COMPARING MARKET-BASED AND FINANCIAL STATEMENT-BASED STOCK VALUATION MODELS: IMPLICATIONS FOR GROWTH EXPECTATIONS AND DIFFERENCES ACROSS TIME PERIODS

by

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ABSTRACT

COMPARING MARKET-BASED AND FINANCIAL STATEMENT-BASED STOCK VALUATION MODELS: IMPLICATIONS FOR GROWTH EXPECTATIONS AND DIFFERENCES ACROSS TIME PERIODS

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The value of a share of common stock in a publicly-listed company should be equal to the present value of the future cash flows the company is forecast to produce, and ultimately pay out to its stockholders. Expectations for these flows may incorporate information that goes beyond current earnings discounted into perpetuity as per the Dividend Discount Model (DDM). By comparing a market-based valuation model with a financial statement-based valuation model this paper seeks to find evidence of information embedded in market valuations that may not be captured in financial statement-based valuations. The analysis endeavors first to identify a component of stock

value that exists incremental to the DDM valuation which is based on current earnings discounted into perpetuity. This incremental component is then examined to determine the factors creating it, with those factors defined as the Franchise Factor (ability to produce returns on equity in excess of the cost of equity capital) and the Growth Factor (ability to produce growth in earnings in future periods off of the current earnings base). These results are analyzed to see what they may reveal about market growth expectations. They are further analyzed by different time periods and a first attempt is made to begin some analysis by industry.

The empirical results produced in this dissertation are generally consistent with and supportive of various aspects of finance theory and other prior empirical research, while building on that prior research because this model is different from others in that it is not returns-based and it compares market valuations to financial statement-based valuations. In particular, the empirical results here lend support to some aspects of the Leibowitz and Kogelman theoretical model that examines P/E ratios and their version of a Franchise Factor.

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CHAPTER 1

INTRODUCTION AND MOTIVATION

Formulating and analyzing stock valuation models has been staple work of research in finance and economics since the earliest days of these disciplines. Equity valuation models have incorporated concepts expressed in terms of the relationship between market stock prices and firms' accounting earnings for more than 50 years.[1] At many turns researchers have sought to bridge the gap between accounting concepts (e.g. Generally Accepted Accounting Principles, or GAAP, reported earnings) and economic concepts (e.g. equity market prices for stocks) in an effort to build models to predict share prices and equity returns, and also in an effort to understand the economic fundamentals that drive firm value and how those are perceived by stockholders. Interestingly, almost every article of those referenced by this dissertation makes some mention of the accounting vs. economics debate and how to deal with it given the data available to support empirical analysis of the subject matter.

As the literature review below will demonstrate, research efforts in this area have branched out in different directions. To begin with, for a number of years researchers sought to build models to predict stock returns in order to demonstrate market efficiency,

[1] See one of the earliest articles on this topic published in 1953 by Molodovsky in the *Financial Analysts Journal*. The author specifically discusses the concept of the Price/Earnings (P/E) ratioand links it to fundamental economic concepts such as economic value added.

or a lack thereof. Witness numerous works, as cited in the references to this dissertation, by Eugene Fama and Eugene Fama and Kenneth French, among others, who have argued for market efficiency over the past four decades since the first publication of one of Fama's earliest studies in 1970; DeBondt and Thaler (1987) and Shiller (1999), who question efficiency; and Scheifer's (2000) book devoted entirely to the question of market efficiency.[2] From these efforts grew bodies of work documenting supposed return anomalies such as size, price-earnings (P/E) and book-to-market. The size anomaly seems to show that firms with smaller market capitalizations earn greater returns than firms with larger market capitalizations. The P/E anomaly appears to demonstrate that firms with high P/E ratios reflect investor expectations that the earnings of these firms should grow faster in the future and these expectations are priced in the stock. Therefore, low P/E ratio firms may produce greater returns than firms with high P/E ratios because their future earnings growth may not yet be fully priced into their stock (or investors don't believe in their future growth prospects). The book-to-market anomaly purports that the higher the book equity to market equity ratio of a firm, the better its returns will be (this has become the value vs. growth firm comparison). We will see in the literature review below that Fama and French were the first to identify size and book-to-market as statistically significant predictors of stock returns and to include them in their version of a

[2] Fama and Fama and French have been especially prolific in the production of studies in defense of efficient markets theory. Fama's work spans four decades and some of his most cited articles are referenced in this dissertation (along with some co-authored with French). The body of work produced by Fama and Fama and French supports the theory that markets are efficient and that return anomalies cited in other research are explained by factors that are pricing risk in returns rather than that true anomalies exist.

Three Factor Capital Asset Pricing Model (CAPM). However, rather than demonstrating that these factors represent return anomalies, Fama and French show that these variables do not in fact represent return anomalies but rather that they are pricing risk in returns.

Building on this early research, subsequent models sought to improve upon the weaknesses perceived inherent to the basic CAPM.[3] Efforts extended to model stock valuations by using dividends, earnings and cash flows as alternative drivers of valuation. Keeping in mind that the CAPM makes use only of financial market data and no accounting data we can see that researchers quickly turned from theoretical discussions of the merits of the CAPM to more pragmatic discussions of how to test it and how to bridge the gap between how the financial markets assign value to stock prices and what the accounting data tells us about firms' financial performance. Further extensions of the research have attempted to segregate earnings changes into "permanent" and "transitory" components, and distinguish between the respective impacts of those components on valuations, and/or to identify "tangible" and "intangible" components of valuations (Beaver and Morse (1978), Beaver, Lambert and Morse (1980) and Daniel and Titman (2004) are examples).

[3] First fully derived by Sharpe in 1964, the CAPM assumes that investors hold well-diversified portfolios within which the unsystematic risk of individual assets is unimportant (that is that asset-specific risk can be diversified away). As a consequence, only the systematic, or undiversifiable, risk of individual assets is important and that risk is a weighted average of the risks of the assets in the portfolio. Thus, the key determinant is the asset or the portfolio sensitivity to economy-wide factors such as interest rates, exchange rates, inflation and business cycles. Others built upon the work of Sharpe and even made improvements to the basic CAPM model and theory. However, empirical testing of the model has often fallen short of proving its usefulness. A competing model has been promoted by Ross (1976), Arbitrage Pricing Theory, and Roll's (1977) scathing critique of CAPM remains to be fully refuted.

Others have also developed valuation models that build on the early work that produced the Dividend Discount Model (DDM) and Gordon Growth Model (Williams (1938) and Gordon (1961)). The early models set forth the concept that any firm's stock should be valued at the net present value of the firm's earnings discounted as a stream into perpetuity. The DDM shows that a firm's base value derives from current earnings discounted at the market discount rate or equity cost of capital. This value for a firm's stock can then be used to calculate the firm's base Price/Earnings (P/E) ratio. Gordon extended the DDM to incorporate growth in earnings.[4] Leibowitz and Kogelman (1990, 1991 and 1992) start with the DDM-based P/E ratio model and build on it to develop a model that incorporates the base P/E value plus factors that explain P/E ratios higher than the base. These factors are a Franchise Factor and a growth measure called the Growth Equivalent.[5] Leibowitz and Kogelman's work is described more fully in the literature review section below.

Despite the extensive empirical research performed in this area, some aspects remain open to debate. These include ongoing questions regarding equity market efficiency and pricing of risk in stock returns. Another aspect concerns the apparent gap between what equity markets tell us about firm valuations vs. what firm financial

[4] The original DDM formula is P = D / k where P is stock price (per share), D is the firm's dividend and k is the market discount rate. Assuming all earnings are paid out as dividends allows to express the formula as P = E / k and derive a base P/E for the firm to reflect relative base value as P/E = 1/k. Gordon extended the model to allow for constant annual growth in dividends, or earnings: P = E / (k – g) where g is a constant annual growth rate. These concepts are described below in this dissertation's model derivation.

[5] In its simplest form the Liebowitz and Kogelman model is P/E = 1/k + FF x G where FF = (ROE – k) / (ROE x k) and G is the Growth Equivalent which is the future stream of franchise opportunities discounted at the market rate and expressed as a percentage of the beginning book value of the firm.

statement data tells us about firm valuations and what gives rise to that gap. It is this gap that I seek to address with this dissertation. The primary motivation for this dissertation is an attempt to show empirically whether a gap exists between a market-based and a financial statement-based valuation model that both make use of sound financial theory. Then I try to explain why the gap arises. I make use of the theoretical models built over time by others and note those in chapter three below that explains this dissertation's model derivation. As will be seen, the model is expressed in share price terms rather than in P/E terms so that when I attempt to break down the price into its value components I can see the percentage of value derived from base earnings vs. the percentage derived from growth, etc. In that respect my model is different from the others while building on the others. In addition, I express my model in such a way as to be able to generate empirical results for it using stock market and financial statement data. In this respect my work is putting into practice the theoretical models of others, such as Leibowitz and Kogelman. I also attempt to link the analysis to one of the more innovative concepts in finance theory, that of real options.[6] Though that link turns out to be hard to prove in a concrete fashion, some evidence exists to support it.

[6] Real options theory holds that there are important managerial options inherent in many corporate investment opportunities and these options embedded in a firm's business portfolio have value (examples include the option to delay or defer investments, to abandon projects in mid-stream, to change course on capital investment projects under different sets of circumstances, etc.). A rigorous exposition of the topic is included in Dixit and Pindyck's book Investment Under Uncertainty (1994). Industries in which the theory have been most frequently applied include mining, oil and gas exploration and pharmaceuticals (with the latter commonly being for R&D projects).

With that backdrop, this paper seeks to build and compare two models for stock valuation, one that incorporates market-based data and one that uses financial-statement based data. The models include both earnings and dividend concepts and they produce information that ultimately allows us to separate firm valuation components into the portion related to future growth expectations, based on embedded sustainable growth rates calculated for each firm from financial statement data, and the portion which may be related to something else that may be firm or industry specific. It is this latter element that I will examine for evidence of real options value, albeit using a simplified analysis.

The overall analysis is broken down into three main parts. First, I look for a statistically significant component of firm value that is not captured by the value from simply discounting current earnings. This component will include, by definition, the value from firms' future growth opportunities. This will be explored using a market-based valuation model. Second, I look for the same type of component of value from future growth opportunities as embedded in a financial statement-based valuation model. Third, I compare the results of the two models and explain those. Within each of these three sections I also look for differences across time periods and differences between firms with positive growth and those with negative growth. I additionally take a first step toward looking at industry differences based on a review of some of the data by Standard Industrial Classification (SIC) code.

Chapter two provides a review of the most relevant literature. Chapter three develops the model and sets forth the version of it to be tested empirically. Chapter four

describes the data, sources of it and the empirical testing techniques used. Chapter five presents the empirical results showing: 1) the results of the market-based valuation model regarding the value of firms' future growth opportunities, 2) the results of the financial statement-based valuation model regarding the value of firms' future growth opportunities and 3) a comparison of the two models and some additional analyses. Chapter six concludes and offers ideas for further research.

