Rational Investing

A System for True Free Cash Flow Estimation And the Valuation of a Firm's Securities

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Rational Investing: A Free Cash Flow Valuation System

EXECUTIVE SUMMARY

The Rational Investing Cash Flow Engine was created in response to the valuations of internet and technology stocks in the late nineties, to understand how the traditional notion of a discounted cash flow could be compatible with the unusual securities prices observed at the time. It generates a comprehensive valuation for a firm using high quality cash flow data, is free of projection biases, and uses a cost of capital that reflects the real risks of owning publicly traded securities by incorporating fundamental risk factors into its discount rate. The incorporation of these fundamental factors facilitated an understanding of equity valuation at a time of high growth, high expected terminal margins, a steep yield curve, and demand / supply imbalance for technology stocks.

The product has evolved into a tool for valuation, risk management, and long or short idea generation from the public investor's point of view by adding leverage and capital structure analysis, including the forward projections of traditional financial ratios, and importantly, tuning the product to business volatility and commodity cycles. This allows it to rank valuations across sectors based on its risk adjusted returns.

While a single 'market portfolio' may exist as a broad average over a time period of decades, the results of the our simulations prove that a nuanced understanding of relationships between multiple risk factors, other than just beta, predicts valuation in the market and generate excess returns on publicly traded corporate securities over indices.

- **Calculating and Projecting Free Cash Flow.** We project the real cash flow generation capacity of the firm within a 10 year horizon by using cash only line items from SEC filings. An identical template of formulae is used for every company no matter what its industry sector or geography, with well-defined and limited human input. Each line item projection uses mathematics to project future years. The firm's evolution into a growing annuity of terminal FCF is driven by trends in its recent revenue and cost structure as well as the true eventual costs of running the business, constrained by the potential returns available to investors. We incorporate capital expenditures and equity issuance as costs of growth. Non-US companies are normalized to approximate US conventions. Many countercyclical assumptions offset the impact of volatile business conditions.

- **Injecting Data.** The supporting step is to automatically populate historical data in conjunction with 'economic scrubbing' of accounting statements. We use the latest 2 quarters and 2 years as necessary and sufficient historical information to create projections. 'Economic scrubbing' incorporates restatements, stripping out of non-cash items, offsetting changes in accounting methodology, spin-offs,

mergers, JV's, error checking or dampening trend lines from amounts varying significantly from other filings or line items, interest rate risk extracted from footnotes, etc. In most research efforts, analysts will do this individually for each firm. We have significantly automated such corrections. This standardizes and reduces the cost of a traditionally idiosyncratic and expensive task. Our cost effectiveness is further improved by our office in Bombay, India. Purely statistical valuation approaches cannot duplicate this effort. ***The ability to do economic scrubbing in the context of a transparent spreadsheet valuation is a significant source of alpha of this model.***

- **Expected Returns.** The third step is to generate discount rates at which the free cash flow of the firm, and separately, cash flow to equity, should be priced. Our calculation models the risk aversion of public investors distinctly from that of private buyers. Because of the additional cost of information, public markets have a skew towards growth, and in point of fact growing firms go public, and mature firms with declining but predictable cash flows are taken private as leverage becomes the sole mechanism for enhancing returns. Additionally, to us, monetary policy resulting in a deviation from the norm of term structure of risk free rates alters risk aversion i.e. the Fed affects the equity risk premium, lowering it when it steepens the risk free yield curve or vice versa. Our valuation incorporates the current shape of the yield curve, leverage, cash flow generation, growth and size as factors in the cost of capital. It also takes into account whether the firm is impacted by the price of a commodity, is in an industry with very high requirements of R&D or CAPEX, and faces regulatory burdens or has otherwise volatile, stable, or monopolistic cash flows. We quantify the difference between predictability of revenues of a specialty retailer, a landlord, and an oil refinery based on hard asset value and competitive / regulatory position. These factors are interlinked; this is a unique element of our modeling process.

- **Liquidity and Capital Structure.** The final step is to project the liquidity of the firm by measuring its minimum and expected financing needs based upon available cash flow, maintenance CAPEX, and typical M&A and other capital markets activity. Here, we incorporate the impact of non-operating income, as well as the reliance upon short term financing. This step helps understand if a firm is going to face material refinancing risk with respect to credit or interest rate exposure. It also generates a simple analysis of enterprise value where we compare the value of the firm with the value of its components i.e. debt, taxes, equity. The difference gives information about default risk at the firm level.

