock' component. Insofar as the ***market value*** of assets reflects the ability to generate cash flow, then the balance sheet can also be used as vehicle for valuation of the firm's securities. Because of the complicated interaction of tangible and intangible assets that is involved in the production of net income, it is usually not practical to sum the market value each asset to determine an aggregate market value of assets. Rather, it is more appropriate to assess the acquisition value of the firm's assets as a whole. Except for large sophisticated investors such as Warren Buffett, this is not typically an exercise that can be accomplished by individual investors. Rather, when an ability to estimate acquisition value is not available, then the balance sheet becomes an adjunct to analysis of the income statement, providing information about: the stock of assets used to generate net income; and, the capital structure used to finance those assets.

Theoretically, the balance sheet is the appropriate accounting statement to use for determining the value of common stock. This is apparent from the ***basic balance sheet accounting identity***:

Assets - Liabilities = Shareholders' Equity.

Netting out the value of preferred stock and dividing the remaining value of shareholders' equity (or, as in Ford's balance sheet, 'stockholders' equity') by the number of shares outstanding gives a value for a share of common stock. Yet, for a whole range of reasons, this estimated value for common stock will differ significantly from the observed market price. In other words, the book value of equity does not typically provide an accurate estimate for the market value of the common stock. The book value of equity is an accounting number that reflects the initial capital invested in the business plus the accumulated retained earnings. Understanding how this accounting number can deviate from the economic or intrinsic value of equity is a key aspect of accurately doing a security analysis. The ratio of the ***market capitalization of equity*** (market cap)-- the market price of common stock times the number of shares outstanding -- to the book value of common stockholders' equity -- ***the price-to-book ratio (P/BV)*** -- is a key measure of this aspect of security analysis.

The composition of the balance sheet is considerably less complicated to understand than that of the income statement (see Tables 8-g and 8-h). However, simplicity and various problems associated with book values versus market values does not mean that the balance sheet is uninteresting. Depending on the specific valuation, there are numerous items on the balance sheet that are of interest. For example, GDC identified the net current asset position per share as an important indicator of value. For both Ford and US Steel the employee pension and benefit plans are key items. For Ford, this item is bundled into 'other liabilities' while for US Steel the item is decomposed into 'employee benefits' and 'prepaid pensions'. Another important balance sheet item is the property, plant and equipment account. For Ford, this item is itemized as 'net property'. In both cases, the property, plant and equipment item (PPE) includes an allowance for accumulated depreciation. Because both Ford and US Steel are engaged in industries with large amounts tangible assets and relatively low intangible assets, evaluation of the market value of PPE is an important element in assessing the 'acquisition value' of these companies.

INSERT Fig 8-a Relationship among financial statements

As illustrated in Fig. 8-a, the income statement, cash flow statement and statement of changes in shareholders' equity conceptually capture different aspects of changes in the balance sheet. Yet another approach explaining balance sheet changes is the ***clean surplus equation***:

$$E_t = D_t + RE_t = D_t + BV_t - BV_{t-1} \quad \rightarrow \quad E_t - D_t = \Delta A - \Delta L$$

Historically, accounting practice was content to provide only the income statement and the balance sheet. As discussed above, these statements alone have certain limitations for analytical purposes. To address some of these limitations, the cash flow statement and statement of changes in shareholders' equity are prepared. While the statement of changes in shareholders' equity has limited analytical uses, the cash flow can be invaluable. This statement is based on a rearrangement of balance sheet and income statement items into a form that is particularly well suited for identifying items of relevance in security analysis, such as free cash flow.

INSERT Table 8-j Sector Cash Flow Statement from Ford
INSERT Table 8-k Cash Flow Statement from US Steel

The ***cash flow statement*** is based on the following identity:

Change in Cash = Cash from Operations + Cash from Investing Activities + Cash from Financing Activities

Though it might seem that the change in cash is only an incidental item for most valuations, it is the process of arriving at the change that is important. By collecting items according to function, the activities of the firm reflected in the other accounting statements becomes more transparent. It is often stated that earnings are, in many ways, something of a fiction. This rationale for this observation is apparent in Table 8-k where, in 2001, US Steel had a net income loss of $218 million compared to $21 million in 2000. Yet, cash provided by operating activities in 2001 was $669 million versus a loss of $627 million in 2000. Though similar capital expenditures were done in both years, the better earnings picture in 2000 was created by a $1.2 billion increase in debt whereas a debt repayment of $370 million was made in 2001. The cash flow statement reveals that the situation at Ford is the reverse. Table 8-j reveals that the large loss in net income for Ford is due primarily to a deterioration of the core business, as reflected in the large drop in cash generated by operating activities. The impact of the weak operating situation on net income is mitigated by the allowance made for capital expenditures and acquisitions being at a lower level than in previous years as well as a lower level of payment in cash dividends.

The motivation for the ***Statement of Stockholders' Equity*** -- to reconcile the items that produced the change in the book value of equity over the period -- is well conceived. However the execution leaves much to be desired (and no examples of this statement are provided here). The basic accounting identify for this statement is, more or less, the same as the clean surplus equation: *Change in Shareholders' Equity = Earnings - Net Cash Paid to Shareholders.* As Penman (2001, p.35) observes: "Unfortunately, the statement is not presented as clearly as this reconciliation of beginning and ending equity prescribes. Indeed, ... the accounting in this statement is rather poor." Yet, this does not mean this statement is always without value. For example, the impact of foreign currency translation losses and derivative accounting transactions on Ford Motor is revealed. Negative values for such items can, in some cases, be offset by positive values in later periods mitigating the impact on shareholders' equity. This type of revealing information is not always the case. For example, the statement of shareholders' equity reveals little about the operations of US Steel. There was some impact on equity associated with transaction between Marathon and US Steel (the two components of USX), but the nature of these transactions is not apparent from inspection of this statement.

B. Earnings, Free Cash Flow and EVA

The central importance of DCF valuation models in modern security analysis begs an obvious question: ***what is the appropriate 'cash flow' to discount in the DCF model?*** Given the potential limitations in the net income number identified in the discussion of the cash flow statement, this earnings number that receives so much attention in 'sell side' security analysis would seem to be a relatively poor candidate, though this is not a clear cut issue. Buffett recommends using owner's earnings calculated as "reported income" (presumably net income) plus depreciation, depletion, amortization, and certain other non-cash charges minus the average annual amount of capitalized expenditures for property plant and equipment and other items that the business requires to fully maintain its long-term competitive position and its unit volume. This is similar enough to the calculation of free cash flow that it could be called '***economic free cash flow***'. In other places, Buffett recommends discounting the amount of cash that will be paid out of during the life of the firm. Both of these measures are difficult to implement precisely. Both notions require estimating values that are effectively unknown. The desire for more precision in the numbers used in the DCF analysis dictates that only cash flow variants derived from manipulation of accounting numbers be considered as viable proxies, e.g., English (2001, ch.14-6).

The form of the financial statements is determined by GAAP. There is no such guidance available where analysis of the financial statements is involved. Construction of 'earnings' numbers as inputs for use in DCF analysis and other techniques of security analysis is guided more by conceptual intuition than precise rules. An example of this is provided by the text for the Canadian Securities Course (Canadian Securities Institute 1992), a certification course required to work in the Canadian securities markets. This source defines earnings per common share (EPS) as: *[Net earnings (before extraordinary items) - Preferred Dividends] / Number of common shares outstanding*, where 'net earnings' means 'net income'. While the adjustment of net income for preferred dividend payments is consistent with Bernstein (1993, ch.12), the deduction of extraordinary items is not. On this point, Bernstein (1993, p. 767) observes: "in determining the earning power of an enterprise, no item of income and expense should be excluded. Since every item of income or expense is part of the enterprise's operating experience, the question is only what year items should be assigned". It seems there is not even agreement in key sources on the calculation of the most basic earnings numbers used for analytical purposes.

While being clear on the calculation of earnings, Bernstein does recognize the adjustments that may be made for purposes of analysis:

> For purposes of analysis or comparison, analysts may, however, wish to focus on an adjusted level of earnings for a short period ... This can be done by adding to, or removing from, reported earnings per share selected items of income or expense that were included therein. If this is to be done on a per share basis, every item must be adjusted for tax effect (by using the enterprise's effective tax rate unless the applicable tax rate is otherwise specified) and must be divided by the number of shares that are used in the basic computation of earnings per share.

Hence, even though the adjustment for extraordinary items in the Canadian Securities Course method of calculating EPS is acceptable on grounds of "analysis or comparison", there is no explicit recognition of the tax adjustment for the extraordinary items. Given the key role played by *EPS* in various aspects of security analysis, e.g., in the determination of the *P/E* ratio, it is not surprising that there are disparate opinions about the appropriate calculation of other less commonly used 'cash flow' measures, such as free cash flow.

Higgins (1998, p.19) observes: "So many conflicting definitions of cash flow exist today that the term has almost lost meaning". In the absence of 'generally accepted cash flow calculation principles', there has been a proliferation of cash flow valuation models that purport to accurately capture the economics of equity valuation. In the management consulting industry, these models are also marketed as methodologies for 'managing company value', 'generating shareholder value' and accurately setting executive compensation. A partial list of these methodologies includes: Economic Value Added (EVA) from Stern Stewart & Company; the Economic Profit Model from McKinsey & Company; Economic Value Management from KPMG; and, Value Builder from Price-Waterhouse. The basic idea behind these methodologies is to make adjustments to GAAP numbers to produce measures of cash flow that can be used to better assess economic value. As Copeland et al. (1996) observe in describing the McKinsey & Company approach: "Cash is King". The number of adjustments to GAAP numbers can be considerable. For example, Weaver (2001) estimates that determining EVA from GAAP numbers can involve up to 164 adjustment items. The precise adjustments used will depend on subjective assessments of factors such as the nature of the industry and the availability of data.

To evaluate the different variations that arise in determining the 'cash flow' variable to be used in DCF valuation it is helpful to examine the conceptual foundations of the technique. DCF valuation is a variation on the net present value (NPV) model used in capital budgeting. This model has a long history, with elements that can be traced to Frank Knight, Alfred Marshall and the Austrian capital theorists.[8] Though conventional microeconomic theory is largely static, the capital investment problem requires the introduction of expectations about future input and output prices, the length of the production period, the production plan, the accumulation of capital, the degree of competition in the industry and so on. In this theoretical approach: "the market value of the firm is a reflection of its expected future earnings ... the object of the owner of the firm is to make this market value, called its *capitalized present value*, as large as possible" (Baumol 1970, p.24). Earnings are defined: "The sum of the money value of his outputs during a period is the entrepreneur's total revenue for that period, and the sum of the money values of the inputs is the total cost incurred during period.

The difference constitutes his total [profit] for that period" (Baumol 1970, p.65). Profit, earnings and surplus are loosely used to capture the same concept.