A quick word about what this analysis does not attempt to do. It is not an analysis of returns per se. It does not look for excess returns nor does it try to precisely define how risk is priced. It does not draw any conclusions about market efficiency. It does make an effort to show differences between how stocks may be valued in the equity markets during any given time period vs. how stock valuations could be derived from accounting data (firms' financial statement reports) based on a model that is grounded in finance theory but that uses readily available firm data. I then explain in a pragmatic way why these differences may exist or how market valuations and financial statement valuations may be linked. I believe there exists a worthwhile opportunity within finance to bring theoretical valuation models and applied valuation models closer together in order to not only support better informed decision making by investors but also to help firm managers make better decisions regarding the creation of long-term sustainable economic value for their stakeholders. With this dissertation I hope to take a step in that direction. In addition I expect to draw some conclusions that may lead to suggestions for how to improve

disclosures in firms' financial statement filings and add information that may be informative for equity holders.

CHAPTER 2

LITERATURE REVIEW

Researchers in finance have postulated models for predicting stock returns since the time finance became an organized academic discipline. Practically from the moment of the development and elucidation of the CAPM[7], researchers were criticizing it and seeking ways to improve upon it. One reason for this was the model's relatively poor performance in several studies when tested empirically.[8] These poor results led some researchers to conclude that stock markets are not efficient, at least in the short-run.[9] Others concluded that the model for predicting stock returns was not adequate to the task and they quickly sought to explain why and promote more robust models.

2.1 Evidence for excess returns

Seminal work by Eugene Fama, as well as Eugene Fama collaborating with Kenneth French, showed that by controlling for certain variables previously viewed to represent return "anomalies", an improved stock prediction model could be formulated

[7] See Sharpe's 1964 derivation of CAPM. Also Linter (1965) and Black and Scholes (1972).
[8] There is a large body of work which finds statistical evidence to reject the validity of the CAPM as formulated by Sharpe. To cite a few such studies, some theoretical, some empirical: Dybvig and Ingersoll (1982) ,Gibbons (1982), Tinic and West (1986), Kandel and Stambaugh (1987), Shanken (1985 and 1987), Roll (1988) and Cambell and Mei (1993).
[9] See Basu (1977), De Bondt and Thaler (1987), Bernard, Thomas and Wahlen (1997), La Porta, Lakinishok, Schleifer and Vishny (1997), among others. In addition, see studies such as that by Kahneman and Riepe (1998) and Shiller (1999) incorporating behavioral aspects and investor psychology.

and markets could be demonstrated to be efficient.[10] These variables were size and book-to-market equity. Subsequent researchers have built upon this concept and included other variables, such as momentum, and claimed to have improved the model further.[11]

Despite Fama and French's insistence that markets are efficient and that purported excess returns are proxies for risk, as this body of literature has developed numerous researchers have found statistical evidence of excess returns not fully explained by risk. These include components of returns related to: the size effect (Banz (1981), Collins, Kothari and Rayburn (1987) and Freeman (1987), among many others); the book-to-market (or value vs. growth) effect (Chan, Jegadeesh and Lakonishok (1995), La Porta, Lakonishok, Schleifer and Vishny (1997) and Chan, Karceski and Lakonishok (2000), among others), the momentum effect (Carhart (1997)) and post announcement drifts in securities returns (Foster, Olsen and Shevlin (1984) and many others subsequently). Another area studied is that of the relationship between earnings and stock returns and stock valuation models that rely on earnings, dividends or cash flows to predict stock returns (Ohlson (1983, 1989a, 1989b and 1995), Penman and Sougiannis (1998) and Francis, Olsson and Oswald (2000)). The relevance of this latter aspect comes from the idea that perhaps by using variables other than earnings in stock valuation models apparent anomalies (or excess returns) might disappear. This might be the case if

[10] Refer to Fama and French references at the end of this paper as well as Daniel and Titman (1997), Banz (1981), Lakonishok, Shleifer and Vishny (1995) and La Porta (1996).

[11] In fact, Fama and French developed their so-called Three Factor Model by incorporating size and book-to-market equity variables alongside beta in a variation on the basic CAPM. In addition, Carhart (1997) added a momentum variable to produce his Four Factor Model.

accounting earnings are not a good representation of the economic performance of a company and thus either dividends or cash flows might be better predictors of stock values and returns. I raise the accounting earnings as informational variable here in the context of its contribution to evaluating excess returns and their compensating for risk. The earnings vs. dividends vs. cash flow model debate is taken up further in section 2.3 below.

2.2 Evidence for a P/E (or E/P) effect

The P/E[12] debate is not new. Even before sophisticated empirical testing techniques became the norm in academic financial research, parties observed P/E trends and tried to explain them. Molodovsky (1953) may have been the first to postulate a theory of P/E ratios. He sought to link P/E concepts to fundamental economic concepts. He concluded that one should be able to make some inferences regarding shares being over or under-valued based on deviations in P/E ratios from expected values. He also discussed the difficulty of choosing the right discount rate as well as the practical issues with forecasting earnings. Others followed Molodovsky early on, showing low P/E stock returns to be superior to high P/E stock returns but with little explanation as to why and through use of less than robust testing (Nicholson (1960 and 1968), McWilliams (1966) and Breen (1968), to cite a few).

[12] Some studies have approached the relationship between stock prices and earnings by looking at the reverse of the P/E ratio, the E/P ratio or earnings yield. E/P can be understood on a standalone basis as derived from a traditional book return on equity (ROE) modified to net income divided by the market value of equity and with both numerator and denominator divided by shares outstanding. This gives an earnings yield on market equity. Expressing the relationship in P/E form may be a more intuitive way for investors to think about relative valuations across stocks.

Basu (1977 and 1983) produced one of the first studies done with a sound empirical model that found low P/E stocks earn higher returns, even after adjusting for risk. In 1978 Ball studied market reaction to earnings announcements and found post-announcement excess returns in many cases. He concluded that earnings were acting as a proxy for omitted variables or other model misspecification effects in a two-parameter asset pricing model. In the same year, Beaver and Morse found that growth in earnings does not explain persistent differences in firms' P/E ratios and that the explanation for these differences is also not related to risk but is a result of differences in accounting methods for determining earnings. Beaver, Lambert and Morse (1980) continued work in this area and decided that earnings do not follow a random walk process and therefore are a more complex process than previously modeled. They did, however, support the use of earnings, as opposed to dividends, for empirical models of stock prices as long as earnings are used in the appropriate manner. Peavy and Goodman (1983) show that low P/E stocks provide superior risk-adjusted returns. Beaver, Lambert and Ryan (1987) argue that using a reverse regression technique is a better way to look at the relationship between share prices and earnings (i.e. use prices to predict earnings rather than the other way around). Ball (1992) hypothesizes that the P/E effect may be related to costs to investors of acquiring and processing information. Many others have sought to document the relationship between earnings changes and risk shifts and the consequent impacts on share valuations (Kim (1987), Bernard and Thomas (1989), Jaffe, Keim and Westerfield (1989), Ball, Kothari and Watts (1993) and Bernard, Thomas and Wahlen (1997)), with

mixed results. Given that the results to date are not definitive, the jury is still out as to whether the "P/E (or E/P) effect" seen in empirical tests is explained by risk or not. Rissman and Marino (2005) draw a conclusion that is perhaps inevitable in the absence of satisfactory explanations for the P/E phenomenon. Their conclusion is that high P/E ratios generally imply unsustainable growth expectations.

Related work by Leibowitz and Kogelman (1990, 1991 and 1992) produces a theoretical model that breaks down the components of a firm's P/E ratio into base P/E and two other factors - a Franchise Factor that represents the P/E impact of new investments that earn a firm specific return and a growth measure called the Growth Equivalent that represents the P/E impact due to the magnitude of the new investment opportunities. Leibowitz and Kogelman start with the simplifying assumptions of certain returns, no leverage and no taxes and then extend the model to relax these assumptions. I refer to the Leibowitz nd Kogelman exposition of this model below in chapter three where I derive my model. Two results of the Leibowitz and Kogelman theoretical model are that the Franchise Factor is relatively small in size and that it takes an extraordinarily high level of growth to support a higher than base P/E ratio. Leibowitz and Kogelman do not attempt to run their model using real world data in the series of papers referenced here. Leibowitz and Kogelman also refer to firm valuation as the sum of tangible value, the capitalized value of a firm's current earnings stream, and franchise value, the capitalized value of the potential payoff from all future franchise investment opportunities (franchise value derives from a firm's ability to invest at returns above the

market required rate of return and from a firm's ability to grow that investment). The Leibowitz and Kogelman work does not seek to analyze returns and find a P/E-based factor inherent in returns like the returns-based researchers did.

2.3 Dividends, cash flow and earnings approaches to valuation

Implicit in this discussion is the issue of whether accounting earnings is the right variable to use in stock valuation models. Arguments have been made in support of the alternative variables of dividends and cash flows. Ohlson in particular has focused substantial effort on this question (see multiple articles 1983, 1989 and 1995). Though finding fault with most models, he tends to favor the use of dividends or earnings as opposed to cash flows (his 1989 article that provides a synthesis of the various approaches is particularly insightful on this point). In his later works, Ohlson moves toward development of a fully articulated model in support of the use of earnings vs. dividends in share valuation models. He finds theoretical weaknesses in each of the valuation models relying on dividends, cash flows or earnings though he settles on the approach using earnings as an information variable that suffices to determine a security's payoff as the one with the fewest problems. He looks at accounting data from an informational perspective and seeks to stay as close as possible to finance theory and derive a sound model for the relationship between securities prices and current accounting data. He acknowledges the limitations of all of the theoretical constructs used in empirical analysis while nevertheless concluding that: "There is therefore nothing intrinsically wrong with *not* specifying an explicit link between the independent

(accounting) variables and expectation of dividends or some other valuation attribute." Others are in agreement with Ohlson (Peasnell (1982)). It is widely recognized that when using earnings in stock valuation models one must pay attention to potential differences due to disparate accounting treatments and several authors have addressed this aspect (Frankel and Lee (1998) and Penman and Zhang (2002)). Bernard (1995) supports Ohlson and brings in consideration of other aspects such as economic value added. Francis, Olsson and Oswald (2000) come out in support of the use of earnings for valuing equities, as do Sougiannis and Yaekura (2000). Francis, Olsson and Oswald conclude that though all of the three theoretical valuation models – using dividends, cash flows or earnings – should yield the same result, they will only do so if the embedded assumptions for growth, discount rates and other attributes are consistent. They then find that an earnings-based model produces the most consistent results and therefore may embody the most consistent underlying forecasts for growth, discount rates, etc. The Francis, Olsson and Oswald model makes use of earnings forecasts sourced from Value Line data. One may argue with good reason that earnings forecast data is as notoriously imperfect as accounting data and for this reason I have chosen to use the imperfect "devil I know" accounting data in my analysis.