This process, now applied to over 3000 domestic stocks and international stocks and ADR's, yields an apples to apples comparison by which the cheapest and most expensive companies are identified. The system scales analyst effort sufficiently to generate significant 'alpha' in a long / short strategy. As a side-effect, the process often highlights cheap or expensive sectors, as well as high growth or troubled firms with the most mis-pricing based on a uniform valuation template. Such mis-pricing usually lasts no more than 4 to 6 months from date of release of information in an SEC filing.

MODELING OBJECTIVE

The genesis of this product was in observing the valuation of internet and technology stocks in the late nineties. The market value of the tech sector represented a challenge to traditional corporate finance theory. The underlying firms had very high, in some cases accelerating, growth rates. They were very small, few of them made money based on GAAP, and free cash flow was usually negative. Yet, this situation was welcomed by the capital markets, despite the fact that a major portion of these firms' labor cost was hidden in equity issuance in the form of options. Some firms acted like biotech companies, going public with little even in the way of revenues, often lacking the clear efficacy parameters and distribution available to the biotech sector. Despite the low expected returns modeled by traditional tools, buyers of these securities were experiencing high capital appreciation and expected that to continue indefinitely into the future. Today, many commodity driven stocks can behave similarly. Without our worldview, the dichotomy between traditional metrics and the prices of such stocks can be puzzling.

The objective of applying our models is to understand the financial risks of a publicly traded firm, and come up with a valuation based upon the projection of free cash flows using a set of reasonable modeling assumptions, discounted using a formula that integrates the risks of the widest range of stocks and investing styles. We have solved the mystery of the wildly different prices paid for ‘momentum’ vs. ‘value’ stocks, integrated a variety of investment styles, with a clear understanding of relationship between the stock price and the expected evolution of the costs as well as growth of a firm. The cost of capital we use to compute NPV significantly revises the traditional Sharpe-Lintner-Black CAPM, using additional factors mentioned earlier, and described in more detail in the following paragraphs.

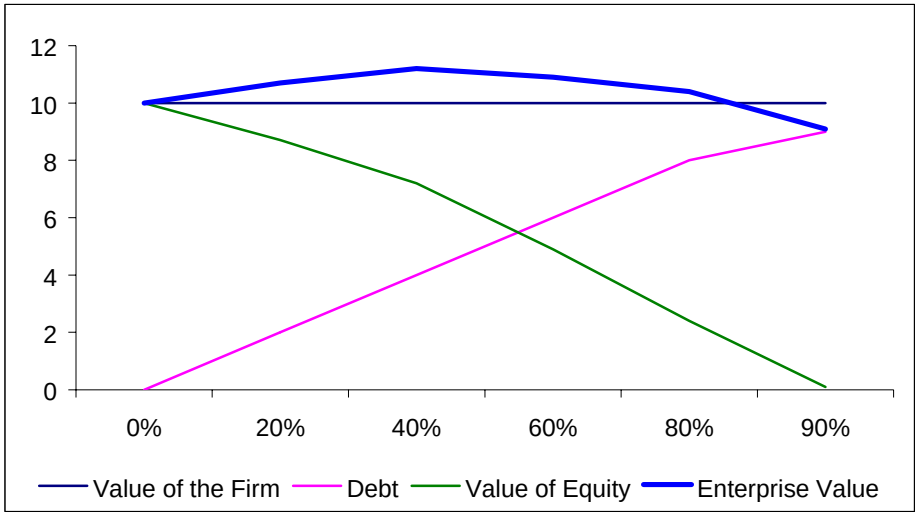
Another important facet is that we use a parallel logic of decision trees tied together in a spreadsheet rather than an explicitly statistical approach. This allows for minimal computing needs for a fairly complex pattern recognition problem, as well as the ability to construct a single set of valuation logic or template that absorbs rather than ignores most outliers. This single valuation template works for all stocks across all sectors. This uniformity proves intellectually and practically important. Intellectually, it is harder to come up with a general set of rules rather than sector specific ones. However, once in place, it is easier to comprehend unsolved problems in a single context, and maintenance is simplified by an order of magnitude else changes have to be propagated across many lines of thought; a task which would eventually become impossible to do.