Given this, the theoretical foundation for DCF analysis requires evaluating the discounted present value of the future stream of 'economic profits', where profits are measured as the cash value of revenues minus the cash value of costs, including interest payments, adjusted for taxes. In capital budgeting, the terminology 'net cash flow' or 'cash earnings' is substituted for 'economic profit'. To determine ***net cash flow*** from GAAP numbers:[9]

$$Net\ Cash\ Flow = Net\ Income \pm Non\text{-}Cash\ Items$$

From this conceptual starting point, the calculations become fuzzier. Ignoring the problems associated with GAAP recognizing revenues and costs when booked not when the cash is received, important non-cash expenses reported for almost all firms are: 'depreciation, depletion and amortization' and 'deferred taxes'. In Tables 8-e and 8-f, Ford and US Steel also report other items that involve non-cash components, e.g., 'Provision for credit and insurance losses' and 'pensions and other post-retirement benefits'.

INSERT Table 8-p Note 18 Operating Cash Flows, Ford 2002 annual report

Working backwards from net income to net cash flow involves disentangling 'cash' from non-cash items. This can be a complicated exercise. In addition, there are cash items that may provide positive or negative cash flow to the company but are better considered differently when doing the 'economic profit' calculation. The most important such item is cash adjustments to working capital that took place due to the firm's operations. All these considerations go into determining the 'net cash flows from operating activities' reported in the Statement of Cash Flows (see Tables 8-j, 8-k, 8-p). The analytical fuzziness of this cash flow calculation is captured in the treatment of 'net interest expense' which is included in net income and not subtracted out in determining 'net cash flows from operating activities', e.g., Penman (2001, p.119). Whether an adjustment for net interest is required is not a clear cut issue.[10] If this adjustment is made, then the tax implications also need to be taken into account. In the end, this item only relates to the cash revenues (adjusted for some of the cash costs) part of 'economic profit'. Because 'depreciation, depletion and amortization' has been added back, a further adjustment is required to account for the cash capital expenditures that were made to support the productive activities of the firm.

While the Statement of Cash Flows seems to be a promising source of accounting numbers for calculating the 'economic profit' needed in the DCF calculation, it is apparent that numerous adjustments are required. These adjustments are not mechanical but, rather, require subjective assessments. This is especially the case for the capital expenditure adjustment. 'Depreciation, depletion and amortization' was added back to net income because this item is a non-cash expense that, in most cases, does not reflect the underlying economic requirement for a cash expenditure item that reflects the assumptions about the length of the production period, the production plan, the accumulation of capital, the degree of competition in the industry and so on. More precisely, the forecasting of future economic profits embeds an assumption about a stream of capital expenditures required to sustain this projection. Firms facing an earnings squeeze may react by cutting back on capital expenditures and permitting a running down the capital stock. This could be what is happening with Ford in Table 8-j. Hence, the cash outflow associated with capital expenditures (capex) derived from the cash flow statement may not provide a realistic picture of the capex required to keep a firm on the historical growth path. Adjusting for alternative growth scenarios is even more complicated.

Conceptually, the DCF calculation can be used to produce either a market value of the firm, by discounting cash flows going to the firm, or a market value of common equity, by discounting the cash flows going to common equity. The connection between these two approaches to DCF valuation follows from the ***market value balance sheet relationship***:

Market Value of Equity = Market Value of Common Stock + Market Value of Preferred Stock
= Market Value of Assets - Market Value of Liabilities

where the market value of assets is equal to the market value of the firm. In effect, the DCF calculation for the estimated market value of the firm adjusted for the market value of liabilities plus the market value of any preferred stock will theoretically be equal to the DCF calculation for the estimated market value of equity. This relationship is only theoretical because DCF valuations are only estimates. The implication is that the DCF value of items that are excluded from cash flows to equity and included in cash flows to the firm will be sufficient to reconcile the two approaches. Because these items are related to debt and preferred stock cash flows the market values and values estimated by DCF methods will likely be approximately equal. As a consequence, subtracting the market value of debt and preferred stock from a DCF estimation of the market value of the firm can be expected to give more-or-less the same value as doing DCF for common equity directly.

The cash flow variable that is most commonly calculated from GAAP numbers to be used in DCF analysis is ***free cash flow*** (FCF). The precise FCF calculation depends on whether the DCF valuation is for the firm or for common equity. Different presentations of the calculation of FCF are available, depending on whether the particular financial statement(s) used in the calculation and whether FCF for common equity (*FCFE*) or FCF to the firm (*FCFF*) is required.[11] For example, Higgins (1998) gives the following calculation:

$$FCFF = EBIT(1 - Tax\ rate) + Depreciation - Capital\ Expenditures \pm \Delta\ Net\ Working\ Capital$$

Following Higgins (1998, p.323) the rationale for this FCF to the firm calculation is:

> The rationale for using free cash flows goes like this. EBIT is the income a company earns without regard to how the business is financed; so EBIT(1 - Tax rate) is income after tax excluding any effects of debt financing. Adding depreciation and any other significant noncash items yields the standard aftertax cash flows used in capital expenditure analysis. If management were prepared to run the company into the ground, it could distribute this cash to owners and creditors, and that would be the end of it. But in most companies, management retains some of this cash flow in the business to pay for new capital expenditures and possibly to increase net working capital. The cash available for distribution to owners and creditors is thus aftertax cash flow less capital expenditures and increases in net working capital. Reductions in net working capital are also possible, and they add to free cash flow.

This rationale captures the essential point that free cash flow is a 'best efforts' attempt to use GAAP numbers to calculate a value for 'economic profit'.

The approach to calculating FCF given by Higgins differs somewhat from approaches that work backward from net income, e.g., Damodaran (1994, p.127). Users of this approach are often motivated to obtain *FCFE*, because net income has already made provision for payments to debt holders. In this case, assuming no outstanding preferred share issues:

FCFE = Net Income + Depreciation - Capital expenditures - Δ *Net Working Capital*
- Debt principal repayments + Proceeds of New Debt Issues

This formulation differs from the Higgins approach due, for example, to the inclusion of extraordinary items. Because FCF is an analytical concept, there is no 'correct' method for calculating this value. The analyst is required to determine which calculation is most appropriate. If ease of calculation is a concern, comparison of this calculation with the cash flow statement reveals that *FCFF* and *FCFE* can be easily calculated as:

FCFF = Cash Flow from Operations - Capital Expenditures + Interest Expense(1 - Tax Rate)
FCFE = Cash Flow from Operations - Capital Expenditures - Preferred Dividends
- Debt principal Repayments + Proceeds of New Debt Issues

For firms without any preferred stock and no changes in outstanding debt issues the *FCFE* calculation is simplified to the subtraction of two items for the cash flow statement: *FCFE = Cash Flow from Operations - Capital Expenditures*.

Free cash flow is a practical attempt to use GAAP numbers to determine a value for economic profit. It is not difficult to see that FCF inherits many of the problems associated with reconciling GAAP numbers to be consistent with economic value. Unfortunately, the appropriate method for adjusting GAAP numbers is not obvious and is likely to vary from firm to firm, depending on particular circumstances. This situation has created an opportunity for the management consulting industry to sell customized adjustments on a fee-for-service basis. There is considerable attractiveness in this activity. On the one hand, there is the potential for measuring the 'true value' of a company. Changes in that value can be used as a measure of management effectiveness and to provide a guide to management as to appropriate corporate policies to 'enhance shareholder value'. On the other hand, the conceptual difficulties of correctly manipulating GAAP accounting numbers can prevent corporations from accomplishing this task with in-house resources. Management consulting services can compete on service by 'branding' the techniques and procedures used to produce 'accurate economic value measures'. As a consequence, there has emerged in the last decade a significant number of such 'branding exercises'. 'Economic Value Added' (EVA) is the registered trademark for the methodology developed by Stern Stewart & Company, e.g., Ehrbar (1998).

Despite the presence of proprietary techniques that are only known within Stern Stewart Company, ***the basic elements of the EVA technique*** do not differ substantively from, say, the 'Economic Profit Model' developed by McKinsey & Company, e.g., Copeland et al. (1996).[12] Both techniques are usually applied to aid with corporate management decision making, so the corresponding FCF value is *FCFF*. Though there are a number of equivalent ways of calculating basic EVA, one revealing formulation is:

$$EVA = EBIT(1 - Tax\ rate) - \{(Weighted\ Average\ Cost\ of\ Capital)(Invested\ Capital)\}$$
$$= Invested\ Capital\ (Return\ on\ Invested\ Capital - Weighted\ Average\ Cost\ of\ Capital)$$
$$\equiv Invested\ Capital\ (ROIC - WACC)$$

where the return on invested capital (*ROIC*) is expressed after tax and depreciation.[13] The relevance of using of *EBIT(1 - Tax rate)* is captured by the introduction of a new terminology, either *NOPAT* or *NOPLAT* to refer to 'net operating profit after tax' or 'net operating profits less adjusted taxes'.

INSERT Table 8-sss Example of Different Methods of Calculating Invested Capital

The number in EVA that is somewhat complicated to determine is 'invested capital'. This number can be determined from either the side of the balance sheet, e.g., Copeland et al. (1996, p.164):

> Invested capital represents the amount invested in the *operations* of the business. Invested capital is the sum of operating working capital; net property, plant and equipment; and net other assets (net of noncurrent, noninterest-bearing liabilities). Invested capital, plus any nonoperating investments, measures the total amount invested by the company's investors, which we will call total investor funds. Total investor funds can also be calculated from the liability side of the balance sheet as the sum of all equity (plus quasi-equity items like deferred taxes) and interest-bearing debt.

Table 8-s provides a basic example reconciling the two different approaches. This example does not provide an exhaustive list of the relevant right hand side balance sheet items that could be included. A partial listing of the items that could be used to calculate invested capital are:[14]

$$Invested\ Capital = Bank\ Indebtedness + Short\text{-}term\ debt + Dividends\ payable$$
$$+ Current\ Portion\ of\ Long\ Term\ Debt + Deferred\ Taxes + Preferred\ Shares$$
$$+ Share\ Capital + Retained\ Earnings + Other\ Financial\ Assets$$

Examination of Table 8-g and 8-h reveals a number of other items that have to be assessed (see end of chapter questions.)

The EVA approach is conceptually the same as the 'Economic Profit Model' of McKinsey & Company. As described by Copeland et al. (1996, p.149-50), the economic profit model is an advance over DCF valuation using FCF:

> An advantage of the economic profit model over the [FCF] DCF model is that economic profit is a useful measure for understanding a company's performance in any single year, while free cash flow is not. For example, you would not track a company's progress by comparing actual and projected free cash flow, because free cash flow in any year is determined by highly discretionary investments in fixed assets and working capital. Management could easily delay investments simply to improve free cash flow in a given year at the expense of long term value creation.

According to proponents, EVA and the Economic Profit Model are conceptual advances over using

FCF-based DCF:[15]

> Economic profit measures the value created in a company in a single period of time and is defined as follows:
> Economic Profit = Invested Capital x (ROIC - WACC)
> ... The economic profit approach says that the value of a company equals the amount of capital invested, plus a premium or discount equal to present value of its projected economic profit:
> Value = Invested Capital + Present value of projected Economic Profit.
> The logic behind this is simple. If a company earned exactly its WACC every period, then the discounted value of its projected free cash flow should exactly equal its invested capital. In other words, the company is worth exactly what was originally invested. A company is worth more or less than its invested capital only to the extent that it earns more or less than its WACC. So the premium or discount relative to invested capital must equal the present value of the company's future economic profit.