One should note that views on this topic are not unanimous and some continue to argue for the use of other variables in stock valuation models, most notably cash flows (Kaplan and Ruback (1995)). Still others have developed different models altogether with these generally relying on some form of structured financial statement analysis (Ou and

Penman (1989), Zhang (2000) and Nissim and Penman (2001)). In related research, some have sought to examine the impact of analysts' earnings forecasts on market opinion and how these forecasts correlate with stock recommendations (Elgers, Lo and Pfeiffer (2001) and Bradshaw (2004)). Still others have looked at whether information that investors have with respect to firms' earnings is consistent with information that firm management has (McNichols (1989)). Penman and Sougiannis (1998) find that different valuation models may perform differently under certain sets of circumstances and so one may need to choose the model that would be expected to perform the best under the particular circumstances being studied. Finally, looking at yet another twist on whether earnings is really the right variable to use in stock valuation models, Arnott and Asness (2003) produce the somewhat surprising result that higher dividends result in higher future earnings growth. They then conclude that perhaps one should look at expected dividend payout levels to forecast earnings growth and stock values, instead of looking at expected earnings to forecast dividends.

As a practical matter, for empirical testing it is clear that data on either earnings or dividends is more readily available from independent sources than is cash flow data, both for actual firm data and for forecast data, and is impacted less by a firm's fluctuating investment requirements (cash flow can be significantly impacted in a given period by capital spending or other business development activities such as acquisitions). Despite the vagaries of changing accounting standards, accounting earnings at least have the merit of being calculated under the consistent methodology of GAAP for publicly-listed

firms, thereby removing one element of inconsistency. With respect to dividends, historical trends in dividend payments have generally been reasonably informative for most firms when looking to future expectations for those payments. There are firm-specific exceptions to these trends and though one may encounter broader exceptions during times of significant economic downturns those can be dealt with within the context of empirical studies. I will show in chapter three how I propose incorporating both earnings and dividends in my model.

2.4 Permanent and transitory elements of earnings and their influence on valuation

Further branches of this body of literature continue to develop. Assuming some degree of acceptance of the validity of a P/E (or E/P) effect and the use of earnings in valuation models, several researchers have sought to decompose the elements of earnings in order to better understand and explain the impact of changes in earnings on share prices. These include looking at "permanent" vs. "transitory" elements of earnings changes (Freeman and Tse (1989) and Ou and Penman (1989)), long-term earnings growth expectations (Chan, Karceski and Lakonishok (2003)) and accrual vs. cash flow components of earnings (Sloan (1996) and Fairfield, Whisenant and Yohn (2003)). All of these attempt to split the components of changes in earnings into those that are core to the firm's business model and therefore sustainable vs. those that may be one-time events or arise from some accounting convention that might distort the multi-period picture. On an individual stock level the evidence from equity analyst reports and what we seem to see from investor behavior is that these parties do a reasonably good job of stripping out one-

time events from their expectations for sustainable future earnings growth. Demonstrating this in macro empirical studies may be a bit more challenging but some of the work done to analyze the impact of special events and announcements on share prices goes in that direction. What we may hope from the macro data is that the impact of one-time earnings events in the accounting data for some individual firms will not overly impact the broader conclusions we are able to draw over time for the stock market as a whole.

2.5 Tangible and intangible information content and stock valuations

In addition, a number of researchers have postulated models designed to segregate the impact of tangible and intangible information on share prices. Barth, Kasznik and McNichols (1999) find that analysts will more often cover, and spend more effort to do so, firms with more intangible assets and this may impact share returns. Chan, Lakonishok and Sougiannis (2001) find that high R&D firms earn large excess returns and the R&D factor should be controlled for when doing P/E analysis. High R&D may be associated with a significant intangible component of share valuation. Daniel and Titman (2004) seek to decipher the meaning of market reactions to tangible and intangible information and find the intangible component significant. We observe this phenomenon anecdotally when companies announce changes in their R&D spending plans or report on developments in their R&D pipelines (see the pharmaceutical industry as an example) and when firms experience significant intellectual property events (i.e. negative upon an important patent challenge or expiration, positive upon the granting of an important

patent or license; positive upon demonstration of protectable know-how or some other intangible advantage; etc.).

Finally, pursuing an entirely different line of thought, Kahneman and Riepe (1998) look at biases in financial advisory services based on psychological aspects and they remind us that behavioral aspects can weigh substantially in valuations at any given point in time.

This dissertation seeks to build on the body of literature that precedes it by extending the analysis of the relationship between market-based valuations and accounting-based valuations to investigate areas that have not been explored in detail in prior studies. First, I construct a market-based valuation model that incorporates equity market data for share prices, discount rates calculated using the CAPM and current period earnings. The model is designed to capture the value of future growth in earnings that is embedded in share prices beyond the value of current earnings discounted into perpetuity. Second, I construct a financial statement-based (accounting data) valuation model to see if it produces a different result than the market-based model. I then look at differences in each model's results across different time periods and I compare the two models. I also look at the results segmented into positive earnings growth firms and negative earnings growth firms and as well start to take a simple look at some possible industry differences. Embedded in the analysis are components included in the financial statement-based model which try to highlight the contribution to value from a Franchise Factor, similar to the concept originated by Leibowtiz and Kogelman, and a Growth Factor (defined below

in chapter three and related to the similar concept originated by Leibowitz and Kogelman but expressed somewhat differently) which may help explain the more important drivers of stock values and may be able to be linked to real options theory, though admittedly this latter aspect has been looked at in only a simplistic way in this paper.

CHAPTER 3

MODEL DERIVATION

The most basic valuation model for a common stock, one that simply discounts the future stream of cash flows (dividends) to common shareholders, can be expressed as:

$$\text{Eq. (1)} \quad P_0 = D_1 / (1 + r) + D_2 / (1 + r)^2 + D_3 / (1 + r)^3 + \ldots + D_t / (1 + r)^t$$

Where:

P_0 = the price of a share of common stock just after dividend D_0 is paid and is therefore no longer included in the stock value

D_t = dividend per share in time period t

r = required rate of return on common stock, or the discount rate (the firm's cost of capital)[13]

Showing the equation in perpetuity and with zero growth we have a version of the Dividend Discount Model (DDM):

$$\text{Eq. (2)} \quad P_{t-1} = D_t / r$$

What happens if a firm does not pay dividends (under the assumption that it is reinvesting all earnings to fund growth which produces returns at or above its cost of capital)? I assume that eventually it will pay dividends, perhaps due to shareholder

[13] Discount rates can be viewed in many different ways. These may include CAPM-based calculations of cost of capital using either book or market equity, the implied cost of capital that can be inferred from a valuation model that "backs into" an implied rate of return, cost of equity capital, cost of debt capital, etc. In this model r will be kept constant, consistent with an interpretation of r as the mean (or mathematical first moment) of rates over a given yield curve. Alternatively one could assume the yield curve to be flat. I can therefore consider r as a constant multi-period equivalent rate.

pressure, management's recognition of the positive signal sent by paying dividends or capital structure issues (tax advantages of using some debt) and it is only a question of time. In an extreme case I can also assume that at some point in the future the firm will be liquidated and a liquidating dividend will be paid. Again it is a question of time value on the payout of the cash flows and the issue of time is reflected in the equation.

Most of us would assume that company dividends will not pay out forever with no growth and historical company data shows this. Dividend paying companies often increase the amount of their dividend payments in line with their earnings growth (though they may hold the dividend constant or even cut it during difficult economic times). Introducing a constant growth of dividends into the model[14], at growth rate g:

$$\text{Eq. (3)} \quad P_{t-1} = D_t / (r - g)$$

This is the Gordon Growth Model, an extension of the DDM, originally articulated in this form by Myron Gordon in 1959.[15] To avoid mathematical quandaries as I further develop my model, I make the simplifying assumption that in a competitive market no firm can grow faster than its discount rate for an extended period of time. I will incorporate this theoretical sustainable growth model into my model below and into the equations to be tested empirically though I allow the actual data to determine the growth rates that are included in the empirical analysis.

[14] At this juncture the growth rate in dividends is assumed to be constant. However, see the discussion below as the model evolves to incorporate a non-constant growth rate.

[15] Myron Gordon first expressed this form of discounted cash flow model of stock valuation in 1959 in his article "Dividends, Earnings and Stock Prices" published in the Review of Economics and Statistics.

Eq. (3) also works for the case of negative growth since a negative g serves to make the denominator larger than in the positive g case ($r - (-g) = r + g$), and a much lower stock price will result.

Relating dividends to earnings (accounting earnings), over the long run, dividends can only be paid if the firm is generating positive earnings and cash flow. In the short run, a company can pay dividends even if its cash flow is negative, but such a situation cannot go on forever. At some point providers of capital will not be willing to finance a firm if it doesn't generate positive economic returns or if the only thing it is doing is paying dividends rather than investing to generate future earnings. At the least such a practice would be highly inefficient from a tax standpoint, both for the firm and for capital providers. In fact providers of debt capital will be loathe to provide financing to a firm just so the firm can distribute dividends to its equity holders and this source of financing will quickly dry up. On the equity holder side, providers of equity capital would have no incentive to put new equity into a firm only to have it paid back in the form of dividends.

So for practical purposes, one can associate dividends with earnings. In the two extreme cases either no dividends are paid, so 100% of earnings are retained, or all earnings are paid out and nothing is retained. Neither assumption is completely unrealistic. Though the latter is not often seen, many well-established companies, particularly those in mature industries which have stable cash flow generation, will pay out dividends in excess of 50% of earnings, and sometimes approaching 100%, and in

years where those companies may execute share buybacks, the return of capital to shareholders in any given year can exceed earnings (the share repurchase component is another discussion and not necessarily relevant to the scope of this paper, I only make the point that firms return capital to shareholders in various ways).

At this point a word on accounting earnings may be in order. The data used for the earnings variable in this analysis is gathered from Securities and Exchange Commission (SEC) filings by exchange traded companies. These earnings are derived using U.S. Generally Accepted Accounting Principles (GAAP) and audited by external audit firms. Therefore we can know that at least the data is comparable across companies. However there are two main issues to consider. First, the provisions of U.S. GAAP have changed over time so U.S. GAAP-based earnings may not be precisely comparable from time period to time period though they will remain comparable by company. Second, U.S. GAAP earnings do not necessarily reflect economics and the simplifying assumption to use earnings as a proxy for cash flow is just that – a simplifying assumption. Often the differences between accounting earnings and economic earnings (forgetting for a moment the cost of equity) are driven by timing differences and over a long period of time cumulative accounting earnings and economic earnings should be close to each other. I have opted to stick with the simplifying assumption of using accounting earnings to proxy for cash flows despite the weaknesses inherent in this assumption. The vagaries of trying to find good quality earnings data from a source other than SEC filings and/or to make extensive adjustments to the accounting data in an effort

to better proxy for economic data seem more dangerous than the imprecision of using the accounting data as it is. As discussed above under the literature review in chapter two, others have come to a similar conclusion, while recognizing the weaknesses in the argument.