We focus on cash flow based rather than asset based valuation, because asset quality is harder to evaluate quantitatively given the information available to public shareholders. Hence we do not presently include banks, insurers or utilities in our universe. We include financial brokers who use mark to market accounting with limited success. Often, our approach is meaningful for asset rich firms which have operating limits on the rate at which they can extract value from such assets e.g. a company can own a lot of

gold in the ground, but if only a certain amount can be extracted per year given current technology, that revenue stream is a better assessment of value to an equity investor than the entire sum of gold underground. To a private investor, such an asset might represent a store of wealth, and to an extent that fallback impacts a public investor's risks.

The follow on objective is to examine the capital structure of a firm to see how value is distributed between equity and debt. This requires projecting the firm's liabilities. The value generated by leverage begins as a positive amount as tax savings dominate at low levels of indebtedness, but as leverage rises, bankruptcy risk begins to dominate, and destroys value. Our simple capital structure modeling results typically clarify this.

Figure 1. Impact of Leverage on Enterprise Value



Based upon the Miller Modigliani theorem, the value of the firm should not be impacted by its capital structure, ignoring taxes and bankruptcy risk. As a corollary, any impact of capital structure on the traded value of the firm should be assignable to taxes and distress.

As a result, a simple formula is:

Value of Equity = Pretax DCF value of operating firm
– Present value of debt and expected new financing
– Present value of tax liability
+ Present value of tax loss carry-forwards

$ Value of Probability of bankruptcy = Value of equity – Market cap of fully diluted shares

This is not strictly true where the one concludes that the stock is simply cheap. We do not yet incorporate traded debt prices in our model.

DATA SCRUBBING AND VALIDATION

A large part of our ongoing process to support a production system is checking data for changes in accounting policies, one time events e.g. significant mergers or divestitures or plant shutdowns, restatements, inconsistency between statements, small acquisitions or write-offs, changes in fully diluted shares, inclusion of non-cash items in costs, mixed allocation of research, exploration, development, related expenses and CAPEX due to the capitalization of certain costs, breakdown of charges between cash and non-cash items etc. While our sources of data are automated and fairly high quality, our vendor's main objective is to provide an accurate electronic version of what the company reported, and capture human error even if it originates with the filing firm. We call this 'numerical' scrubbing. Our effort, on the other hand, is geared towards 'economic' validation, i.e. our software adjusts models for accounting items and corporate events listed above and then we look at models with extreme valuation movements or large changes in costs relative to changes in revenue, to determine if further adjustments need to be made manually. We continue to automate such checks and adjustments, so that manual intervention is required only when there is an anomalous outcome or with international data which needs cross checking or often triangulation. Nevertheless, application of human judgment occupies half our resources with US data, and is even more labor intensive in the case of non-US data. We are able to do such data scrubbing in the context of a transparent spreadsheet valuation which clearly identifies outlier valuations. Such final quality of trend data as ours is simply not available in the market and is an important part of the value created by our models.

Changing Accounting Practices and Corporate Events

Movements of costs between line items are far more common than one would like to believe, in the largest of firms and often without any stated reason. In other instances, a continuum of cash charges have become a regular feature of the management's reporting; interest rate risk hidden in swaps, and so on. Adjusting for such items requires going through the footnotes as well as projecting a trendline of 'other' costs. The opposite can also be true, where JV's and subsidiaries add to a firm's cash flow value and yet a set of measures focused on the main filing data would miss them completely. Projecting refinancing risk is also a significant task that results in a far clearer understanding of the firm's value than available in raw data from vendors, which is typically all that is available to other quantitative models. Our formulae and switches highlight, correct for or dampen the impact of acquisitions and one off events that would otherwise throw projections and valuations off. The model also accommodates situations where the firm is a rollup – there is a continued string of acquisitions that is expected to continue. The final decision of whether the transaction was a one-off, or a part of an ongoing rollup, requires an analyst to read text information on the firm and set the merger switch appropriately.