Such claims beg an obvious question: are these approaches as superior to other DCF approach and other valuation techniques as the proponents claim?

INSERT Table 8-u Top 30 Stern Stewart MVA ranks

EVA and the related techniques being marketed by the management consulting industry were initially proposed to measure corporate performance and assess the use of shareholder capital by management. Because this involves a valuation exercise, it is natural that the performance of EVA as a tool in security analysis was empirically examined. For example, Stern Stewart provide annual rankings of firm performance based on estimates of EVA and a related measure, market value added (MVA). Stern Stewart (www.sternstewart.com) describes the rankings and MVA as follows:

> Stern Stewart compiles annual performance rankings of large, publicly owned companies in most of the major countries of the world. The rankings are in terms of a measure that we call MVA, for Market Value Added. MVA is the difference between the market value of a company (both equity and debt) and the capital that lenders and shareholders have entrusted to it over the years in the form of loans, retained earnings and paid-in capital. As such, MVA is a measure of the difference between "cash in" (what investors have contributed) and "cash out" (what they could get by selling at today's prices). If MVA is positive, it means that the company has increased the value of the capital entrusted to it and thus created shareholder wealth. If MVA is negative, the company has destroyed wealth.

As illustrated in Table 8-u, the MVA rankings for 2000 produce some odd results with Cisco, Lucent and Sun Micro all ranking in the top 15 of the 1000 firms being ranked. Yook and McCabe (2001) even present evidence that MVA is negatively related with future stock returns. However, it does not follow that EVA and MVA will produce similar predictions about future returns. For example, the EVA for a number of firms in Table 8-u does seem to provide an indication of the impending poor performance.

Unfortunately, the promise of superior performance for EVA as a security analysis tool compared to traditional measures such as net income does not have much empirical support. For example, Clinton and Chen (1998) found that other traditional accounting measures, such as *P/E*, *EPS* and *ROA*, tracked stock returns more reliably than *EVA*. More recently, Cordeiro and Kent (2001) considered whether analysts that adopted EVA outperformed other analysts in forecasting future EPS and found "no significant relationship between EVA adoption and security analyst forecasts of future firm EPS performance." Biddle et al. (1997, 1998) find similar results. For example, Biddle et al.

(1997) conclude: "earnings [are] more highly associated with returns and firm values than EVA, residual income, or cash flow from operations. Incremental tests suggest that EVA components add only marginally to information content beyond earnings ... these results do not support claims that EVA dominates earnings in relative information content, and suggest rather that earnings generally outperform EVA."

C. Financial Shenanigans

It is difficult to find a period since the enactment of the major securities legislation in 1933 and 1934 where the failures of the accounting profession have been so apparent than in the period surrounding the Enron collapse. Arthur Anderson, one of the at-the-time-big-Five accounting firms, was indicted and dismantled for practices that were seemingly devious and illegal. Collapses at telecom firms, such as Worldcom, raised serious concerns about the ability of firms to manipulate the accounting numbers that were being presented in annual reports and regulatory filings. These are only two of a large number of similar situations that led Congress to introduce and pass legislation requiring substantive oversight of the accounting profession in the form of the Sarbanes-Oxley Act.[16] All this is clouded by the confusion over which activities were illegal frauds and which were legitimate, if somewhat unethical, 'management' of accounting numbers. Even if accounting numbers are prepared according to Generally Accepted Accounting Practices (GAAP), there is still considerable leeway in massaging the accounting numbers to present a misleading description of the firm's financial performance.

Schilit (2002) is a now classic primer on the identification of financial shenanigans. The author, Howard Schilit is also the founder of the Center for Financial Analysis and Research (www.cfraonline.com), a provider of analysis about misleading information produced by the accounting practices of specific firms. The seven shenanigans identified in Schilit (2002, p.24-5) have achieved recognition in various other sources as a benchmark for discussing these issues, e.g., English (2001, p.129). All that is provided here is an overview to give the flavor of the problems that can arise. The first shenanigan is:

Shenanigan No. 1: Recording Revenue Too Soon or of Questionable Quality

* Recording revenue when future services remain to be provided
* Recording revenue before shipment or before the customer's unconditional acceptance
* Recording revenue even though the customer is not obligated to pay
* Selling to an affiliated party
* Giving the customer something of value as a quid pro quo
* Grossing up revenue

Each of the (*) items is a technique that can be used by a corporation to achieve the desired manipulation of the accounting numbers. Schilit usually provides an example or two of each technique. For example, in 1996 Sunbeam began using the technique of booking revenue to boost sales of gas grills, even though there was a significant probability of right-of-return in the sales. In such cases, FAS 48 requires recognition of such sales in revenue only when the cash is received. The SEC latter determined that Sunbeam did overstate revenues on these sales.

The second shenanigan is related to the first, though the issues involved here have a greater element of unethical or fraudulent intent:

Shenanigan No. 2: Recording Bogus Revenue

* Recording sales that lack economic substance
* Recording cash received in lending transactions as revenue
* Recording investment income as revenue
* Recording as revenue supplier rebates tied to future required purchases
* Releasing revenue that was improperly held back before a merger

Surprisingly, it is not just 'shady characters' that engage in such activities. Major companies such as Bausch & Lomb and Xerox have engaged in this type of activity. For example, Xerox improperly recognized revenue from lease operations that involved future deliveries of supplies and services. In addition to corporate giants, there are also smaller firms populated by shady characters that engage in such activities. An excellent sources on such activities can be found in the writings of David Baines at the Vancouver Sun documenting, among other things, the phony revenue recognition schemes of various promoters that populated the Vancouver Stock Exchange and now operate on the OTC bulletin board and TSX Venture Exchange. Of course, bogus revenue schemes are not restricted to the small firms examined by Baines, as evidenced by the infamous ZZZZ Best bankruptcy of 1987 (Baliga 1995).

The third shenanigan is less insidious than the first two and, arguably, lies within the fair game area of managerial discretion. For example, consider an airline that is under earnings pressure and is anxious to avoid reporting poor earnings numbers. One option would be to sell or lease-back an airplane that had a low book value due to substantial depreciation. Another example of a possible transaction that could be used to boost earnings is to sell a marketable security that was purchased at a price well below the price at which the security could be sold.[17] The listing of possible techniques for this type of shenanigan are:

Shenanigan No. 3: Boosting Income with One-Time Gains

* Boosting profits by selling undervalued assets
* Including investment income or gains as part of revenue
* Reporting investment income or gains as a reduction in operating expenses
* Creating income by reclassification of balance sheet accounts

Schilit provides a number of examples where this boosting of income originated from the pooling of interests associated with a merger or acquisition.

The objective of accounting manipulations is to produce financial statements that are not accurate reflections of the position of the firm intended by GAAP. This usually involves a desire to inflate current earnings numbers, though there are some reasons to deflate current earnings in order to achieve better earnings in later periods. Shenanigans 1-3 relate to boosting earnings by inflating revenues. A similar result can be achieved by deflating expenses or by suppressing the recording of liabilities. This objective is covered in shenanigan four:

Shenanigan No. 4: Shifting Current Expenses to a Later or Earlier Period

* Capitalizing normal operating costs, particularly if recently changed from expensing
* Changing accounting policies and shifting current expenses to an earlier period
* Amortizing costs too slowly
* Failing to write down or write off impaired assets
* Reducing asset reserves

AOL provides an excellent recent example of this type of shenanigan where, according to the SEC, the costs of marketing to acquire customers were inappropriately capitalized. Other examples are: Snapple and JDS Uniphase where expenses were reclassified and booked against previous periods; Orion Pictures where costs of failed films were written off too slowly; and Lockheed where impaired assets, effectively new aircraft designs that were not feasible for production, were not written off quickly enough. Some financial institutions also engage in this type of activity by being too slow to make provisions for bad loans.

The fifth shenanigan has a number of dimensions. Perhaps the most topical aspect of this shenanigan is captured in the debate over the expensing of executive stock options:

Shenanigan No. 5: Failing to Record or Improperly Reducing Liabilities

* Failing to record expenses and related liabilities when future obligations remain
* Reducing liabilities by changing accounting assumptions
* Releasing questionable reserves into income
* Creating sham rebates
* Recording revenue when cash is received, even though future obligations remain

Warren Buffett (Cunningham 2002, p.226) makes the following observation about the executive stock option aspect of this shenanigan:

> The most egregious case of let's-not-face-up-to-reality behavior of executives and accountants has occurred in the world of stock options ... even when options are structured properly, they are accounted for in ways that make no sense. The lack of logic is not accidental. For decades, much of the business world has waged war against accounting rulemakers, trying to keep the costs of stock options from being reflected in the profits of the corporations that issue them.

Buffett describes the accounting treatment for executive stock options as "outrageous". In addition to stock option abuses, this category also includes the 'special purposes entities' that Enron used to disguise the true character of the company's financial statements.

The final two shenanigans are not concerned with inflating current profits but, rather, with deflating current profits in order to make profits in future periods more attractive. There are a number of possible reasons for such activities. Healthy companies may want to create a 'reserve' for use in future periods. A weak company may want to 'take a bath' and get all the bad news out of the way in order to "relieve future periods of these expenses". Companies involved in an acquisition may manipulate profits of the target firm in order to obtain a better purchase price or the submerge bad news within the costs of the merger in order to disguise the true operating state of the acquiring firm. Given this, the two remaining shenanigans are related to deflating revenues, shenanigan six, and inflating expenses, shenanigan seven:

Shenanigan No. 6: Shifting Current Revenue to a Later Period

* Creating reserves and releasing them into income in a later period
* Improperly holding back revenue just before an acquisition closes

Shenanigan No. 7: Shifting Future Expenses to the Current Period as a Special Charge

* Improperly inflating amount included in a special charge
* Improperly writing off in-process R&D costs from an acquisition
* Accelerating discretionary expenses into current period

An example of shenanigan six is provided by W.R. Grace that used "a significant and unanticipated increase in revenue as a result of Medicare reimbursements" at a subsidiary in the early 1990's to create a reserve that was used to smooth income in later periods. As a consequence of the release of reserves in later periods, the subsidiary was able to report steady earnings growth between 27-31 percent instead of erratic earnings growth of -8% to 61% that would have been observed without the reserve. The activity led to an SEC enforcement action in 1998. Though not subject to any SEC actions, Microsoft is currently sitting on substantial reserves that could be used to manage future earnings. As for shenanigan seven, the recent goodwill writedowns that have taken place in the telecom sector is a potential area for this type of accounting manipulation.