If I assume that over time all earnings will be paid out as dividends, then earnings can be considered to proxy for dividends in a share valuation model. I also avoid the practical data problem of valuing non-dividend paying firms. It may further be the case that it is easier to find estimates of future earnings growth than estimates of future dividend growth (though one can certainly look backwards for actual data on both of these). So use of earnings in valuation models may allow for easier collection of data and a more straight-forward application of constant growth assumptions uniformly across both dividend and non-dividend paying firms. Again, this treatment is consistent with much of the literature.

Another aspect to consider is that though market values of equity are often vastly different from book values of equity, in many jurisdictions the maximum amount of dividend that a company can pay out in any given year is limited by book earnings or book retained earnings. It is well known that accounting earnings generally do not equal economic earnings and that accounting values have to be adjusted to get to cash flows for any given time period. This is why even if a company did pay out exactly the value of its accounting earnings in every year, if that company were liquidated at some future date, the “balancing” amount left to settle out the balance sheet (net treasury position, retained

earnings, book value of equity, etc.) will not be zero. This would not hold only in the event that time periods coincided so that all capital investments had been fully depreciated and if assets and liabilities in the books exactly offset each other's market value. So in the end we would need to examine liquidation realizations to, in a sense, reconcile the accounting vs. economics debate on valuation and that debate is beyond the scope of this paper.

Nevertheless, in order to proceed with the study at hand, for valuation models which will be used to study actual stock market and company financial data, I will assume that earnings can reasonably be substituted for dividends. As will be seen below, the present model also incorporates the dividend concept via use of a Retention Ratio (the percentage of earnings not paid out as dividends but instead retained for reinvestment in the firm) and shows the applicability of Modigliani and Miller's (M&M) dividend irrelevance finding.[16]

If I assume a specific firm pays out all its earnings as dividends, then Eq. (3) can be stated as (with E_t representing earnings):

$$\text{Eq. (4)} \quad P_{t-1} = E_t / (r - g)$$

However, on an ongoing basis it is unlikely that a firm will continuously pay out all of its earnings as dividends because this would limit the firm's ability to invest for

[16] M&M's central point is that the economic value of the assets owned by a firm derives solely from the stream of operating cash flows those assets produce. How this stream is repackaged into debt payments or equity payments (e.g. dividends) is irrelevant to firm value. See M&M 1958 and 1961.

future growth.[17] Therefore the model is enhanced below by incorporating a definition for D that expresses it in terms of earnings paid out, thus allowing me to incorporate dividends in Eq. (4) via applying a Retention Ratio (discussed below) to E.

Either Eq. (3) or Eq. (4) could be considered the base model, as will be seen below. I choose to derive the ultimate expression of the model in such a way as to show that it is theoretically consistent to use either earnings or dividends in the model and that a model can be formulated to incorporate the relevant elements of each while at the same time utilizing a practical expression that lends itself to empirical study.

Now, let us define the Retention Ratio, RR, as the percentage amount of earnings not paid out as dividends. This would leave the percentage amount of earnings paid out as dividends as 1 – RR. I can express RR as follows:

$$\text{Eq. (5)} \quad RR_t = 1 - (DPS_t / EPS_t)$$

Where DPS is dividends per share and EPS is earnings per share. I include in the definition of dividends only dividends on common shares. This is consistent with my growth assumption which only applies to dividends on common shares. Therefore I treat preferred stock or other hybrid equity instruments as debt in order to avoid overly complicating the analysis. I therefore deduct dividends paid on preferred shares from earnings since most companies who have preferred stock will show earnings before and

[17] In their theoretical model, Leibowitz and Kogelman point out that even if a firm is able to produce franchise returns in excess of its market required return, if it doesn't retain any earnings to allow it to reinvest in those opportunities then it will get no value in its stock price from its Franchise Factor.

after dividends on preferred stock (or on convertible preferred) with the earnings after dividends paid on preferred stock being those available to common shareholders.

When I take earnings and divide them by the firm's book equity[18], I get a return on equity (ROE) ratio expressed in percent. One can think of the growth rate in earnings as RR (the percentage of earnings retained by the firm) times ROE. So:

$$g_t = RR_t \text{ x } ROE_t$$

With this way of expressing g, I can now allow for a non-constant growth rate in the model. It should be noted that this expression of g has been defined as a firm's sustainable growth rate (Higgins (2007)). I discuss this concept more below. Substituting Eq. (5) into the formula for g:

$$g_t = (1 - (DPS_t / EPS_t))ROE_t$$

I can use this expression of g to formulate a model that can handle both dividend and non-dividend paying firms. Obviously, for non-dividend paying firms RR=1. Dividends can be expressed as:

$$\text{Eq. (6)} \quad D_t = E_t(1 - RR_t)$$

Substituting Eq. (6) into Eq. (3):

$$\text{Eq. (7)} \quad P_{t-1} = E_t(1 - RR_t) / (r - g_t)$$

From our expression of g above:

$$\text{Eq. (8)} \quad P_{t-1} = E_1(1 - RR_t) / (r - (RR_t \text{ x } ROE_t))$$

Or:

[18] We use book equity to be consistent with accounting, or book, earnings.

$$\text{Eq. (9)} \quad P_{t-1} / E_t = (1 - RR_t) / (r - (RR_t \times ROE_t))$$

Multiply the right-hand side by r / r and simplify:

$$P_{t-1} / E_t = (1 / r) \times (r(1 - RR_t) / (r - (RR_t \times ROE_t)))$$

$$P_{t-1} / E_t = (1 / r) \times ((r - (r \times RR_t)) / (r - (RR_t \times ROE_t)))$$

Expanding the numerator of the second term in the above equation by adding and subtracting the term $(RR_t \times ROE_t)$ yields the following:

$$P_{t-1} / E_t = (1 / r) \times ((r - (RR_t \times ROE_t) + (RR_t \times ROE_t) - (r \times RR_t)) / (r - (RR_t \times ROE_t)))$$

Which can then be simplified to:

$$\text{Eq. (10)} \quad P_{t-1} / E_t = (1 / r) \times ((1 + (RR_t(ROE_t - r))) / (r - (RR_t \times ROE_t)))$$

If I were to assume that ROE = r (in this case ROE would also be constant), such that the firm earns exactly a return on equity commensurate with its discount rate and therefore with the return expected for its risk class[19], then $P_{t-1} / E_t = 1 / r$ (the zero growth perpetuity model using earnings rather than dividends to proxy for cash flows to shareholders). I see this is true regardless of the firm's retention ratio (dividend policy), so firm value is independent of dividend policy, as per the M&M dividend irrelevance proposition.

[19] Dividend irrelevance does not require that all firms earn the same return. Firm value is given by capitalizing a firm's expected return at a rate appropriate to its risk class and independent of its capital structure. I can also show that by using ROE calculated from financial statement data and with our r taken from market expectations at a given point in time, I may find that in my empirical model ROE is not equal to r yet this does not change the applicability of dividend irrelevance. (I might also test and find that ROE is not statistically different from r, this would need to be seen.) Refer also to Gebhardt, Lee and Swaminathan's 2001 article on implied cost of capital where the authors use a discounted residual income model to generate a market implied cost of capital.

If RR = 0, then $P_{t-1} / E_t = 1 / r$ once again. If no earnings are retained, then firm value is also independent of the relationship between ROE and r. Multiplying the right-hand side of Eq. (10) by ROE_t / ROE_t and simplifying:

$$P_{t-1} / E_t = (1 / r) (((1 + ROE_{t)} \text{ x } RR_t(ROE_t – r)) / (ROE_t \text{ x } (r – (ROE_t \text{ x } RR_t))))$$

$$\text{Eq. (11)} \quad P_{t-1} / E_t = (1 / r) + ((ROE_t – r) / (ROE_t \text{ x } r)) \text{ x } (g_t / (r – g_t))$$

The term $(ROE_t – r) / (ROE_t \text{ x } r)$ is consistent with Leibowitz and Kogelman's concept of the firm's Franchise Factor or FF. FF_t can also be expressed as:

$$FF_t = (1 / r) – (1 / ROE_t)$$

How should we think about FF in terms of its meaning? We might consider it to represent the incremental value generated by a firm that is able to produce returns on its equity in excess of its cost of capital (positive economic profit or economic value added à la Stern and Stewart[20]). This is consistent with the Abnormal Earnings concept cited in the Francis, Olsson and Oswald (2000) paper cited in my references and with Leibowitz and Kogelman though as they correctly point out there is only value to FF if the firm is able to actually execute on the investments required to capture the above market return opportunities. From the equation for FF above we see that if ROE is greater than r then FF is theoretically positive and the firm is creating incremental economic value if it is growing. If ROE is less than r then FF is negative and the firm is destroying economic value. If ROE = r then FF is zero and the firm is neither creating additional economic

[20] Stern and Stewart's Economic Value Added (EVA) concept is that to create incremental value a firm must earn a return (based on economic profits, not accounting profits) above and beyond its weighted-average cost of capital. The ability to generate EVA will determine how a firm's share price evolves over time.

value nor destroying it, it is simply earning its cost of capital. It should be noted that the firm may be in this position yet still may generate positive growth in earnings and cash flow. This growth would not create economic value nor incremental present value but the firm's share price would evolve in line with its discount rate. In this situation, as per Leibowitz and Kogelman, a firm would maintain a constant P/E consistent with its base P/E. Given the way it is expressed, my model does not purport to draw any conclusions about P/E ratios per se nor their evolution though obvious inferences can be made about them. I am attempting to demonstrate differences between the share prices derived from the market-based and financial statement-based valuation models and draw conclusions about why those differences exist and where they come from.

Again striving for consistency with Leibowitz and Kogelman, I will call the term $g_t / (r - g_t)$ the firm's Growth Factor or G. Then:

$$\text{Eq. (12)} \quad P_{t-1} / E_t = (1 / r) + FF_t \times G_t$$

We might consider G to represent the incremental value generated by a firm that has a particularly attractive returns and growth profile. Obviously if g = zero then G = zero and there will not be any incremental value generated by the firm's franchise opportunities. G can be thought of as showing a sort of "multiplier effect" on valuation related to a firm's growth profile. The higher g is, for a given r, the higher the G multiplier is. Taking an example of r = 10%, if g = 1% then G = 0.11. If g = 2% then G = 0.25. At g = 5%, G = 1 and at g = 7%, G = 2.3. Leibowitz and Kogelman call their growth measure a Growth Equivalent and in their model express is as a percentage of the

original firm book value and relate both FF and G to P/E in terms of their contribution to P/E above base P/E. Because, as we will see momentarily, my model is not expressed in P/E terms but in share price terms the expression of FF and G is somewhat different but consistent. I have expressed my model in this way to facilitate the empirical testing and interpretation of the results.