A change in accounting practice should not be confused with a change in business model. Occasionally, the firm has really changed the business it is in – going from producing pulp to selling paper and office supplies, or from producing energy under regulated profit margins to trading derivatives based on it in a de-regulated one. In such instances, the value of historical information, as well as the resulting model, becomes quite limited.

Equity Dilution

The issuance of new shares to finance the business is treated as a direct cost to the firm and one that impacts its per share valuation no matter what the kind of issuance that occurs i.e. whether through options, shares, or convertible bonds. Such management behavior is also projected forward, penalizing equity value. The reverse occurs in the case of buybacks. This methodology is a creation of Rational Investing, and for many years, was an important reason our models were at odds with those of the broker / dealers, and rightfully so.

This issuance is projected to go down over time, presumably as the firm becomes more valuable, so that the growth of number of shares slows faster than the slowdown of revenue growth. The faster slowdown for equity issuance compared to revenue growth also offsets the double counting (as an expense) of the portion of cash raised which is consumed in the current year. This is generally not a serious discrepancy for valuation purposes, because cash raised from employee option exercise is usually at a strike prices materially lower than the market price. Treating option issuance as a direct cost is now becoming a norm, years after we recognized its economic value in our models.

Share buybacks are expected to continue by using a certain amount of cash generated.

PROJECTION

Our methodology allows for a single template to cover all industry sectors as a result of sophisticated mathematical interpolation techniques; differences between different industry sectors have been reduced to a set of parameters that incorporate risks specific to that industry sector while applying general principles of economic cycles and competition to the template. The result generalizes the projection solution for financial statement line items for growing, shrinking, and cyclical or otherwise volatile firms in various stages of an economic cycle, including those dependent on the outcome of concentrated product development, extreme seasonality in revenue, or commodity prices.

Techniques learnt in the government bond and FX worlds have been applied in this system to model income statement, equity outstanding, debt service coverage and refinancing projections. For decades, the fixed income business has routinely relied upon modeling solutions comparable to ours to calculate present value of securities by applying parameters and interpolation techniques to ‘gaps’ in available information. This

technology is far less prevalent in the equity world. The uncertainty of cash flow, unlike the known coupon of a bond, as well as the ineffectiveness of Beta in any arbitrage worthy time frame, leading to uncertainty of discount rate, led to very few quantitative resources being applied to discounted cash flow equity valuation. Most analytical systems were either focused on trading oriented statistical arbitrage which included but was not particularly beholden to fundamentals, or corporate finance oriented Economic Value Added analysis, which ignores the cost of information, the yield curve, and other forces that impact public investors and was meant as an advisory rather than trading technique. As a result, constructing valuations suitable for fundamental money management remains labor intensive and practices vary widely.

Our model projects the revenue and costs of a firm forward using recent historical information by assuming that change of financial statement line items in a given year can be estimated using recent prior years and risk parameters. Revenue growth is set in order to reduce it by the 10^{th} year to a range around GDP growth, after which a perpetuity formula is used to calculate terminal value of cash flows. All line items are impacted by economic cycles as well as competitive forces.

Assumptions

The assumptions in our projection logic have been refined over many years, and take a firm as is and create convergence with the industry sector and economy it belongs to over a horizon of 10 years. If the firm is doing far better than its peers, it will grow into median performance. If it is doing much worse, it will eventually be restructured or bought out by a better management. The same applies to an industry sector. If the sector is 'hot', capital will flow in, and competition will drive down margins to sustainable levels over time. If it is not doing well, consolidation will occur until the survivors can earn meaningful returns. There are exceptions – a deflationary environment identified by extremely low discount rates is one - which can indicate overwhelming macroeconomic problems where countercyclical assumptions might fail.

If the industry sector is cyclical and there is a downturn in the economy or the underlying commodity driving its revenues, then it is assumed that revenue in a succeeding year would 'bounce back'. This thinking can also be applied to commodity costs. Even if a firm is growing exponentially, terminal growth is projected at no more than 10% i.e. about 2x nominal GDP growth. If an industry is in decline, e.g. broadcast television, then the decline in revenues would be reduced gradually, and after a few years modest revenue growth is restored, assuming management finds additional lines of business or the sector consolidates, so that it now has declining growth until the terminal growth equals inflation i.e. approaching 2%. If one were to assume continuously declining revenues for an industry sector, then projected CAPEX in that space must be cut down sharply. Such firms are typically cash cows, and good candidates for going private. For public investors they must offer returns comparable to venture capital to avoid becoming 'value traps'. While individual sectors or stocks might do better or worse, these are reasonable modeling assumptions for a 10-year horizon.