At the time of writing, Schilit (2002) apparently did not have sufficient information or lead time to discuss the massive accounting frauds at ***Enron and Worldcom***. These accounting frauds led to the two largest US corporate bankruptcies in history at the time of the bankruptcy filings. The accounting frauds at both firms involved more than one type of shenanigan. Two key manipulations involved in the accounting scandal that resulted in Worldcom filing for bankruptcy protection in July 2002 were: improper revenue recognition; and the capitalizing of operating expenses. Much of the revenue recognition related to the release of reserves into current revenue. The use of reserve accounts is common for telecom firms, e.g., to allow for customer accounts that are not paid. The release of these reserves into revenue when the potential losses are still likely to occur is designed to inflate revenue. This is a variant of shenanigan three. The capitalizing of operating expenses involved the shift of operating expenses to the capital expenditure account. Not only did this give an incorrect impression of operating profits, it permitted the depreciation of those expenses over time. This is a variant of shenanigan five.

Enron filed for bankruptcy protection in Dec. 2001. The Enron bankruptcy was, from an accounting standpoint, more complicated and involved considerably more elements than the Worldcom case. At least five types of inter-related accounting irregularities can be identified. The primary vehicles in the accounting manipulations were the non-consolidated 'special purpose entities' (SPE's) that Enron used to disguise losses and liabilities. These SPE's were privately held partnerships, usually 'owned' by the Enron CFO or members of his family. FAS 94 requires that consolidation of accounts be used if there is an element of control between entities making the transactions. Though there was clearly an element of control in the Enron-SPE transactions, consolidation was not used. In addition, many of the SPE transactions involved the sale of stock in exchange for notes receivable. The SEC requires that such transactions be reflected in the balance sheet, which Enron did not do. Yet, another type of transaction involved derivative security transactions between Enron and the SPE's, allowing Enron to shift risk to the SPE's that was not reported due to absence of financial statement consolidation.

Examples of the types of transactions between Enron and the SPE's are described in Enron's 2000 financial statements where the company recognizes a transfer to the SPE's of assets valued at $1.2 billion, including $150 million in notes payable, 3.7 million restricted Enron shares and subscription rights to receive up to 18 million Enron common shares in March 2003, subject to certain conditions. Enron also transferred to the partnerships other assets valued at $309 million, including a $50 million note payable and "an investment in an entity that indirectly holds warrants convertible into common stock of an Enron equity method investee." In return for these considerations, Enron reports receiving 'economic interests in the entities', $309 million in notes receivable against the SPE's and an additional $1.2 billion in SPE notes receivable as part of a "special distribution." The disclosure went on to mention a series of purchases by Enron of "share-settled options from the entities" on shares of Enron common stock. Through the selective use of hedge accounting rules, Enron was also able to disguise a range of derivative transactions done with the SPE's. In sum, the Enron transactions were sufficiently opaque that even the most well-informed accounting professionals could not make sense of the financial statements, a clear violation of the intent of GAAP which requires "information deemed necessary to an understanding of the effects of the transactions on the financial statements" be revealed.

Though an excellent and well organized source, Schilit (2002) is only one of a number of interesting studies of accounting manipulations.[18] The introduction of the securities laws of 1933-1934 is a watershed in history of accounting manipulations. Prior to this time, manipulations were the rule rather than the exception. Warren Buffett provides a delightful satire given to him by Ben Graham on various financial shenanigans of a fictitious company (Cunningham, p.185-191). Included in the accounting operations are an immediate writedown of assets to a large minus number in order to be able to claim a regular asset 'appreciation', as opposed to depreciation, credit. Elimination of wage and salary expenses by making all such payments using stock options. This would also benefit the company with a large cash inflow as the options are exercised. The success of the accounting manipulations in inflating the market price of the stock by greatly inflating company earnings will be a windfall to employees receiving the stock options. And so the story goes, tongue-in-cheek but not without an almost depressing sense of reality.

8.3 Forecasting the Inputs

A. Identifying the Value Drivers

Value is a concept with many possible interpretations. In general, the 'value' is equal to the 'true worth'. This interpretation is too normative for practical purposes. Some method of determining true worth is needed. In one sense, the value of a security is equal to the price of the security observed in the market for that security. This interpretation of value is consistent with the spirit of a central proposition of modern Finance: the efficient markets hypothesis. In security analysis, it is usually assumed that the market price does not necessarily capture the true worth of a security. At any point in time, the market price may be above or below the true value. In this sense, value is an economic concept. This economic value can be estimated using techniques such as discounted cash flow analysis but this requires estimates of the key inputs to the model, i.e., cash flows, capitalization rates, termination dates. A substantial portion of security analysis is concerned with interpreting the economic content of accounting numbers in order to determine the value of a security. A ***value driver*** is a factor that has a significant impact on the level and change of the value of a security. There are two key dimensions to value drivers: profitability and growth.

Reference to value drivers is a relatively new development in security analysis. The concept migrated into security analysis from the management consulting industry where value drivers were introduced as concepts to 'measure, manage and maximize shareholder value'. For example, Copeland et al. (1996, p.107) observe:

> A value driver is simply any variable that affects the value of the company. To be useful, however, value drivers need to be organized so we can identify which have the greatest impact on value and assign responsibility for their performance to individuals who can help the organization meet its targets. Value drivers must be developed down to the level of detail that aligns the value driver with the decision variables directly under the control of line management.

If value drivers can be used to better manage a company to enhance shareholder value, then it is not difficult to extend this notion to using value drivers to measure the value of a company's common stock. Given the sizable amount of management consulting done by the large accounting firms, it is not surprising that academic sources using the value driver terminology, e.g., Penman (2001), Liu et al. (2002), are primarily from the accounting stream, though there are also some studies using value drivers in a strategic management context.

INSERT Table 8-t ROE and Levers of Performance

Recognizing the connection between the use of value drivers and accounting, a useful starting point for the discussion of value drivers is the residual income model (see sec. 8.1). The numerator in the residual income model is: $(ROE(t) - k)\ BV(t-1)$ where ROE can be interpreted as the return on common equity. This can be mechanically transformed into a value driver format:

$$ROE = \frac{Net\ Income}{Book\ Value\ of\ Equity}$$

$$= \left(\frac{Net\ Income}{Sales} \right) \left(\frac{Sales}{Total\ Assets} \right) \left(\frac{Total\ Assets}{Book\ Value\ of\ Equity} \right)$$

Expressed in other words: Return on Equity = (Profit Margin) x (Asset Turnover) x (Financial Leverage). This approach to roughing out the value drivers is consistent with the management consulting approach where (Copeland et al. 1996, p.107): " Generic value drivers such as sales growth, operating margins and capital turns, apply equally well to all business units". Using this approach, there are three value drivers for the residual income model. The variation of these drivers across various sectors is illustrated in Table 8-t. The next step in this approach is to decompose the profit margin, asset turnover and financial leverage to gain further insight into the value drivers, e.g., profit margin can be examined by considering elements of fixed and variable costs associated with the business.

The use of *ROE* to define the value drivers is only one possible approach. Even within the framework of the residual income DCF model, examination of the model variables, $(ROE(t) - k)\ BV(t-1)$, reveals that k has not been taken directly into account. A more telling comment applies to the method of measuring the profit margin using net income divided by sales as a value driver. Presumably, the profit margin is concerned with the success of the operating component of the business. In this case, it is more conventional to measure profit margin using, say, *Gross Profit Margin = {Sales - Cost of Goods Sold} / Sales* or *EBITDA Profit Margin = {Sales - Cost of Goods Sold - Selling, Administrative and General Expenses} / Sales.* In addition to having a range of accruals, net income may also include significant extraordinary items. Another complication associated with starting from *ROE* arises with the use of *Book Value of Equity* which does not directly account for the inherent increase in riskiness associated with leveraging. One method of addressing this concern is to use the *ROIC = {EBIT (1 - Tax Rate)} / Invested Capital* of the 'economic profit model' as a starting point for specifying value drivers.

INSERT Table 8-s 10 year Financial Statement Highlights for Coca-Cola

Taking a cue from the management consulting approach, the nuts-and-bolts problem of identifying value drivers for specific companies is not as easy to solve as the mechanical accounting formulas would suggest. Though the generic value drivers such as sales growth, operating margins and capital turnovers "apply equally well to all business units" these notions "lack specificity and cannot be used well at the grassroots level." This comment applies equally well to the use of value drivers in security analysis. Yet, when pressed for precisely how to identify value drivers, the management consulting approach is decidedly vague, e.g., Copeland et al. (1996, p.111)

> Key value drivers are not static they must be periodically reviewed ... Identifying the key value drivers for a company can be difficult because it requires the company to think differently about its processes, and in many cases the company's reporting systems are not equipped to supply the necessary information. Identifying the key value drivers is also a creative process that requires trial and error. Mechanical approaches based on existing information and purely financial approaches rarely identify the key value drivers. Aligning the value drivers with decisions is the key ... Nor can value drivers be considered in isolation from each other.

References are made to 'decision trees' and 'scenario analysis' as techniques for dealing with the difficulty of identifying value drivers, even though these techniques appear to involve substituting one form of mechanistic analysis for another. Similar difficulties arise when the value driver approach is applied to the valuation of the common stock of companies.

Ultimately, the format used to structure the identification of value drivers pales in comparison with the economics required to assess the underlying business. Consider the problem of identifying the value drivers for Coca-Cola, a company that Buffett describes as a "wonderful" company. Penman (2001, p.497) suggests that: "For Coca-Cola sales and margins are key drivers". These drivers are related to 'brand creation and maintenance' and 'product innovation'. "Coca-Cola is a *brand management firm* where value is driven by exploiting a brand." The accounting information for Coca-Cola that is provided in Penman (2001, p.468, 497) covers the years 1990-1997 and reflects a strong and steady increase in sales estimated to be 7.5% per year. This sales growth is used by

Penman to provide an estimate of futures sales growth that, in turn, is used as a key input to a DCF valuation of the common stock of $56.20. Yet, Table 8-s reveals that sales from 1998-2002 did not conform with past patterns. Sales fell significantly in 2000 and 2001. Net Income fell from 2001to 2002. Though dividends per share have been increased and the share buyback program has been stepped up, the *ROIC* fell.

Buffett is correct to characterize Coca-Cola (KO) as a 'wonderful' company. In a macroeconomic and stock market environment where many firms are suffering, both on an operating and common stock price basis, Coca-Cola is weathering the storm with some dignity. There are even glimmers of hope in Table 8-s that the corner may be in sight. However, this is only based on a casual inspection of accounting numbers. To make any plausible statement about future performance requires considerably more dissecting of factors such as the regional and product distribution of sales, developments in the marketing of the key brands (Coke, Fanta, Sprite, Minute Maid, etc.), roll-outs of new products, projected changes in the financial structure and so on. If there is a lesson to be learned from Philip Fisher it is that casual, or even intensive, analysis of accounting numbers is only of secondary importance relative to analyzing and understanding the business. The general accounting format for value drivers based, say, on a decomposition of *ROE* provides a motivation for which elements to examine. However, this is only a guide to where to channel energies in dissecting the business. It is at this point that the elements discussed in sections 7.3 and 7.4 have to be addressed.