So with both FF and G I build on the work of Leibowitz and Kogelman but do so in a way to try to isolate factors that may explain specific components of stock valuations using real world data, as opposed to making inferences about P/E ratios. Continuing to work with these equations, multiplying both sides of Eq. (12) by E_t:

$$\text{Eq. (13)} \quad P_{t-1} = (E_t / r) + E_t(FF_t \times G_t)$$

I will call the term $E_t(FF_t \times G_t)$ the firm's Present Value of Growth Opportunities or PVGO which will become a key term for testing within my model. So if:

$$\text{Eq. (13a)} \quad P_{t-1} = (E_t / r) + PVGO_t$$

Then from Eq. (13a) I calculate a variable I will call PVGO1 as:

$$\text{Eq. (14)} \quad PVGO1_t = P_{t-1} - (E_t / r)$$

This model can be thought of as a market-based valuation model because P is one of the independent variables in its determination. We will also see below that r is derived from market data via a CAPM calculation.

So what is PVGO1? It represents the portion of the stock price that is not captured by the value of this year's earnings discounted in perpetuity into the future. It may embody a growth factor or a franchise factor. Formulating the equation for PVGO1 in

this way allows it to be either positive or negative, thereby capturing how the equity market perceives growth or franchise value and reflects it in the stock price, on top of the value of the discounted earnings stream. Again, this is consistent with the Leibowitz and Kogelman approach to breaking down the components of P/E but I choose to look only at share price and then put real numbers to the test in my model.

Additionally, from Eq. (13) and Eq. (13a), PVGO can be expressed in a second way as:

$$\text{Eq. (15)} \quad PVGO2_t = E_t(FF_t \times G_t)$$

Remember that all of the variables on the right hand side of this equation come either directly or indirectly from financial statement data (refer back to the equations defining FF and G). P is not an independent variable in the computation of PVGO2. PVGO2 can therefore be thought of as embodying a financial statement-based valuation model. This can be seen by expressing Eq. (15) in its unsimplified form as:

$$\text{Eq. (15a)} \quad PVGO2_t = E_t(((1 / r - (1 / ROE_t)) \times ((RR_t \times ROE_t) / (r - (RR_t \times ROE_t))))$$

The PVGO2 equation in this form is the one needed for empirical testing. Its expression as Eq. (15) may be useful for interpretation.

I will use equations 14 and 15a to calculate values for PVGO1 and PVGO2. I then test their values to see if they are statistically different from zero. I also test PVGO1 and PVGO2 to see if they are different from each other and if that difference is statistically different from zero. I further run a regression of PVGO1 against the variables FF and G, as well as control variables for market equity (ME) for size and book-to-market ratio

(BM) for value, in order to attempt to isolate the contributions of these components to PVGO1.

I expect both PVGO1 and PVGO2 to be statistically different from zero because I believe that most of the time there are expectations incorporated into stock valuations that go beyond a simple discounting of current earnings into the future. PVGO1 captures these as does PVGO2 but by incorporating the theoretical sustainable growth rate embodied by the firm's financial statement data. While this may seem obvious it is not always apparent from a casual observation of stock price behavior. I have no preconceived notion about the possible difference between the two though one likely exists as equity markets may incorporate some value component that can't specifically be derived from financial statement data. If there is a statistically significant difference between PVGO1 and PVGO2 and if that difference is positive, it may be because PVGO1 gives better visibility to the market's assessment of additional value a given firm may be able to create on top of that implied by the sustainable growth rate embedded in its financial statement data. This amount, if it is found to exist, could represent real options value but it is beyond the scope of this paper to prove that in a robust fashion. The model allows for the signs on any of PVGO1, PVGO2 or PVGO1 minus PVGO2 to be either positive or negative and those signs will inform my interpretation of the results as we will see in chapter five.

A difference between PVGO1 and PVGO2 may proxy for risk if it remains significant after introduction of control variables such as market equity (to take out the

variability associated with small size market capitalization firms vs. large firms) and book-to-market.

The chosen model holds appeal for several reasons. First, it can be applied to both dividend and non-dividend paying firms. Second, as can be seen from a review of its derivation, it incorporates both dividends and earnings, the former via the Retention Ratio and the latter explicitly. In doing so, I am able to demonstrate that the two concepts are not mutually exclusive. Third, as can also be seen from the model's derivation, I have shown dividend irrelevance to stock valuation since the RR term is not present in the final expression of the model though it is present throughout the derivation. Finally, I end up with a model that lends itself to empirical testing in a practical and straight-forward manner given the data collection requirements for the variables included (i.e. there is nothing particularly "controversial" about the data used for the empirical analysis, as is explained below).

CHAPTER 4

DATA AND EMPIRICAL TECHNIQUES

The following data was collected from the Center for Research in Security Prices (CRSP) and Compustat databases for all exchange-listed non-financial firms and can be segmented by Standard Industrial Classification (SIC) code:

P_t – market observed price per share

E_t – accounting (book) earnings from firms' published financial statements

BE_t – accounting (book) equity from firms' published financial statements, to use in calculating ROE_t below

DPS_t – dividends per share, to use in calculating RR_t below

S_t – annual revenues (sales), to be used as a control variable if desired

$CSHO_t$ – common shares outstanding, if needed to calculate per share data as appropriate

A_t – total assets (gathered in case of need or desire to use at some point)

The following data was calculated:

EPS_t – earnings per share, to use in calculating RR_t below

EPS_{t+1} – created as a lead earnings variable from one year forward earnings per share, also to use in calculating growth in accounting earnings as an alternative to the g calculation based on the sustainable growth model, see below

ME_t – market capitalization (market value of equity)

ROE_t – return on equity calculated from data in firms' published financial statements (accounting (book) earnings and equity)

ROA_t – return on assets calculated from data in firms' published financial statements (accounting (book) earnings and assets), available in case of need

RR_t – retention ratio calculated from firm data for DPS_t, dividends per share, and EPS_t, earnings per share (calculated dividend payout rate and then RR, retention rate) where RR = 1 – (DPS / EPS)

g_t – growth rate calculated from g = RR x ROE (the sustainable growth model)

FF_t – franchise factor calculated from FF = (1 / r) – (1 / ROE)

G_t – growth factor calculated from G = g / (r – g)

r – equity discount rate calculated using the Capital Asset Pricing Model (including calculated firm betas)

fret and mret – firm and market equity returns were calculated for use in the CAPM in order to calculate beta and r

Share price data is monthly and financial statement data is annual. Following Fama-French, I matched stock return data from year t to financial statement data from year t-1 (t+1 to t and so forth). Financial statement data may be for a calendar year or a fiscal year. In order to match these, calendar year data for time t equates to fiscal year data for the period beginning with July of t-1 and ending with June of t. The respective returns data for the calendar years and fiscal years is t+1 and July of t to June of t+1. CRSP returns data was gathered for the years 1958-2009. Compustat financial statement data was gathered for calendar years 1963-2006 and fiscal years beginning in 1962-2005. With the matching methodology described above the relevant dataset used for the statistical analysis comprises financial statement data for the years 1963-2006 and returns data for 1964-2007. When discussing the data and results I refer to time periods

coinciding with the financial statement year t's, unless otherwise specified. The last year of returns data in this dataset is 2007 and therefore the returns data in this model is not impacted by the severe financial crisis of 2008 and its subsequent effects on the years after 2008. Applying the model to that time period could prove interesting but is not done here. The dataset includes years in which stock market crashes occurred, 1987 and 2000, and those time periods are specifically analyzed below.

The "rolling beta" method was used to calculate firm betas and these were in turn used in the CAPM formula to calculate discount rates.[21] The discount rates were then constrained to be positive and not less than the risk-free rate.

Stock prices, earnings and values for PVGO1 and PVGO2 are expressed on a per share basis and analyzed on that basis. Discount rates and growth rates are expressed on an annual percentage basis and analyzed on that basis. All data was harmonized, as appropriate, regardless of the basis on which it was originally collected.

I collected Fama-French factor loadings for small-minus-big (SMB) and high-minus-low (HML) to be able to control for size or value/growth but have not included that analysis in this paper.[22] One reason I have not used them is the focus of this paper on

[21] The rolling beta method uses stock market data for the previous 60 months and begins with a base case beta calculation based on the previous 60 month period and then rolls the calculation for beta month by month. This technique is used to minimize the short-term variability that may otherwise be seen in shorter specific time period beta calculations and thereby take noise out of the model that might be associated with short-term (and possibly unsustained) volatility in betas.

[22] The Fama-French factor loadings for SMB (small-minus-big) and HML (high minus low) have been shown to proxy for risk and are often used as control variables in studies analyzing stock returns.

stock valuations vs. stock returns. The dataset could be used to do additional analysis, including returns-based analysis.

The term PVGO1 was computed for each time period using Eq. (14) above and is tested for statistical significance.

The term PVGO2 is calculated from the financial statement-based valuation model given by Eq. (15a), which incorporates the definitions of computed variables FF and G, and is tested for statistical significance.

PVGO1 and PVGO2 are compared and tested for a statistically significant difference between the two. This difference is analyzed and explained.

Records including missing data have been deleted, as have been records including negative values for equity, shares outstanding and any data where a negative value would not make logical sense. Negative growth rates in earnings are included.

The results and analysis are furthermore broken down into the following time periods:

All years (financial statement data from 1963-2006, returns data from 1964-2007)

The 20 years from 1987-2006

The 10 years from 1987-1996

The 10 years from 1997-2006

The 6 years from 2001-2006

The individual years 1986, 1987, 1999 and 2000

The rationale for the time periods is described as follows. All years are examined in order to give the perspective of the longest time period possible. The 20 years from 1987-2006 are examined in order to see the results for the most recent years just prior to the 2008 financial crisis. Comparability of the data may be better for these years than for the older years, particularly if the data is analyzed in more detail, e.g. by industry since SIC codes have evolved over time. In addition, the risk of significant differences in U.S. GAAP accounting diminishes by using more recent data. The two 10 year periods of 1987-1996 and 1997-2006 were analyzed simply to see if there was any merit to breaking the 20 year period into smaller increments. The six years from 2001-2006 were analyzed since they followed the stock market crash of 2000. The individual years 1986, 1987, 1999 and 2000 were analyzed because they were years that either preceded or included a stock market crash. Further discussion of the causes and circumstances of those crashes will take place below with the discussion of the empirical results.

Analyses were performed for all SIC codes and some work done for individual SIC codes. The results as discussed below are generally presented for all SIC codes unless otherwise noted. A specific section of the results discusses some SIC segmented findings though a full and robust analysis by industry proved beyond the scope of this paper.