Most of the costs of a firm are projected as a percentage of revenue, including capital expenditure, and in cases where a stable capital structure with limited leverage can be assumed, interest costs as well. We strip out non-cash items from costs, and account for maintenance and investment CAPEX directly. Prima facie expectations in this area can mislead e.g. maintenance capital expenditure can seem quite low for a chain of restaurants or a fleet of trucks, but when they reach a certain age, they will all have to be refurbished or discarded. Our formulae are focused on economic returns, and can vary significantly from information the company would provide in its 'guidance'. The software strips out trends in costs generated by accounting changes, i.e. movements between line items, and attempts to maintain a stable operating margin, as well as corporate events, where a new cost structure needs to be assumed to be stable and not representing an ongoing trend from prior to the merger or divestiture.

Taxes

While information is available on marginal tax rates at the state and federal level, individual firms face varying effective tax rates on net income. We gradually raise effective marginal tax rates from those paid today towards the sum of federal and local marginal rates over the course of 10 years. If a firm is currently not profitable, then the application of taxes is delayed to account for loss carry-forwards. Some firms, e.g. Scandinavian oil companies, can face punitive tax rates – these are estimated from effective taxes being paid currently, to the extent possible. Tax projections can intentionally ignore short term volatility generated by complicated IRS rules.

Discount Rate

This step began as an intuitive effort because merely scrubbing cash flow and projecting it reasonably did not value firms in many sectors anywhere near where the market was trading based on textbook CAPM / WACC rates. We added and tuned the impact of a number of risk factors potentially significant to valuation. Simulation results subsequently offered validation of our economic logic. For those interested in theory, the empirical basis of ANY observed discount rate is still tenuous, partly because it is an argument about historical numbers that cannot be observed directly: what risk premium did people expect in the past from capital assets looking forward? It may be the same as actual returns over the past 3 or 30 years, but that is uncertain if not unlikely. A number of events over time in the structure of markets or availability of information should have changed the risk premium for any factor if not equities as a whole. Nevertheless, a starting point is 550 basis points over the 10 year Treasury, a number first calculated by Ibbotson Associates as the historical additional return of stocks for a period of 75 years. Our concern is how the 'typical' premium today is impacted by money supply and a firm's financial and operating condition, as well as tax policy. It is also proven that smaller firms earn higher returns, and at the extremes small cap value has historically delivered a significantly superior return to large cap growth. Since small cap returns are far more volatile the more interesting question is what the risk averse expected return is, to offer assurance of that realized return across a portfolio of small caps is sufficient.

What is clear is that the actions of the Federal Reserve change not only the discount rate, but also the risk aversion of investors. We have defined a working relationship between short term real rates i.e. the Fed's behavior, the yield of the 10 year Treasury, and the risk premium. We believe the difference between a historical 'equilibrium' yield curve and one that is the result of explicit policy bias by the Fed alters the equity risk premium, and compounding makes this relationship quite powerful in setting stock prices.

Intuitively, low real returns in the money market lower return expectations from long dated assets, driving capital into the stock market. Real expected returns in excess of historical at the short end would lead the market to expect significantly higher returns from longer term capital assets, creating, potentially, an inverted yield curve and a higher risk premium for stocks. The result is to magnify the impact of the Fed's actions when they force real rates away from market clearing prices, an outcome borne out over the years. Applying this hypothesis consistently moves valuations closer to the market price. It also calls into question the validity of statistical studies prior to the US abandonment of the gold standard. The Fed since Paul Volcker has been a significant presence in the markets. We believe the nature of the US market has changed from that time onwards.

Other factors include the leverage of a firm as a proxy for investor confidence in its cash flows or distress, as the case may be, in the calculation of the risk premium specific to the firm. We attempt to estimate a firm's debt coverage and spread in our models, which can easily be overwritten with actual market data when available.