Having conducted a detailed analysis of the business operations, the value drivers can be estimated to obtain the appropriate inputs to the DCF model. In certain cases where simple models such as the Gordon model are applicable, the DCF model can be inverted to provide, say, k and g parameters that would make sense of an observed price. In some cases, such as the valuation of resource companies with known reserves, the DCF model can be used to provide an estimate for the implied average future selling price for the commodity. However, in other cases, the DCF calculation is sufficiently complicated that the simple models do not apply. This is, arguably, the case with most of the firms in the airline industry following 9/11. As of the start of the US-led war in Iraq in March 2003, major carriers such as Delta (DAL), American Airlines (AMR) and United Airlines (UAL) are all bleeding staggering amounts of red ink. Problems in the industry are so severe that UAL entered chapter 11 bankruptcy protection in early 2003 with considerable discussion about whether American will follow. Faced with competition from point-to-point low cost carriers such as Southwest Airlines (LUV), the large hub-based carriers are caught in a vice of intense competition on the most profitable routes, increased costs of security and a dramatic and potentially continuing fall in traffic generated by a combination of macroeconomic, geopolitical and psychological factors.

What are the key value drivers for an airline such as Delta? Profit margins are negative and look to remain so for the near future. Prospects for improving asset turnover by, say, reducing routes and capacity to adjust to the decline in traffic are uncertain due to levels of competition, significant fixed cost elements and other factors. Increasing financial leverage raises interest costs that contribute to an erosion of the ability to compete on fares. Writing prior to the recent difficulties that have hit the airline industry, Penman (2001, p.499) provides the following discussion of key drivers in the airline industry:

The size of the fleet and gate allocation defines what the industry calls *available seat miles (ASM)*. A *load factor* determines the *revenue miles seat (RMS)* and ticket prices determine the dollar yield per RMS. This yield, along with RMS, drives revenues so, for a given ASM, load factors and yields are the key drivers for airlines. The analyst cuts to these key factors but is also sensitive to any changes in available seat miles with new routes and gate allocations. Other drivers such as labor productivity, labor costs, commission rates to travel agents, and fuel costs per mile are also monitored.

It is possible to express the current situation for Delta common stock in terms of the factors identified by Penman, e.g., the need to increase debt to pay for current losses raises the breakeven load factor and further erodes the competitive position of the airline. However, the focus on numbers tends to mask essential conceptual questions such as: when or if this particular airline can return to profitability and what the restructured airline will look like if profitability can be achieved? The issues are discussed in more general detail in the ***Cases for Fundamental Analysis***, available for download from the book website, and for airlines specifically in the case for Delta Airlines.

B. From Value Drivers to Valuations

The quote from Hartley Withers (1910) about common stock valuation given at the beginning of Part III is worth repeating at this point: “The pedantic mind craves a precise formula ... But second thoughts put the formula into the waste-paper basket”. The DCF model is a formula that suggests it is possible to arrive at a precise estimate for the value of a common stock. Reinventing Withers in the present, it is still true that ***there is no precise formula*** – though some techniques do perform better in particular situations. Acknowledging that there are cases where the cash flows and discount rate are more-or-less known with relative certainty, a DCF valuation will only be as precise as the inputs that are used. Because the relevant inputs are typically imprecise, the resulting estimated value obtained from a DCF model will also be imprecise. However, even though the formula does not yield a precise value, it does not follow that the waste-paper basket is the appropriate end point. The DCF model provides a process of constructing an estimated value that can provide insight into the future evolution of the value drivers that determine the common stock price. To what extent the estimated price determined from a DCF model can be used as the primary vehicle for conducting a security analysis will depend on a range of factors including the type of stock and the biases of the analyst.

Following GDC, Warren Buffett and other ‘value investors’, the DCF price estimate puts a face on the ‘intrinsic value’. Combining an intrinsic value with the ‘margin of safety’ principle is an implicit recognition that the value estimates obtained from DCF models are inherently imprecise. Consistent with the underlying investment philosophy of value investors, at any given time a particular common stock may be overvalued or undervalued relative to the ‘true’ intrinsic value that will eventually be reflected in the market price. DCF models are a theoretically sound if imprecise method of determining an estimate for the intrinsic value. Even if there is not enough confidence in the DCF estimate to make a trading decision, if the common stock price is significantly different than the DCF estimate, either above or below, then this is a flag to reexamine the assumptions and forecasts that were made for the value drivers and inputs to the DCF model. Hence, following Hooke (1998, ch.12) and others, estimating a price using ***a DCF model is a sound first step*** in the security analysis process. It will not likely be sufficient to generate a trading decision and, even if it is, there will almost certainly be a number of iterations of the DCF price estimate before a trading decision is made.

Given that a DCF model is used to construct a first step value estimate, a number of key questions have to be addressed before the forecasts of the inputs are determined. One question concerns the specific type of DCF model to use. The various DCF alternatives to equity valuation differ according to the variable that is being discounted, i.e., dividends, accrual earnings or cash flow. In terms of the DCF models in conventional use, the associated alternatives can be classified as the dividend discount model, the residual income model and the free cash flow model.[19] Each of these models can be expressed in a simple format, e.g., the Gordon growth model version of the dividend discount model. Alternatively, each model can appear in a more flexible format that does not make, say, constant growth assumptions but calculates the price estimate by individually discounting a string of future cash flows. Though more conceptually appealing, because it is not feasible to discount cash flows out to infinity this approach requires some forecasting horizon to be specified and some method for estimating the terminal value. Following Penman and Sougiannis (1998), the different DCF models have different sensitivities to the selection of the forecast horizon.

A natural question arises about the practical differences between the simplified versions of these different models. In cases where dividend payouts are zero or not approximately based on a constant target dividend payout ratio, then there will be difficulties with applying the dividend discount model. In such cases, the residual income or free cash flow approaches will be superior. Which of these two simplified models works best depends on whether the inclusion or exclusion of accruals provides a better fit to the future stream of cash flows. Though there is some empirical accounting research on the relative ability of current cash flows and current earnings to predict future cash flows, this research is better suited to the more general DCF models that estimate a stream of future cash flows and a terminal value at the fixed horizon end point. There is little information about the relative performance of the different forms of the simplified DCF models. Though based on the same general DCF approach, this is no assurance that these simplified models will provide much the same results. Yet, these simplified models are well suited to providing a relatively quick check on the difference between the estimated intrinsic price and the observed stock price. Difficulty of application is one criticism that is often made of the DCF model by professional security analysis.

In order to provide some information on this point, consider a comparative valuation of Coca-Cola using three different simplified DCF models. To this end, recall the Gordon model from sec. 8.1: $P(0) = \{D(0)(1 + g)\} / \{k - g\}$. Deriving this model required a constant growth rate in dividends assumption. As discussed in sec. 8.1, to derive a similar version for the free cash flow to equity (*FCFE*) model, observe that the general form of this form the DCF model is specified:

$$P(0) = \sum_{t=1}^{\infty} \frac{FCFE^*(t)}{(1 + k)^t}$$

where $FCFE^*(t)$ is $FCFE(t)$ expressed on a per share basis. Recognizing that constant growth in dividends with a constant dividend payout does not ensure that *FCFE* will also grow at the same rate, it is possible to assume that *FCFE* grows at a constant rate g_f such that $FCFE(t) = FCFE(t-1)(1 + g_f)$, this produces the simplified free cash flow valuation model: $P(0) = \{FCFE^*(0)(1 + g_f)\} / \{k - g_f\}$. Under appropriate assumptions, it is possible to assume $g = g_f$ though this may not be plausible in many situations (see end of chapter questions). Similarly, assuming that the book value of equity grows at a constant rate g_b such that $BV(t) = BV(t\text{-}1)(1 + g_b)$, produces the simplified residual income model: $P(0) = BV(0) \{ ROE(1) - g_b \} / \{k - g_b\}$. Again, under appropriate assumptions, it is possible to assume $g = g_b$ (see end of chapter questions in chapter questions). With constant dividend payout the 'constant payout residual income model' becomes: $P(0)= BV(0) \{b\ ROE(1)\} / \{k - g\}$

Coca-Cola (KO) is an excellent company to use for comparative purposes, if only because it has such helpful financial statements (see Table 8-s). Other aspects that make it an attractive example are that, being a stock that is highly touted by Warren Buffett, it can be viewed as a classical example of a 'value company'. Such companies are likely to be excellent candidates for applying DCF techniques. Another attractive feature of Coca-Cola is that it is such a strong company that many problems that can arise in estimating the input values, e.g., where earnings have been negative for some time or dividends have been suspended, do not arise. Given this, consider ***applying the Gordon model*** where the five year growth for dividends is g = 7.4% with $D(0)=\$.80$ and $P(0)$ = \$40.73 (27/03/03). With this information it is possible to solve for the implied expected return on equity as $k = \{.8\ (1.074)/\$40.73\} + .074 = 9.51\%$. Given that the beta for Coca-Cola is 0.624 and the long-term Treasury bond is yielding 5.375% using Damodaran's long-term market risk premium of $E[R_M] - r = 5.5\%$ the CAPM provides an estimate of the discount rate of 8.81%. This provides an estimated price of \$61.06.

In contrast to the price estimate provided by the Gordon model, the ***simplified free cash flow*** and ***residual income*** models for Coca-Cola are more difficult to evaluate. The constant payout residual income model can provide a bridge between the Gordon model and the residual income model. However, examination of the ten year (1992-2002) dividend payout ratio for Coca-Cola reduces confidence in the constant payout assumption. Though the dividend payout ratio was always below 45% and sometimes below 40% until 2000, the payout ratios in 2000 and 2002 were 77% and 65%. Nevertheless, taking $BV(0)$ = 11.8/2.478 = 4.762 and assuming b = .5, it is possible to use the $\{k - g\}$ values from the dividend growth model to provide an estimate for the constant payout residual income model: $P(0) = 4.762\ \{.5\ (.35)\} / \{.0951 - .074\} = \$39.50$. The value for $ROE(1)$ is based on the 34.3% value observed in 2002 and similar values observed in a number of previous years. Using the CAPM discount rate estimate of 8.81% instead of the 9.51% rate from the Gordon model gives a price estimate of \$59.10. The close correspondence of these values with the Gordon model price estimates reveals that .5 is close to the equilibrium dividend payout ratio that is consistent with the growth rate of 7.4% and discount rate of .0951 derived using the Gordon model.

In contrast to the steady 7.4% growth of per share for dividend payments, determining a growth rate for net income and book value of equity per share is more difficult. A five year horizon gives a growth rate for net income of -5.9% while the ten year rate is 6.2%. Return on equity is also quite variable with a high over the five year period of 61.6% in 1997 to a low of 23.1% in 2000. The growth rate for book value of equity is only somewhat more cooperative. For example, the three year compound growth rate for BV from 1999-2002 is 7.45%. (Using BV values from earlier periods result in an estimated growth rate for book value in excess of k, violating the stability condition). Evaluating the simplified residual income model with k = .0951 gives: $P(0) = BV(0) \{ ROE(1) - g_b \} / \{k - g_b\}$ = 4.732 {.35-.0745}/{.0951-.0745) = \$63.69, indicating the common stock is undervalued. The reliance of the residual income model on the book value of equity and net income is a substantive limitation on the effectiveness of this approach. BV and E are residual outcomes of a significant number of accounting calculations. Accrual values for items such as depreciation, company pension fund adjustments, methods of inventory valuation and so on can have a significant impact on this method of calculating a DCF price estimate.