The analysis was performed on all observations in the dataset, then excluding periods with missing values for PVGO1 and PVGO2, then truncating the data to exclude the top 2% and bottom 2% values for PVGO1 and PVGO2 in order to examine the

impact of outliers. The conclusions of the analysis did not change under any of these circumstances. For both the sake of completeness as well as tidiness, the reported results are those excluding the missing values but without any data truncation. All results are available for perusal.

A look back at the formulas above for FF, G and g will highlight issues that can arise with the mathematics in these formulas when some of the data used in the formulas are negative or when large values are calculated for ROE or g. To minimize the impact of this on the analysis I performed the calculations a few different ways. First, I ran the analysis with no constraints other than the obvious ones such as that the data for equity values, discount rates, risk free rates and such could not be negative, and that RR had to be equal to or greater than zero and equal to or less than one. With the accounting data I sometimes found ROE to reach extremely high rates, rates that are unlikely to be sustainable, or to even be negative (when earnings are negative). The former can significantly influence the magnitude of PVGO2, via both FF and G, and the latter creates real mathematical issues. So I ran a modified version of the analysis with a constraint placed on ROE such that it had to be at least equal to one standard deviation less than the risk free rate. In general a negative ROE would not be sustainable for an extended period of time though there is historical evidence for exceptions in certain industries, notably those involved in technology innovation. Therefore, this does not seem like an unreasonable constraint and it allows for low ROE observations, which may be observed in the real world even if theory would tell us they should not be sustainable. To

implement this constraint I set up the calculation of ROE such that if it is negative in period t I look one period back at t-1 and if it is positive I use that ROE and if not I look one period ahead to t+1 and if that is positive I use that ROE and if not I set ROE equal to at least the risk free rate minus one standard deviation. I then considered some of the problems with accounting standards that can result in write-offs to equity that may significantly reduce the book value of equity and therefore cause returns on book equity to be quite high. So I further modified the ROE computation to normalize it by the book-to-market equity ratio, thereby creating an ROE that is closer to a return on market equity. With these modifications I ran a version of the analysis that employs this modified ROE variable. Furthermore, I postulated that accounting data for assets may not be as significantly impacted by the vagaries of accounting standards as that for equity and I then ran a scenario of the analysis that substitutes ROA for ROE, with the same constraint on minimal ROA, like was done with the modified ROE. Finally, just to check the reasonableness of the part of the model that defines g = RR x ROE, given the potential pitfalls of accounting data, I also ran a scenario where I simply let g equal the change in accounting earnings from period to period. I am mindful of the fact that this last scenario deviates from the sustainable growth theory.

Below the results are generally presented for the modified ROE-based calculation, the ROA-based calculation and the growth based on earnings calculation. The tables note when results belong to the ROE scenario, the ROA scenario or the growth computed based on earnings scenario. These modifications mostly impact the calculations of

PVGO2, via the formulas for FF (which includes ROE and then the substituted ROA) and G (which includes g based on RR x ROE). Because in all of the various analyses I omit records with missing values of PVGO1 or PVGO2, the modifications impacting PVGO2 can somewhat impact PVGO1 because of the elimination of missing values and problematic accounting data. The impacts on PVGO1 do not impact any of the statistical conclusions regarding PVGO1 though we will see that the absolute values of PVGO1 do vary somewhat across the three scenarios (ROE, ROA, g based on earnings growth).

Various tests of statistical significance were employed, including t-tests, p-tests and Wilcoxon signed-rank tests. The conclusions are consistent regardless of the methodology employed.

Regressions were also performed on PVGO1 with the following independent variables: FF, G, ME and BM. All results are reported below.

CHAPTER 5

EMPIRICAL RESULTS

The results discussed in this chapter cover all companies for which data was gathered (non-financial firms, records with missing values excluded, etc.) unless otherwise noted. The first section of this chapter analyses the results produced by the market-based valuation model. The second section looks at the results produced by the financial statement-based valuation model. The third section compares the two models, looks at the differences between them and provides context and additional analysis to explain the differences. Within each section differences are explored across time periods and some information is provided related to specific SIC codes in the third section.

Table 1 gives the time periods analyzed, the sample sizes for the different periods and a high level description of the dataset. The table provides the number of observations in the different time periods and for each of the methodologies described in chapter four above. These differences in numbers of observations did not meaningfully impact the conclusions of the statistical analysis though the quality of the data included may be somewhat better under one methodology vs. another as we will see below.

Table 1 Summary of time periods analyzed and sample sizes

Time Period	ROE-based Data *	ROA-based Data	g Calculated on e
All years of data	108,082	108,661	139,279
1987 – 2006	62,738	60,965	85,633
1987 – 1996	31,117	30,073	40,444
1997 – 2006	31,621	30,892	45,189
2001 – 2006	17,500	16,932	25,036
1986	2,688	2,639	3,504
1987	2,801	2,733	3,711
1999	3,426	3,413	4,916
2000	3,278	3,206	4,843

* Number of observations for variables PVGO1, PVGO2 and PVG01 – PVGO2. Included are data for all non-financial firm Standard Industry Classification (SIC) codes regardless of sample size for each individual code. When individual SIC codes with samples sizes of n<20 are excluded from the analysis the high level statistical results and conclusions do not change for any time period. It should nevertheless be noted that individual results for SIC codes with n<20 may be spurious. Data excludes any records where values for PVGO1 and PVGO2 are missing. This does not impact the results of the analysis (the results do not change when missing values are included). Sample sizes the ROE- and ROA-based calculations are smaller than for those with g calculated based on earnings growth due to the mathematical complexity of those equations and the need to place constraints on the ROE and ROA data.

5.1 The market-based valuation results

The market-based valuation model is so named because the equation for PVGO1, Eq. 14, includes a variable for stock price that comes from equity market quotations. The other independent variables are earnings per share from reported financial statement data and the equity discount rate computed as described in chapter 4. Both PVGO1 and PVGO2 (derived from the financial statement-based model and discussed in the next section below) can be thought of as "residual" values in the sense that they each capture the value component of stock price that is not captured by the discounting of current earnings into perpetuity. But they are not "residuals" in the standard sense of the term in typical regression analysis. PVGO1 in period t is capturing the component of "excess" value that represents the difference between the market price of the stock and the discounted value of earnings in period t. I first analyze whether or not PVGO1 is statistically significant and if it is, what it means. If it is significant it may reflect the value from expected growth in future earnings, it may reflect a franchise element (specific to a company or industry) or something else. I analyze this by regressing PVGO1 on some key variables, described below, and as well use the analysis of PVGO2 to possibly contribute to the explanation for PVGO1. The model allows for PVGO1 to be positive or negative. The equation for PVGO2 seeks to represent the same concept calculated in a different way and is the component of "excess" value one would obtain using only publicly available financial statement information for earnings, growth based on sustainable growth theory and a discount rate calculated as explained in chapter four

above. The same discount rate is used in both the PVGO1 and PVGO2 equations so that variable does not contribute to differences in the two models. The equation for PVGO2 does not have the market price of the stock in its equation and is therefore called a financial statement-based valuation model. PVGO1 and PVGO2 may each contain information useful in explaining some element of the other. Given their respective constructions it is most likely that PVGO2 may contain information relevant to explaining some component of PVGO1 (e.g. FF and G).

Summary data for the values of PVGO1, PVGO2 and PVGO1 minus PVGO2 for all firms is presented in Table 2. This table uses the modified ROE variable described in chapter four above as a component in the calculation of PVGO2. I run another scenario using ROA in the calculation of PVGO2 and discuss that later because it does not impact PVGO1 in an important way. The table includes values for the variables for all time periods and I will discuss differences across those. I cover PVGO1 in this section and PVGO2 in the next section though it is convenient to have the data for both in one table (I include information on both PVGO1 and PVGO2 in most of the paper's tables).

Table 2 Results for statistical significance and values of PVGO1, PVGO2, PVGO1 - PVGO2: all companies based on ROE

Statistical Significance

	PVGO1		PVGO2		PVGO1 – PVGO2	
	Significant	t-value	Significant	t-value	Significant	t-value
All years of data	Yes	31.05	No	-0.51	Yes	101.01
1987 – 2006	Yes	33.60	No	-1.63	Yes	99.28
1987 – 1996	Yes	66.08	Yes	-3.36	Yes	51.26
1997 – 2006	Yes	19.46	No	-0.52	Yes	110.63
2001 – 2006	Yes	11.19	No	-0.12	Yes	79.63
1986	Yes	40.93	Yes	-2.08	Yes	29.71
1987	Yes	29.98	No	-0.05	Yes	40.59
1999	Yes	44.29	Yes	-3.27	Yes	45.75
2000	Yes	41.70	No	-1.30	Yes	29.71

Values of Terms

	PVGO1		PVGO2		PVGO1 – PVGO2*	
	Mean	Median	Mean	Median	Mean	Median
All years of data	19.34	13.44	-0.33	-0.62	19.67	14.39
1987 – 2006	19.25	13.47	-0.96	-0.69	20.21	14.30
1987 – 1996	16.90	11.91	-1.36	-0.61	18.27	12.50
1997 – 2006	21.56	15.12	-0.57	-0.79	22.13	16.31
2001 – 2006	22.28	15.67	-0.25	-1.56	22.53	17.30
1986	19.52	13.83	-1.26	-0.68	20.79	14.40
1987	19.19	12.63	-0.02	-0.44	19.22	13.19
1999	20.27	13.68	-0.85	-0.42	21.12	14.12
2000	21.66	13.14	-0.76	-0.59	22.43	14.00

* May be slightly affected by rounding

PVGO1 is highly statistically significant and positive in sign. For the significance tests the tables shown in all sections of this chapter provide the relevant t statistics. Significance tests were also performed using p values as well as Wilcoxon sign-rank tests. The conclusions were consistent across all the tests. I note that the values of the t statistics are quite high. This may not be unusual given some degree of serial correlation in the type of data I am working with, but for this reason I ran the other significance tests.

Before providing additional context for the analysis, I look first to see what the high level results reveal. Given that PVGO1 is designed to capture the excess value in stock price that is greater than just the value of current earnings discounted into perpetuity (the Dividend Discount Model without growth), I might expect PVGO1 to be significant and positive. This would mean that equity investors attribute more value to stocks than just today's discounted value of current earnings into perpetuity. That value may relate to expected future growth in earnings beyond just a continuation of the current earnings stream and this value is logically positive if the returns on that growth are in excess of the cost of capital. There could also be other components of that value and I look at this below. This may seem obvious but obtaining this result for PVGO1 should provide some support for the credibility of the model before I take the analysis further. At the same time, without further context it may not be that meaningful.