We also incorporate other fundamental risk components as drivers of returns. The risk of most industry sectors is a combination of such components. In our view, the Markowitz-era 'market portfolio' can be splintered in the short term, and specific portions of the market offer returns tied to high R&D or CAPEX, litigation, monopolies, working capital needs, credit risk, event risk, commodity cycles, ownership of rent generating physical or intellectual property etc. We have to look at each industry sector and try to understand how competitive and regulatory forces and asset liquidity drive expected returns.

A factor that impacts the discount rate in a somewhat synthetic manner is the rate of change in growth of the firm. If growth is low or slowing down, then it is likely that any surprises are negative, not positive. In that situation, the discount rate gets raised, so that the stock is not as attractive an investment, and indeed, may be a short if fully valued. This has to be weighed in light of the behavior of other market participants, who might have stock price momentum built into their 'factor' models as well as the business case for that momentum.

The combination of factors we use exhibits tremendous explanatory power. This power seems to withstand out-of-sample testing, in that once we test our work against current valuations of a set of firms and sectors, it explains a large portion of the price of a stock in those and additional sectors or stocks back-testing from the year 2000 i.e. using data since 1998. We are now able to apply our methodology universally, except for companies sensitive to asset valuation.

DEBT AND CAPITAL STRUCTURE

Liability is modeled for most firms where it is of meaningful size. For equity investors, modeling leverage in detail is immediately important for highly levered firms, or for those that significantly reduce the duration of their liabilities with swaps or short term borrowing. For firms with a stable investment grade or low leverage balance sheet, debt costs can be assumed to be a fixed percentage of revenues with little loss of accuracy in pricing the stock. For debt investors, of course, projecting debt service coverage accurately is significant. While we can look up a company's financial engineering in its SEC 10-K filing, the spread to Treasury of a firm's cost of debt capital in light of its overall leverage can be an important and quick indication of its liability duration, and refinancing risks are taken into account in our liability projections and valuation. We can maintain accurate track of fixed vs. floating liabilities for firms where needed from the footnotes of these companies' SEC filings.

In the projection of debt service coverage, EBITDA is adjusted for income from non-operating sources such as equity investments or intellectual property. We assume a percentage of such income to be available as cash. We also distinguish between maintenance and growth CAPEX. Maintenance CAPEX reduces cash available to pay required debt service and taxes. For a projection of expected financing, the firm's history of acquisitions, fresh investments, and divestitures is projected as well. Interest costs for new issuance are calculated using an estimated spread of fixed rate debt to current 10-year Treasury rates. The impact of leverage on the discount rate is muted for firms with substantial assets or intellectual property.

Our model on the borrowing behavior of the largest firms can offer insight. It would seem that, through either swaps or the extensive use of short term debt, firms like IBM reduce their cost of capital to negligible levels, and those such as GE literally act like banks. The risk of this 'duration mismatch' has been underappreciated in a 20-year bull market for bonds. The market has tolerated higher leverage than it might otherwise.

ASSUMPTIONS AND FORMULAIC REPRESENTATION

The Sharpe-Lintner-Black Capital Asset Pricing Model (SLB CAPM):

Rs = Rf + Beta * (Rm – Rf)

Rs is the expected return from stocks
Rf is the 1 month t-bill yield or close equivalent (e.g. repo rate)
Rm is the return of the market as a whole.
Beta is the correlation of the price of the stock to the price of a reasonable proxy for the market, say, the S&P 500 in the US.

Our modification:

$$\mathbf{Rs = R10 + beta * (Rm-R10+ f(R1,R10) + f(Yield) + f(Size) + \sum f(Prop))}$$

R1	is the yield on 1 year Treasury bonds.
R10	is the yield on 10 year Treasury bonds.
Yield	is the market yield on the firm's long term debt, or securities superior to the one of which the return is being measured.
Size	is the size of the firm by market capitalization.
Prop	are proprietary factors added to accommodate revenues, commodity prices, regulatory issues and other sources of revenue volatility, high reinvestment rates, etc.

Yield and Size roughly correspond to the two additional factors introduced by Fama and French to the CAPM.

The CAPM literature focuses on t-bill rates as risk free expected returns, resulting in a wider spread between equities and such returns. However, most markets use the 10 year government (or AAA swap) rate as a benchmark for pricing risky assets, hence as a practical matter our approach works fine.