In many presentations, reference to the DCF model implies the discounting of free cash flow. Net income and book value are accrual accounting numbers and, as such, are only proxies for 'true' cash flows. Yet, free cash flow (*FCF*) is not without problems and limitations. One important limitation is that *FCF* requires a value for capital expenditures to be subtracted from 'net cash provided by operating activities'. While it is conventional to use the observed capital expenditure item(s) from the investing activities section of the cash flow statement, this is not conceptually correct. The logic of the DCF model requires the use of a capital expenditure expense that reflects the assumptions used to generate the future stream of free cash flows. English (2001, p.295) provides a discussion of this point:

> My students often ask what level of capital expenditures (capex) to assume in a cash flow projection. Recommendations on this question vary. Some say capital expenditures sufficient to maintain existing operations are the appropriate choice. Or perhaps that level of capex should be adjusted for inflation. I believe that, once cash flow from operations is determined, a level of fixed investment, appropriate to the growth and production assumptions, is also determined ... Analysts are often guided to capital expenditure assumptions by management. If management guidance on capex is used, then the analyst's operational scale assumptions are bounded. That is, the productive capacity implied in management's capital expenditure plans limits sales growth and operational scale assumptions. Unless that limitation is observed, the company's cash flow generating capacity could be seriously misstated.

While the observation that management capital expenditure assumptions need to be recognized is sound advice, what if there is no direct guidance about capital expenditures provided by management? In this case English provides the almost vacuous response: "Essentially, any scale assumption the analyst feels comfortable with."

INSERT Table 8-q Financial Highlight statement for RCCC

The use of the reported capital expenditure items as a baseline for evaluating the current level of *FCF* and the future capital expenditure stream is tempting but, depending on the specifics of the firm, can be potentially distorting. For example, consider a firm that is under considerable pressure on earnings due to a decline in sales. There is the temptation to reduce capital expenditures, sell productive assets and the like in order to improve the appearance of the accounting statements. Yet, this will have a substantive impact on the future ability of the firm to generate free cash flow. If exogenous change results in an improvement in the product market, the firm will be less able to take advantage of these changes. In this case, using reported capital expenditures will likely be inconsistent with the use of current 'net cash from operations' to predict future 'net cash'. Another problem with free cash flow involves the handling of changes in the degree of financial leveraging. For example, *FCFE* is initially improved if the firm increases the level of debt. This will impact *FCFE* in latter periods as the interest expense of the additional debt is paid. Table 8-q provides an example of a firm, Rural Cellular Corporation (RCCC) with positive free cash flow that is suffering a serious financial crisis (see end of chapter questions).

Coca-Cola does not report *FCF* as a separate line item in the 10-K financial statements. This value has to be calculated and, to this end, a number of conceptual problems arise. In particular, the calculation of capital expenditures is equated in the financial statements with purchases of property, plant and equipment. Yet, the line item 'acquisitions and investments, principally trademarks and bottling companies' is sufficiently close to capital expenditures that it is appropriate to be included. Despite some opaqueness in the total debt number, debt repayments and debt issuance are directly identifiable from the cash flow statement. Using this calculation process the following *FCFE* values are calculated:

Free Cash Flow to Equity for Coca-Cola, 1996-2002 (millions US$)

2002	2001	2000	1999	1998	1997	1996
$2591	$1770	$1870	$1894	$2551	$1244	$2370
(-544)	(-651)	(-397)	(-1876)	(-1428)	(-1100)	(-645)

The numbers in brackets below the free cash flow numbers is the 'acquisitions and investments, principally trademarks and bottling companies' that is listed separately from the conventional capital expenditure number associated with purchases of property, plant and equipment.

Based on these FCF numbers setting $g_f = 0$ does appear to be a realistic assumption. The largest *FCFE* number occurs during 1998 with 1996 being approximately the same as in 2002. Setting the fixed $FCFE^* = \$2,500/2,478$ shares $= \$1.01$/share and using the CAPM discount rate of 8.81% gives an estimated price of \$11.51. If the 'trademark and bottling companies' number is not included then the valuation produces $FCFE^* = \$3,100/2,478 = \$1.25$ with $k = 8.81\%$ for an estimated price of \$14.20. Using the simple constant growth *FCFE* valuation model to estimate a projected growth rate for free cash flow to equity that is consistent with $P(0) = \$40.73$ produces $g_f = 6.86\%$ for $k = 9.51\%$ and $g_f = 6.18\%$ for $k = 8.81\%$ with the 'trademark' number included and $g_f = 6.25\%$ for $k = 9.51\%$ and $g_f = 5.57\%$ for $k = 8.81\%$ with the 'trademark' number excluded. Why do the *FCFE* price estimates differ so much from the Gordon model and residual income model? In the case of the Gordon model, the growth rate in dividends is being achieved by a substantial increase in the payout ratio, a violation of an underlying assumption. The residual income model relies on the relationship between the book value of equity and net income. The book value is sensitive to retained earnings and not, directly, to how the assets purchased with those retained funds are used to generate cash flows in a given year.

Is Coca-Cola is over-valued? The answer to this question depends on the confidence allotted to the three simple DCF models employed.[20] The sizable difference in the price estimates lend support to the notion that estimates from these models are, at best, imprecise and subject to a number of vagaries. What the simple DCF models do provide is the first step in a structured approach to evaluating observed market prices. For example, the dividend discount model demonstrated that for a current dividend of \$0.80 per share and $g = 7.4\%$ then a $k = 9.51\%$ is needed to make sense of the current price of \$41. The CAPM estimated discount rate of 8.81% indicates the stock price is overvalued. But this could be due to the beta estimate or market risk premium used to determine the k from the CAPM. This raises the question: what expected return is appropriate for KO? Similarly, the residual income model raised the need to evaluate the erratic growth rate in earnings.

Comparison of the residual income and free cash flow results indicate some concerns about whether retained earnings have been effectively employed in the purchase of cash flow generating assets. In addition, the difference between the accrual and cash flow estimates raises concern that the high value for $ROE = \{P/BV\} / \{P/E\} = \{E/BV\}$ may be masking price-to-book and price-to-earnings ratios that are 'overvalued' at 8.5 and 23.

Lacking confidence in all three of the simple DCF valuation models, it would be possible to employ more detailed DCF models where cash flows for each individual time period up to the end of a forecasting horizon is specified.[21] In residual income model applications, the terminal period is often assumed to be where $ROE(T) = k$ and all future terms after the terminal period in the (infinite) sum can be set to zero. The economic rationale for this is that when $ROE(T) = k$ the firm has reached a 'competitive equilibrium' where no further abnormal earnings are possible. If dividends or free cash flows are being discounted, the terminal period is often assumed to be where the relevant dividend or free cash flow is constant from that point forward, again being rationalized as an implication of the firm reaching a competitive equilibrium. The value of the cash flows beyond the terminal period is then determined using a perpetuity pricing model and that value discounted back to the present at the appropriate discount rate. Recognizing that 'competitive equilibrium' may be an impractical endpoint because it cannot be attained in a foreseeable future, Penman and Sougiannis (1998, p.347) suggest that, if the forecast horizon is truncated at a practical horizon of five to eight years, then accrual techniques, i.e., the residual income model, "yield lower valuation errors than those based on forecasting dividends or cash flows". The potential for accrual numbers to outperform cash flow numbers in forward-looking valuations is also supported by Barth et al. (2001).

Which DCF approach works better? Is it better to discount free cash flow, dividends, economic value added, residual income or some other cash flow measure? As the valuations of Coca-Cola and RCCC illustrate, the answer to this question is elusive. In general, the applicability of a certain model will depend on the specifics of the situation. The various DCF models are simplified characterizations of reality and are useful as an initial screen and a crude check on other aspects of the valuation exercise. As illustrated in the 'cases for fundamental analysis' available on the book website, there is a need to do intensive study of a particular security in order to do an adequate valuation. Such study goes well beyond the confines of a simplified DCF calculation. In turn, the process of determining the inputs into the DCF calculation provides a structure within which the various sources of information about a particular security can be organized. Following GDC and others, DCF models generally work best with stable cash flow industries. As such, the performance of a specific DCF model will depend on the sources of cash flow instability. When possible, it is advisable to calculate an estimated security value from a number of DCF models and use the diversity or disagreement of the estimates as a guide to further investigations.

C. Alternatives to and Hybrids of Discounted Cash Flow Models

In addition to the three DCF models, a number of hybrids have been proposed based on approaches such as EVA or ***the economic profit model***. Penman (2001, p.468) develops one such model, based on capitalizing the value of the cash flows from net operating assets. This model is used to estimate a price for Coca-Cola. Taking *VNOA* to be the estimated value of net operating assets, *ROIC* to be the return on invested capital, *IC* to be invested capital, *WACC* to be the weighted average cost of capital and g_s the growth rate of sales, Penman provides the following simple valuation formula:

$$VNOA(0) = IC(0) + \frac{(ROIC(0) - WACC(0))\ IC(0)}{WACC(0) - g_s(0)}$$

The connection with the economic profit model is apparent in the use of *WACC, ROIC* and *IC*. Based on the 2002 values in the Coca-Cola financial statements, *IC(0)* = \$17,156, *ROIC(0)* = 24.5% and g_s = 3.3% (5 year compound rate). Observing that *BV(0)* = \$11,800 with a value for debt of \$5,356, completion of the valuation requires an estimate for the *WACC*. Taking the CAPM value of 8.81% and assuming a debt cost of 7% produces a *WACC* of 8.25%.

Arriving at price estimate based on this formula requires evaluating *VNOA*. This can be viewed as an estimate for the right hand side of the balance sheet. Deducting the (book) value of debt to obtain an estimate for the value of equity and dividing by the number of shares outstanding produces a common stock price estimate. Using the values given produces an estimate of *P(0)* = \$27.51. This value is sensitive to the assumption made about the growth rate in sales. If instead of the five year sales growth rate, the ten year sales growth rate of 6.3% is used then the common stock price estimate rises to \$62.41. A growth rate of 5.1% produces a price estimate of \$40.48. This method of valuation is a hybrid, mixing the economic profit model with simplifying assumptions needed to achieve a readily calculated pricing formula. Much like the residual income model, the methodology combines income statement and balance sheet items. The estimated values relate to capitalizing cash flows associated with net operating assets, hence the use of the sales growth rate. While the connection between a sales growth rate and the *WACC* may seem somewhat tenuous, g_s can be viewed as a proxy for other more conceptually appealing growth rates.

Despite widespread acknowledgment of the discounted cash flow methodology as the theoretically appropriate approach to specifying a common stock valuation model, ***the 'relative value' approach*** (see sec. 7.3), also known as the 'method of comparables' or 'companion variable' approach, is often used in practice.[22] As English (2001, p.289) observes:

> The discounted-cash-flow (DCF) technique is the most familiar and arguably the most rigorous of equity valuation techniques. Unfortunately, in the real world of equity analysis, it is among the most infrequently used – rightly so, in my view ... The DCF model has a number of potentially serious limitations. It is poorly suited for comparative valuations, lacks the solid intuitive basis of accounting earnings, and is subject to whatever difficulties the capital asset pricing model itself may have.