For the analysis to be more meaningful I looked for additional context within which to think about the value of PVGO1, remembering that it is expressed in per share terms. Table 3 shows the low and high ends of the ranges of PVGO1 values across all time periods for all companies for the various scenarios using ROE, ROA and g based on earnings growth. For all companies across all time periods the spread from low to high is higher for PVGO1 than for PVGO2, which may make sense in light of PVGO2's derivation from financial statement data but I will come back to this in the next section. The variation around the midpoint of the range for PVGO1 is lowest under the ROE-based calculation and highest when g is based on earnings growth. This probably makes

sense because the ROE and ROA-based calculations embody the sustainable growth model for computing g and therefore may imply less variability than that implied by a g calculated on accounting earnings growth which may be more volatile than the sustainable model growth rate. The variances around the midpoints of the ranges for the different analyses go from 14% to 28% and are meaningful given that we are looking at per share numbers. This may indicate that how the equity markets perceive the value captured by PVGO1 can be quite different by company or perhaps by industry.

Table 3 Ranges for PVGO1, PVGO2 and PVGO1 – PVGO2 across all time periods

	PVGO1			PVGO2			PVGO1 – PVGO2		
	Low	High	Midpoint *	Low	High	Midpoint	Low	High	Midpoint
ROE	16.90	22.28	19.59	-1.36	-0.02	-0.69	18.27	22.53	20.40
	Spread low to high=5.38			Spread low to high=1.34			Spread low to high=4.26		
	% + / - midpoint=14% **			% + / - midpoint=nm			% + / - midpoint=10%		
ROA	12.87	19.85	16.36	-8.76	-2.35	-5.56	17.54	22.78	20.16
	Spread low to high=6.98			Spread low to high=6.41			Spread low to high=5.24		
	% + / - midpoint=21%			% + / - midpoint=nm			% + / - midpoint=13%		
g based on e	10.47	18.62	14.55	-7.32	-0.64	-3.98	15.13	21.10	18.12
	Spread low to high=8.15			Spread low to high=6.68			Spread low to high=5.97		
	% + / - midpoint=28%			% + / - midpoint=nm			% + / - midpoint=16%		

* Midpoint = midpoint of the range low/high values
** This percentage is the percent above or below the midpoint for the high and low ends of the range and is designed simply to show how wide (disperse) the range is; nm = not meaningful due to large percentage variance around the midpoint given the magnitude of the numbers

Table 4 includes mean values for selected independent variables based on the dataset described in Table 1.

Table 4 Mean values of selected independent variables

Time Period	rf	r	P	ROE	ROA
All years of data	0.058	0.082	19.88	0.152	0.223
1987 – 2006	0.045	0.071	20.08	0.171	0.248
1987 – 1996	0.053	0.077	17.92	0.556	0.271
1997 – 2006	0.037	0.065	22.19	-0.200	0.226
2001 – 2006	0.025	0.042	22.46	-0.361	0.242
1986	0.060	0.074	20.62	0.010	0.209
1987	0.051	0.100	19.45	0.060	0.190
1999	0.050	0.114	21.36	-0.126	0.202
2000	0.058	0.078	22.87	-0.088	0.208

Table 5 shows the mean values of PVGO1 and PVGO2 and their relative contribution to P.

Table 5 Mean values of PVGO1 and PVGO2 compared to P

	PVGO1				PVGO2			
	ROE Model		ROA Model		ROE Model		ROA Model	
Time Period	Value	% of P	Value	% of P	Value	% of P	Value	% of P
All years of data	19.34	97%	15.53	78%	-0.33	-2%	-3.85	-19%
1987 – 2006	19.25	96%	14.39	72%	-0.96	-5%	-5.35	-27%
1987 – 1996	16.90	94%	12.87	72%	-1.36	-8%	-4.67	-26%
1997 – 2006	21.56	97%	15.87	72%	-0.57	-3%	-6.01	-27%
2001 – 2006	22.28	99%	13.24	59%	-0.21	-1%	-8.76	-39%
1986	19.52	95%	17.06	83%	-1.26	-6%	-3.11	-15%
1987	19.19	99%	17.49	90%	-0.02	0%	-2.67	-14%
1999	20.27	95%	18.80	88%	-0.85	-4%	-2.35	-11%
2000	21.66	95%	19.85	87%	-0.76	-3%	-2.94	-13%

From this we see that PVGO1 represents 97% of the value of P when we look at all companies and all years in the dataset for the ROE-based calculation, 78% in the ROA-based calculation and 83% in the modified g calculation. This would say that one way to think about PVGO1 is that most of the value of stock prices comes from investors attributing value to something other than current earnings discounted into perpetuity. This value may derive from expected future earnings growth or some other factor in combination with growth. Looking at this percentage by time period we see that in all scenarios it is highest in the individual years preceding or including a stock market crash. This makes intuitive sense because the biggest question arising during times of economic recession and financial market crisis relates to growth. This seems to be reflected in the data. The time period 2001-2006 showed the lowest percentage of value in price attributable to future growth. This may be because this period follows the 1999/2000 crash and the 1992-2000 period of record expansion. Perhaps the era of 2001-2006 was marked by investor skepticism regarding the true value of growth and all of its potential consequences and therefore stock values were not rewarded as highly for growth as they previously had been. Another way to say it may be that investors saw greater risk to growth and therefore required lower share prices and higher returns post 2000 to compensate them for this risk.

A brief look at the nature of the stock market crash of 2000 supports the above conclusion. From 1992 to 2000 the U.S. economy and equity markets experienced a period of record expansion. The NASDAQ market index reached it’s all time high in

March of 2000 and by October of 2002 had dropped over 78% from that high. Just from September of 2000 to January of 2001 it lost about 46%. Several factors contributed to the crash. Over the 1992 to 2000 period many stocks become overvalued by any commonly accepted valuation metric and the only justification for sustaining those valuations was a bet on future growth in earnings for those firms. When it because apparent that firms making significant losses had no hope of turning a profit for years to come then the valuations for those firms came crashing down. The problem was exacerbated by unscrupulous corporate executives fraudulently inflating their reported earnings so they could keep up with the growth treadmill. The true poor economic performance of their companies eventually caught up with their accounting shenanigans. To make it all worse, there were conflicts of interest between the sell-side equity research analysis arms and the investment banking arms of the major financial institutions. Therefore, often research analysts produced justifications for inflated growth expectations in order to support firms that were major investment banking clients. Most of the inappropriate behavior by both company managements and by financial institutions centered around trying to maintain unrealistic growth expectations for many firms so that investors would continue to support inflated stock prices and high P/E ratios. All of this led to changes in legislation and financial reforms that better regulate conflicts of interest in financial institutions and that have improved financial reporting by companies (Sarbanes-Oxley), as well as its oversight by external auditors.

It is somewhat hard to believe that assigning 97% of the value of stocks to the expected future growth in earnings, and perhaps some other factors, and only 3% to the discounted value of the current earnings stream is reasonable. Generating this result from the model may highlight a weakness in the model design or the difficulties of employing accounting data within stock valuation models (mainly accounting earnings within the PVGO1 calculation). The ROA-based scenario mainly impacts the PVGO2 calculation and it does not change the statistical conclusions for PVGO1 but it may filter out some of the more problematic accounting data and for this reason the 78% of value attributable to PVGO1 under the ROA-based calculation vs. discounted current earnings of 22% may be a more accurate representation of how equity markets perceive growth. The changes in this percentage contribution over the different time periods may also make more sense under the ROA scenario (under the ROE scenario the percentage essentially doesn't change).

To explore this aspect a bit more, I also looked at the mean value of price for all observations in the raw dataset, keeping in mind that in the PVGO1 calculations I dropped records with missing data and filtered out nonsensical values for some of the variables, trying to eliminate problematic accounting data. This caused a reduction in the number of observations remaining for the PVGO1 calculation vs. the original full dataset and may have impacted the comparison of the value of PVGO1 vs. the mean price. The 97% and 78% figures above are based on a mean price of $19.88 and an n of just over 108,000. Looking at the full raw dataset for price I find an n of over 2.6 million and a

mean price of $23.88. At that mean price PVGO1 would represent 65-81% of the value, a range perhaps more reasonable than 78-97% though still very important.

Table 6 shows the results of regressing PVGO1 against FF (the Franchise Factor variable from the PVGO2 equation, a concept originated by Leibowitz and Kogelman, as noted earlier in the paper, and somewhat modified for incorporation into this dissertation's model), G (the Growth Factor variable from the PVGO2 equation, consistent with Leibowitz and Kogelman's Growth Equivalent concept though expressed somewhat differently), ME (Market Equity, a measure of size) and BM (Book-to-Market ratio) for all years and the subset time periods. Included are the results for both the ROE-based and the ROA-based analyses. Both analyses for the period containing all years show consistent results for the intercept, ME and BM terms. These are all significant and have positive signs. The ROA analysis also shows FF to be significant, with a negative sign. The results for the multi-year subset time periods are generally consistent with this. The results for ME significance and sign are consistent under any scenario for any time period. When analyzing individual years, I often obtain a result for FF that is different from the result for the multi-year periods. In the ROE analysis the FF variable is not significant for the multi-year periods but for individual years it is always significant. The sign is positive for years 1986 and 1987 while negative for the years 1999 and 2000. In the ROA analysis the FF variable is significant in 2000 but is not significant in 1986, 1987 and 1999. FF, the Franchise Factor, is designed to capture the value in stock prices related to a firm's ability to produce an ROE greater than its discount rate. The different

results between the multi-year time periods and the individual year periods may indicate that if any firm or franchise-specific value is attributed to stocks it only lasts for a short or specific period of time. This may mean that investors doubt that firms generally are able to produce higher returns on equity or assets than their cost of capital for a long period of time based on their existing base of business and financial policies. FF and G are computed from financial statement data and by definition must assume the existing base of business for companies and existing financial policies. This result is broadly consistent with both the Leibowitz and Kogelman model for the Franchise Factor and sustainable growth theory. Though Leibowitz and Kogelman's theoretical model does not provide for a negative Franchise Factor specifically, it does conclude that the Franchise Factor is small in size and that significant increases in P/E require extraordinarily high future growth rates. The financial statement-based data here does not support those extraordinarily high growth rates and therefore G as calculated and used in this regression equation is not significant for PVGO1.

Table 6 Regression results for PVGO1: all years of data

ROE Methodology

	Intercept	FF	G	ME	BM
Variable coefficients	18.8648	-0.0079	-0.0000	0.0005	0.0262
t-statistics	28.40	-0.70	-0.05	7.06	1.68

ROA Methodology

	Intercept	FF	G	ME	BM
Variable coefficients	16.1949	-0.1756	0.0000	0.0006	0.0304
t-statistics	35.25	-6.73	0.02	11.59	3.07

The results for the ME and BM variables consistently show a significant, positive relationship with PVGO1 meaning that the value of future growth opportunities is directly and significantly related to size and whether the stock is considered to be a value stock. Concerning size, this means that share prices today reflect a greater value of future growth opportunities for bigger firms. With this value already built into large firm stock prices one might expect future returns to these stocks to be relatively lower than for smaller stocks. Though this is not a returns-based analysis, it would support the research on small vs. large stock returns. Also from a returns perspective small companies may need to generate higher returns to their shareholders to compensate them for risk while large companies may need to continually show their ability to grow on a larger and larger base in order to support their valuations. The BM result may say that firms with a higher BM ratio (value firms) get more credit in their current share price for future growth than lower BM ratio firms. It is harder to relate this latter result to the returns-based research findings of greater returns associated with value stocks (high BM stocks). It could simply be that future growth in a high BM firm is viewed more positively, or less risky, than future growth in a low BM firm. Perhaps high BM firms are viewed to have relatively greater access to the capital necessary to support continued investment for growth.