VALUE OF A FIRM VS. VALUE OF SECURITIES

An important distinction in our model results is what we call the Miller-Modigliani line: The value of the operating firm is calculated including the impact of CAPEX but before the impact of interest, taxes, and equity dilution or stock buybacks. An (estimated) un-levered risk spread is applied to calculate the discount rate for this projection of cash flows. After the deduction of interest and taxes, the remaining cash flow for the valuation of the equity is discounted using the rate for equity. Our proprietary factors if applied to either discount rate may also be tuned differently to each calculation based upon our thesis that the public and private investors have different skews in their risk aversion. This can result in significantly different public and private market valuations of the firm. The present value of taxes is calculated using the same discount rate as that applied to equity i.e. the government's payoff is treated like that of any other shareholder.

ENTERPRISE CALCULATION AND THE IMPACT OF CAPITAL STRUCTURE

A calculation of the difference between the value of the firm and that of its securities plus financing requirements leads to an understanding of the impact of leverage and, to some extent, simply that of being a public entity. The Implicit Cost of Bankruptcy is a blended

indication of a cheap stock or (default probability * loss in default), calculated as the difference between the dollar value placed on the firm's securities by the equity market and our model's valuation of the firm.

The difference between the pre-tax value of the un-levered firm and the value of securities i.e. shares plus face value of debt and taxes represents the value created or destroyed by capital structure.[1] To the extent that it is generated by a recent move in the stock price, it can also be a leading indicator of movement of credit quality. Where the number is positive in the presence of significant leverage, the market certainly considers the firm to be in financial, though not necessarily operating distress. The difference in market vs. model value of the stock represents an implicit cost of bankruptcy risk created by the capital structure. This is an ongoing cost borne by the firm when issuing securities. In the absence of high yield debt, in our model it implies that the stock is cheap. This is a different, and we submit, superior, result from the default probability typically indicated by Merton models or Z scores. We are going a step further, and putting a dollar value on the information in the capital structure with a 10 year horizon, whereas most models offer a 1-year prediction of default probability and Merton uses the stock price rather than fundamental information as a primary driver of this conclusion.

A negative value of bankruptcy risk implies the securities are valued above the underlying firm, and the probability of default is remote. We are not tracking 'when issued' vs. spot yields or credit spreads, so this estimate contains a minor error to the extent bond prices have traded away significantly from the issue date coupon. An estimated value of any tax loss carry-forwards is also explicitly stated here.

SCALING THE ANALYSIS

An important ability of the system is to be able to do model generation and other reporting in batch so that results can be produced on the entire data sample, a sector, a portfolio or an index. Our system allows the same set of assumptions to be applied to every stock to produce a set of results for a sector or portfolio as a whole. Assuming all methodology errors are equally applicable to each valuation, it is especially useful as an indicator of the 'relative value' of various securities.

Index And ETF Valuation

As individual investors drift toward ETF's and index funds, and institutions begin to trade credit derivatives using models driven more by fundamentals of underlying securities than stochastic price information, it becomes important for asset allocation to be able to use valuation judgments on entire portfolios. Such an effort would be

[1] Our EV currently includes cash on the books, because of its credit implications. Most LBO analyses would strip it out.

impossible without the sort of automation offered by our system. Our system may allow a 'fundamental overlay' on many tactical trading strategies, adding significant value to the returns of such investment processes.

Such financial ratios as those found in the projections of individual models, as well as others calculable from historical information, can be produced by the Analytics section of the system. A 'view' generator allows the placement of one or more calculations in the order selected on portfolio reports. Not only can an entire portfolio be analyzed, but several portfolios can be compared side by side as well.

SOFTWARE ENGINEERING AND SUPPORT

The system is tuned towards the day to day task of running a fund. Our reports can be produced in Excel or HTML. These features can be enhanced on demand by our programming team. Currently, information from SEC filings is read into an Access database, which is then scrubbed. This database is used as an input for a batch valuation process that updates a SQL Server database. This database is used as the foundation of our web site www.rationalinvesting.com with a variety of reports on the current sample in our database. The site's technology can be used to create rankings based on blended criteria incorporating our valuation models and other metrics. A daily XML feed delivers new models to client desktops simultaneously with our web site. Private web pages can be constructed to track specific universe. The technology has been tested through thousands of transmissions and batch runs.