Other sources, such as Hooke (1998, p.241), agree with this view, adding the observation that DCF modeling depends on a range of assumptions and "practitioners ... decided long ago not to argue interminably among themselves about the merits of one projection against another". Casual inspection of valuation practices used in 'professional' equity analysis reveals a reliance on accounting-based, as opposed to cash flow-based, quantitative measures of common stock value. Important examples of these measures include the *P/E* and *P/BV* multiples. These measures are used despite the recognition of the limitations of GAAP in producing 'economic', as opposed to accounting, measurements of firm performance.

INSERT Table 8-r Internet Site Information for F

Various arguments can be made against DCF modeling. English (2001, p.290-1) expands on one type of rationale, the need for professional security analysts to use '***combat finance***' techniques:[23]

> The stock valuation methods that working analysts actually use must be driven by the tremendous time demands of the analysts' world. Nevertheless, many finance writers and teachers begin and end the subject of equity valuation with the discounted-cash-flow technique. There is nothing wrong with DCF. It is certainly rigorous, complete, and familiar. And, at least for some companies they actually cover, most equity analysts already maintain detailed, multi-year financial models that could support DCF valuations ... The fact is that DCF is a fine behind-the-lines method that works well, one company at a time out of the heat of battle. But the working analyst needs "combat finance" techniques that: work quickly; can accommodate a large number of stocks; and are framed in the market's valuation multiple language ... Instead of discounted projected cash flows, working analysts and many professional investors rely instead on accounting-based valuation techniques, relative/multiple valuation.

Many of the important variables that are mostly commonly used in relative valuation analysis can be readily identified by examining the output on a www.bloomberg.com stock information screen (see Table 8-r). The dividend yield, the P/E ratio, realized and forecasted earnings, market capitalization and relative earnings forecast for the industry group compared to the S&P 500 are all prominent. In addition, the combat finance analyst may also have at hand the *P/BV*, *ROE* (= *E(t)/BV(t))* or *ROBBV* (Return on Beginning Book Value, *E(t)/BV(t-1)*) and other comparables such as *P / Sales*.

There are a range of possible approaches to arriving at price estimates that can be associated with the method of comparables. For example, Philip Fisher did not advocate DCF modeling preferring to use comparative measures, especially ***the P/E multiple***, to assess whether a stock was under or over valued relative to current stocks. Fisher would estimate a future level for the earnings per share and combine this with the *P/E* to determine an estimate for the future price. One example involved a stock that currently had *E*= \$1 and *P/E* = 10 and was forecasted to have *E*=\$2 and *P/E*=20 in the future. The *P/E* is expected to increase because the current *P/E* is low compared to other similar companies or, possibly, to the level of the market. The earnings are forecasted to increase based on an analysis of the business. The numbers used in the example imply the common stock price will increase from \$10 to \$40. Though extremely simple, this example does capture the essence of one possible approach to relative valuation analysis. The *P/E* is used as a measure to compare relative value across firms. Forecasted earnings are then combined with a *P/E* forecast and used to provide a future price forecast.

An ***illustration of the use of P/E multiples*** for relative value analysis has to deal with the limitations of the *P/E* ratio as a valuation measure. In particular, the volatility in earnings over time, either from quarter to quarter or from year to year, makes it difficult to identify the appropriate *P/E* ratio to use. Are current earnings the appropriate value? Is some weighted average of past earnings or some forecast of future earnings a better approach? For example, using information from www.globeinvestor.com, consider a relative value comparison of General Motors (GM) and Ford (F). On Sept. 4, 2003, GM had a *P/E* of 5.80 based on a price of \$41.97 and *EPS* of \$7.24 based on a trailing 12 months estimate of earnings. (Dividend payout has been held constant at \$2 per share.) This value is up significantly from the \$3.34 *EPS* that GM was earning in calendar year 2002 and the \$4.58 for the trailing 12 month earnings estimate from the previous quarter. In contrast, Ford has a *P/E* of 20.30 based on a stock price of \$11.94 and a trailing12 month *EPS* of \$0.58. This is up from the trailing 12 month *EPS* of \$0.46 from the previous quarter and a loss of -\$0.54 in calendar year 2002. (After suspending the dividend, Ford has resumed the dividend at a reduced payment of \$0.40 per share.)

A comparison of the *P/E* multiples for GM and F is decidedly favorable to GM. Even if GM is unable to sustain the \$7.24 *EPS* and falls back to the previous value of \$4.58, a doubling of the *P/E* would still leave GM as an attractive purchase at (11.6)(\$4.58) = \$53.12 which is considerably above the current price of \$41.97. In contrast, even if F is able to double *EPS* to \$1.16, at the same *P/E* value as used for GM this produces: (11.6)(\$1.16) = \$13.46. Similarly, a doubling of the *EPS* for F still leaves the *P/E* at 10.15 if the stock prices does not change. This type of analysis raises questions about the ability of F and GM to grow earnings. As of 3Q 2003, Ford is still in an earnings recovery mode, following a shakeup in senior management. If plans underway are successful, the prospects of a significant *EPS* increase are good. In comparison, GM did not experience the same problems as Ford and does not have a potential earnings upside that is comparable to Ford. Both companies have a pension overhang problem associated with previous contracts negotiated with the UAW. Yet, even with these mitigating factors, a relative value analysis based on *P/E* multiples is still decidedly favorable to GM.

Similar to the variation in DCF techniques there are a range of possible approaches to the relative value approach. The general approach of relative value analysis was discussed in sec. 7.3. Hooke (1998, p.232) provides a description of the heuristic style involved:

> Inevitably, a stock price is characterized as "20x earnings", "8x EBIT", or "3x book value". When the analyst is asked how he justifies this valuation, the response is invariably something like "comparable companies are trading at 20x earnings, 8x EBIT or 3x book value." If the subject company's multiples are higher than the comparables, the investor asks the obvious question, "Why is this firm's price higher than its peers?" The answer is typically a recitation of the firm's positive attributes, such as a better growth outlook, a better track record, or a better balance sheet.

There are a number of problems with such an approach. In particular, by comparing only companies within the same line of business, no evaluation is made about whether the group of comparables is appropriately valued. For example, General Motors (GM) may be a comparably better value than Ford Motor (F) but the automobile sector as a whole may be overvalued relative to, say, non-alcoholic beverages. Another problem with the relative value approach is that company characteristics differ within the group of comparables. For example, though often classified into the same group of comparables, IBM (IBM), Dell (DELL) and Hewlett-Packard (HPQ) are substantively different companies operating in a range of over-lapping but not identical product markets.

English (2001, ch.15) recommends an alternative approach to relative value analysis based on the ***use of regression techniques*** across comparable firms to identify the fitted relationship between, say, *P/BV* and *ROE*. To illustrate this approach, assume that Gateway has an *ROE* of 23.6% and a *P/BV* of 6.54. For all comparable firms in the computer industry a bivariate regression equation is fitted between the dependent variable *P/BV* and the independent variable *ROE*. The fitted equation is found to have an intercept of -1.2 and a slope coefficient of 35.4. Evaluating the predicted *P/BV* for Gateway gives: -1.2 + 35.4(.236) = 7.15 > 6.54.[24] This implies that Gateway is undervalued by

9%. English concludes: "Regardless of the reason for the deviation ... it suggests further questions, causes the analyst to dig deeper, and provides a strong starting point for further inquiry". Just as the price estimate from the simple DCF model was used as a first step in the DCF valuation process, the fitted regression estimate is used as a first step in this version of the method of comparables. Though this approach may seem naive to those familiar with advanced econometric techniques, the approach is similar in spirit to the multi-factor models of modern Finance.

As observed, the method of comparables or relative value approach is the rule rather than the exception among professional security analysts. Though this observation sometimes comes as a surprise to the uninitiated, this point has long been recognized by academics, as reflected in a number of studies comparing the pricing performance of DCF models with techniques from the method of comparables. For example, S. Kaplan and Ruback (1995) examines the pricing performance of a cash flow DCF technique to value highly leveraged transactions and find that the DCF model performs as least as well as the method of comparables. Berkman et al. (2000) report similar results when cash flow DCF models are compared with *P/E* multiples to value IPO's, i.e., DCF methods and the method of comparables have similar accuracy. Liu et al. (2002) report that the use of valuation multiples, the most common approach to relative value analysis, provides superior results when compared to simplified residual income DCF models. Contrary to the general view that the performance of relative value analysis is sensitive to the industry being examined, Liu et al. find these results apply across industries.

QUESTIONS

1.a) Dividend discount models are based on the notion that firms have a stable target payout ratio for dividends that is stable over time. Funds that are not paid out are reinvested in the firm and the resulting growth in the firm's asset base sustains future growth in dividends. Yet, in practice, instead of paying out earnings as dividends or reinvesting in the firm, many firms return cash to share holders by repurchasing shares. Explain how the dividend growth model has to be adjusted to account for share repurchases. Does your answer depend on whether the firm also makes extensive use of executive stock options?

b) In sec. 8.1 it was observed that the Gordon growth model could be extended to two-stage and higher levels of dividend growth, where the different stages had a different growth rate for dividends. Demonstrate that where g_1 and g_2 are the dividend growth rates in the first (T period) and second ($T+1$ to infinity) stages that the solution to the DCF valuation equation is:

$$P(0) = D(1)\left[\frac{1-\left(\dfrac{1+g_1}{1+k}\right)^T}{k-g_1}\right] + \frac{D(1)\,(1+g_1)^{T-1}\,(1+g_2)}{(1+k)^T\,(k-g_2)}$$

(Hint: observe that $D(T+1) = D(0)(1+g_1)^T(1+g_2)$).

2. Starting from the 'clean surplus' equation (to substitute for the value of dividends in the general discounted dividend model) and using the results that:

$$E(t) = ROE(t)\ BV(t-1) \qquad \frac{BV(t)}{1+k} = BV(t) - \frac{k\ BV(t)}{1+k}$$

Show that:

$$P(0) = BV(0) + \sum_{t=1}^{\infty} \frac{(ROE(t) - k)\ BV(t-1)}{(1+k)^t}$$

(Hint: see English 2001, p.334-5.) If it is assumed that $BV(t) = BV(t-1)(1 + g_b)$, then show that the price to book ratio can be expressed as:

$$\frac{P(0)}{BV(0)} = 1 + \frac{ROE(1) - k}{k - g_b} = \frac{ROE(1) - g_b}{k - g_b}$$

(Due to the assumption of constant perpetual growth, this is the highest possible price-to-book ratio). What is the relationship between the constant growth assumption for book value and the constant growth assumption for dividends and earnings?

3.a) Show that the expression for the earnings/dividend growth rate in the constant growth model, $g = ROE(t)(1 - b)$ can be derived from the value equation: $E(t+1) = E(t) + (ROE(t+1))\ RE(t)$, where *RE* is the retained earnings and *b* is the constant dividend payout ratio. Does this formulation depend on the 'perpetual earnings model', i.e., that earnings can be maintained as a constant level in perpetuity if $b = 1$?

b) Derive the relationship between the growth rates in $BV(t) = BV(t-1)(1 + g_b)$ and $E(t) = E(t-1)(1 + g)$. Under what conditions will $g = g_b$? (Hint: assume constant dividend payout and solve for the *BV* looking forward from a given $t=0$ in terms of earnings. This will produce a geometric series solution in terms of $E(0)$. Because $t=0$ is arbitrary, this solution will also hold for *BV* at $t=1$ as a geometric series in terms of $E(1)$. Observing $E(t) = E(t-1)(1 + g)$ and dividing $BV(1)$ by $BV(0)$ and solving gives the desired solution.)

4. For the three different formulas for the *P/E* given in sec. 8.1, let $b = \{0, .2, .4, .6, .8, 1\}$, $g = \{-.2, 0, .02, .04, .06, .08\}$ and $k = \{.06, .08, .10, .12\}$. Derive a tableau of values for the formulas by substitute these values into the formulas. What do you observe about the required relationships for *AE, E* and *ROE?* For what values of *b, g* and *k* do the formulas produce sensible values?

5. Explain the difference between: a) accrual basis and cash basis accounting; b) percentage-of-completion and completed contracts method of revenue recognition; c) cash flow from operations and free cash flow; d) primary earnings per share and fully diluted earnings per share.

6. Explain briefly how each of he following transactions would affect a company's balance sheet, income statement and cash flow statement: a) purchase of a new building for $1 million using internal cash; b) purchase of a new $1 million building, financed 60% with debt and 40% with cash; c) receipt of a $100,000 payment from a customer on an account receivable; d) repurchase of $10 million in company stock using internal cash.

7. XYZ Corporation earns a 12% profit margin on sale of its high-technology electronic calibrators. The manager of the calibrator division strongly opposes introduction of a new mass-market calibrator because its anticipated profit margin is only 6%, arguing that the new calibrator can only lower division returns. Is this a valid argument against the introduction of the new calibrator? Explain the various factors which have to be taken into account in making the decision.

8. Describe three ways in which a company could manipulate earnings and the book value of equity within the framework of GAAP (generally accepted accounting principles). (Hint: consider the seven shenanigans).

9. There are certain accounting signals that can be used to identify deteriorating earnings capacity. Explain how the following could be used in this process: a) increase in accounts receivable; b) changes in accounting policies; c) increases in intangible assets; d) increase in non-recurring income; e) manipulation of reserve accounts.

10. From the information in Tables 8-g and 8-h calculate the 'invested capital' for both Ford and US Steel using both the assets approach and the liabilities approach. What assumptions were made to achieve equality of the invested capital number for the two approaches? What conclusions can be drawn about the practical applicability of EVA given the difficulties associated with determining a number for invested capital?

11. The simplified free cash flow to equity DCF model uses the condition that, under appropriate assumptions, it is possible to assume $g = g_f$. Examining the definition for *FCFE* and net income given in the discussion of financial statement analysis in sec. 8.2, specify a set of conditions that are sufficient for this result to apply. (Hint: under what conditions will accrual accounting be equivalent to cash flow accounting?)

12. In Table 8-q, the free cash flow situation for Rural Cellular is provided. Explain how a firmwith a positive free cash flow can be have such a large increase in the equity deficit? What role does preferred share financing have on the free cash flow situation?

NOTES

1. Williams (1938, p.6) states: "investment value [is] the present worth of the future dividends in the case of a common stock, or the future coupon and principal in the case of a bond."

2. In what follows, do not confuse the use of *D(t)* for *D* and *D** that appeared in Part II in reference to either the Macaulay or adjusted durations. Except in the case where a bar appears over the *D* ($\bar{D}$) dividends are always referenced with a time date while the duration value is not.

3. The convention in accounting is to make a distinction between valuation methods that involve 'cash flows' and 'accruals'. Using this distinction, discounted cash flow (DCF) techniques refer ***only*** to valuation methods that discount 'cash flows' such as free cash flow or dividends. Valuation methods such as the residual income method (about to be introduced), which use accrual numbers, are not considered to be DCF techniques, e.g., Penman and Sougiannis (1998). While this distinction is useful in accounting studies, it is terminological overkill when the primary objective is discussing the valuation of securities. The operative cash flow in the residual income model, i.e., accounting earnings/net income, can be viewed either as a proxy for a cash flow or taken to be an accounting cash flow. In both cases, a cash flow is being discounted and the residual income model can be viewed as a DCF technique. This interpretation is used in what follows.

4. Damodaran (1994) is of interest because of the intensive examination of the discounted dividend approach to DCF valuation. As such, Damodaran differs from other sources in the depth of coverage. Useful textbook level overviews of the different approaches to DCF analysis are available in a number of sources, e.g., Palepu et al. (2000) and Weston et al. (2001).

5. An American depository receipt (ADR) is a security that represents a claim to shares of a foreign security, almost always a common stock listed and traded on an exchange outside the US. Conceptually, an ADR can be viewed as an all equity financed closed end fund that holds a foreign security as the sole asset of the fund. While publicly traded on US exchanges, an ADR is only subject to SEC reporting requirements on the receipt. The company associated with the foreign security is only subject to reporting requirements imposed by the foreign market in which the security trades.

6. As with the use of Boeing in sec. 1.1, the selection of Ford is for pedagogical purposes. Ford was not selected as a model for how accounts are to be prepared or because it represents viable security selection opportunities. If anything, the method used by Ford is somewhat atypical and confusing. In some cases, the income statement is referred to using other terminology. For example, US Steel uses 'Consolidated Statement of Operations'.

7. In the following, ticker symbols appear after the company names to facilitate the retrieval of the company information from an appropriate information source such as www.bloomberg.com . In all cases, the information provided is obtained from the financial statements provided in the annual reports of the companies.

8. Baumol (1977, ch. 25) contains references to some of the early studies from the 1940's and 1950's where the capital budgeting theory currently taught in corporate finance was developed. Included in these studies are a number from engineering economics.

9. This definition corresponds with the 'indirect method' of calculating cash from operations in the cash flow statement. More precisely, there are two methods of calculating the cash flow statement: the direct method and the indirect method, e.g., Penman (2001, p.314). The indirect method calculates: *Net Income + Accruals = Cash from Operations.* Following Barth et al. (2001), the major components of accruals are: change in accounts receivable, change in accounts payable, change in inventory and depreciation/amortization. Barth et al. demonstrate that accruals have a statistically significantly ability to forecast future cash flows.

10. This adjustment can depend, for example, whether the DCF valuation is determining the market value of the firm or the market value of common equity. Adjustment for net interest expense is more appropriate if the market value of the firm is being calculated.

11. There is a procedural difference between these two numbers in determining a DCF value. If *FCFF* is used, then discounting is done at the weighted average cost of capital. If *FCFE* is used then discounting is done at the cost of equity.

12. Following Ehrbar (1998), the types of additional adjustments that are made involve: goodwill amortization; asset write-offs; full expensing of R&D; restructuring charges; and, leasing arrangements.

13. Calculation of the weighted average cost of capital is discussed in introductory corporate finance texts, e.g., Giammarino (1996). The formula defines *ROIC* after taxes and depreciation as *ROIC = {EBIT(1-Tax Rate)} / Invested Capital.*

14. The Canadian Securities Course (1993, p.97) does not include deferred taxes in the calculation of invested capital.

15. Though proponents of EVA and the economic profit model distinguish between these techniques and DCF models, there is no conceptual difference in the underlying methodology. The distinction is largely one of semantics. The intent is to distinguish between the types of cash flows being discounted, the EVA-type being closer to 'economic profit' than the accounting determined FCF values.

16. Sutton (2002) provides a practical overview of the current crisis including a brief overview of the main points of the Sarbanes-Oxley Act. The text of this Act can be viewed from links at the SEC website.

17. Poitras (2002b) discusses the different accounting standards that are used in various jurisdictions. In some locales, it is possible to revalue assets without doing an asset sale. In practice, this transforms the earnings management decision into a classificatory problem.

18. The number of academic accounting studies on techniques of earnings management and earnings manipulation is difficult to estimate, certainly numbering in the hundreds. Dechow and

Skinner (2000) examines the differences between views of various academics, practitioners and regulators about earnings management. Sutton (2002) discusses some of the issues associated with the reform of financial reporting.

19. Ruback (2002) suggests an alternative DCF model, the 'capital cash flow model' that involves discounting free cash flow by the weighted average cost of capital. Because in this method the interest tax shields are included in the cash flows, the capital cash flow approach is easier to apply when debt is forecasted in levels instead of as a percent of total firm value.

20. Though the objective of doing a valuation for Coca-Cola was to illustrate the use of simple DCF models, the analysis indicates that KO is accurately valued with the balance pointing toward overvaluation. Mitigation comes from the reasonably robust improvement in variables such as free cash and earnings in 2002. In addition, this improvement has been accompanied by a fall in the common stock price level to values that are historically low for KO. However, with a *P/E* at 23, a *P/BV* of 8.5 and a deterioration in the dividend payout ratio there does not appear to be sufficient improvement in free cash flow to support the significant upside price movement from the current price level. An expected increase in net operating revenue similar to what was experienced from 2001 to 2002 is indicated for the current common stock price to sustain the view that KO is still a legitimate 'value investing' company. Whether such an increase in operating revenue is justified requires considerably more analysis than what has been provided. Such analysis would have to take into account the gains that could be obtained from purchasing, say, an investment grade corporate bond.

21. Modeling the future cash flows individually permits the introduction of ***real option*** values into the valuation. In addition, variability and contingency in the future cash flows (or accruals) can be captured using Monte Carlo analysis (see sec. 6.3). However, while Monte Carlo methods are attractive when valuing fixed income securities with embedded options and real options are valuable for capital budgeting decisions, the problem of valuing a common stock is usually not sufficiently precise for these techniques to be as valuable in this type of application.

22. The method of comparables is not a technique that is unique to professional security analysts. Variations of this approach can be found in real estate appraisal, tax law, and probate law where valuations of untraded real assets and privately held businesses are required.

23. In sec. 7.3, GDC observed that relative valuation analysis (method of comparables) is sensible for a fund that is required to be always fully invested in common stocks. This observation can be used to provide another rationale for the widespread use of the method of comparables in professional security analysis. In effect, both the buy-side and sell-side institutions can be viewed as fully invested funds. In aggregate, the buy-side institutions hold the bulk of common stock and the sell-side institutions make a large fraction of firm revenue from supporting common stock trading activities. Unlike Warren Buffett who has the luxury of sitting on the sidelines for years if common stocks are estimated to be over-valued, the professional security analyst is, of necessity, required to support a position that is continuously invested in common stocks. Hence, even if a

detailed DCF model determined that stocks, as a whole, were overvalued and that a shift into bonds and other assets, e.g., real estate, was indicated, such a conclusion could not be sustained by the nature of the job the professional security analyst is required to do.

24. This estimate is based on data from July 1999. Based on the performance of Gateway common stock since that time, it is apparent that the estimate of Gateway being undervalued was decidedly incorrect. As of March 2003, the stock is trading at historic lows and is on the bankruptcy watch list from Weiss ratings service.