To summarize, PVGO1 is designed to represent the dollar value per share of future growth opportunities, or value from something other than current earnings discounted into perpetuity. Future growth opportunities may be the result of something we can isolate as future earnings growth or they may derive from other factors such as

franchise-specific factors. The model results show PVGO1 to be statistically significant and positive. There is evidence to show that its relative contribution to value can vary, and the data here has shown that it can vary by time period. It may also vary by firm or by industry, though this remains to be demonstrated. It may contribute as much as two-thirds to three-quarters or more of total per share value. It has shown the highest relative contribution in individual years that precede and include equity market crashes and recessions. PVGO1 shows a consistently positive, significant relationship with ME and BM. Here its relationship with FF is usually negative but its significance varies with time periods. This may mean that identifying a Franchise Factor (firm or industry specific) component of value is difficult, especially when analyzing data across large numbers of firms and across multi-year time periods. To better explore the Franchise Factor concept may require applying the model to individual industries and comparing those results by industry. Using ROA instead of ROE data within the model, though more important to the conclusions for PVGO2, seems to filter out some of the problematic accounting data for the PVGO1 calculation and make some of the conclusions more intuitive. Regardless, the results across the two approaches are broadly consistent for PVGO1.

5.2 The financial statement-based valuation results

The financial-statement valuation model is so named because I calculate PVGO2 as per Eq. (15a) above using information obtained from firms' financial statements as filed with the SEC, including earnings and book equity used to compute ROE, earnings and assets to compute ROA, growth in earnings computed in two ways, first as RR x

ROE or ROA and second from the reported earnings from time period to time period. I use the same equity discount rate used in the PVGO1 equation in order to maintain consistency in that variable across the two models. As explained in chapter four, I run the different versions of the analysis using ROE, ROA and calculating the growth rate two different ways in order to see which approach yields the most reliable or understandable results given the potential problems from accounting data influencing the model calculations.

Using the ROE approach, as can be seen from Table 2, PVGO2 is always negative and is generally not statistically significant though it is significant in the time periods 1987-1996, 1986 and 1999. Interestingly, these latter two are years immediately before years of stock market crashes. The mean values of PVGO2 are modest. Using the ROA approach, with those results presented in Table 7, PVGO2 remains always negative but becomes significant in every time period.

Table 7 Results for statistical significance and values of PVGO1, PVGO2, PVGO1 - PVGO2: all companies based on ROA

Statistical Significance

	PVGO1		PVGO2		PVGO1 – PVGO2	
	Significant	t-value	Significant	t-value	Significant	t-value
All years of data	Yes	40.66	Yes	-9.91	Yes	128.78
1987 – 2006	Yes	21.32	Yes	-7.78	Yes	82.39
1987 – 1996	Yes	9.69	Yes	-3.46	Yes	60.24
1997 – 2006	Yes	50.03	Yes	-17.79	Yes	57.87
2001 – 2006	Yes	23.96	Yes	-14.34	Yes	33.00
1986	Yes	15.97	Yes	-14.43	Yes	18.50
1987	Yes	39.20	Yes	-5.02	Yes	28.50
1999	Yes	45.29	Yes	-22.21	Yes	50.18
2000	Yes	40.65	Yes	-28.10	Yes	47.30

Values of Terms

	PVGO1		PVGO2		PVGO1 – PVGO2*	
	Mean	Median	Mean	Median	Mean	Median
All years of data	15.53	11.62	-3.85	-1.76	19.38	14.25
1987 – 2006	14.39	11.02	-5.35	-2.29	19.74	14.55
1987 – 1996	12.87	10.28	-4.67	-2.02	17.54	12.81
1997 – 2006	15.87	11.95	-6.01	-2.64	21.87	16.38
2001 – 2006	13.24	11.28	-8.76	-3.96	22.00	17.49
1986	17.06	12.79	-3.11	-1.98	20.17	15.00
1987	17.49	11.59	-2.67	-1.32	20.16	13.61
1999	18.80	12.11	-2.35	-1.34	21.16	14.00
2000	19.85	11.56	-2.94	-1.96	22.78	14.25

*May be slightly affected by rounding

This is also true when g is calculated based on period-to-period changes in earnings as opposed to being set as RR x ROE or RR x ROA. These results may indicate that the accounting data issues inherent in ROE are more problematic than those in ROA, stemming from the impact on book equity of GAAP (book equity is widely viewed to be

an artificially low number for all firms and not representative of true invested capital amounts, therefore book asset values, though not perfect may be better).

What does it mean that PVGO2 is consistently negative? Using the ROE data PVGO2 is not significant and the values modest. This simply means that using financial statement data to value stocks we would typically come up with values that essentially reflect current earnings discounted into perpetuity. In the absence of additional information on top of that apparent from financial statements, this may be reasonable. In addition, it is not inconsistent with the common usage of current period earnings-based P/E ratios which only show the relative price per unit of earnings being paid by investors for stocks at a point in time. In the absence of additional information it is hard to make inferences about P/E metrics other than statements about relative valuation. Returns-based research showing that low P/E stocks produce returns greater than high P/E stocks has not always demonstrated why though some postulate those higher returns are compensating for risk. That the values for PVGO2 are negative may imply that inherent in the financial statement analysis is an assumption that even current earnings can't be sustained in perpetuity, all other things being equal. This is not inconsistent with the fact that even to sustain current earnings firms would have to make investments that might depress returns for some period of time or that competition might eventually put pressure on earnings. There is nothing in a firm's financial statement data to better inform valuation, therefore we end up with a value for PVGO2 that is either not statistically

significant (under the ROE-based analysis) or when it is (under the ROA-based analysis), it is negative and of smaller magnitude than PVGO1.

In terms of percentage of stock value, using the ROA-based approach PVGO2 represents anywhere from an 11% to 39% discount and is lowest in the years preceding or including a market crash. This may be true because what is known (i.e. current earnings) is more trusted during times of financial duress that what is not known (i.e. the promise of future growth opportunities captured by PVGO1).

It may seem obvious, or at least somewhat intuitive, that the value of PVGO2 is relatively less than that of PVGO1. This may simply highlight that using only information gathered from company financial statements (i.e. accounting data) will likely not provide us all we need to understand market valuations of equity. The construct of the model may lead to PVGO2 being negative because there is not enough information in firms' financial statements to support the concept of earnings in perpetuity. Financial statement data may simply say that if it is the only basis upon which one is valuing a stock that it may not provide enough information to allow assigning a value that does anything more than take current earnings, discount them at the equity discount rate and then discount all of it a bit more to consider the risk of not being able to sustain those earnings in perpetuity.

A word of caution is in order regarding the model for PVGO2 and its reliance on financial statement data. The mean value of g based on accounting earnings growth for all observations in the raw dataset is high at about 20%. Even with the adjustments made

to deal with some of the weaknesses inherent in the accounting data I continue to get relatively high growth rates using either ROE or ROA in the PVGO2 calculations, i.e. 17-18%. It is hard to imagine that these rates would be sustained for a long period of time since they are significantly higher than the mean discount rate calculated using the CAPM (8.2%, risk free rate 5.6% for the observations included in the PVGO1 and 2 calculations; 8.2% and 5.1% for all raw data n) and this impacts the computation for PVGO2 because the values of FF and G are sometimes negative and they can be quite large. It is difficult to constrain g to better conform to finance theory and still rely on financial statement data to inform the analysis. Directionally, and perhaps relatively, I think that the conclusions from this model's results for PVGO2 are meaningful but they are far from perfect and more research could surely improve them.

5.3 Comparing the two models and additional analyses

From the above discussion of the results of the model for PVGO1 it is clear that the market-based valuation model highlights a component of equity value attributed to stock prices that is significantly greater than the discounted value of current firm earnings in perpetuity. From the above discussion of the results of the model for PVGO2 it appears that a financial statement-based valuation model does not inform valuation in the same way. In fact the financial-statement based model says that a discount is taken against today's value of current firm earnings in perpetuity and the resulting valuation is significantly lower than that assigned by the equity markets. Therefore if one attempts to use financial statement data only to derive stock valuations one will not generally be able

to justify equity market values for stocks, across the broad set of all stocks. If investors would rely only on financial statement-based analyses they might find no worthy candidates in which to invest for firms would generally be viewed to be over-valued by the equity markets by comparison. Obviously investors are generally not only relying on financial statement data to make decisions about stock valuations. At the same time, there are individual firm cases where stock prices reflect a value that is approximately equal to firms' book value for an extended period of time (as an example, see historical market and financial statement data for Bunge Ltd., NYSE quotation BG). This is sometimes seen in situations where a firm's returns are at or less than cost of capital for a fairly long time and where the industry returns for those firms are also only in line with cost of capital or where investors doubt that returns above cost of capital can be sustained (examples include airlines and commodity-based industries). Once again I find consistency between these empirical results and the theoretical model of Leibowitz and Kogelman.

The statistical analysis for the difference PVGO1 minus PVGO2 shows significant, positive results for all time periods under all methodologies.

With respect to industries as defined by SIC codes, interestingly, I found no SIC codes for which PVGO2 is significantly positive in any of the time periods covered by this analysis. On the other hand, I did find SIC codes for which PVGO1 is significantly negative, a different result than that for the overall population. There were only two SIC codes with significant negative PVGO1 results under the ROE-based analysis and there

were five codes with significant negative PVGO1 results under the ROA-based analysis. The two under the ROE-based analysis were code 2061 for Cane Sugar, Except Refining in the period 2001-2006 and code 1211, a high level code for Minerals Mining, in the period 2000. Under the ROA-based analysis no codes produced a significant negative PVGO1 in individual years. Code 7996, Amusement Parks, produced a significant negative PVGO1 in the period covering all years, and in the 1987-2006, 1987-1996 and 1997-2006 time periods. Code 1040, a high level code for Metal Ores Mining, mimicked the results for code 7996 except for the period 1997-2006 where PVGO1 was not significant. In the period 2001-2006 two codes produced a significant negative PVGO1. They were code 1310, Crude Petroleum and Natural Gas, and code 5810, Eating and Drinking Places.

At the SIC code level it is difficult to draw any conclusions about patterns for the PVGO1 results without knowing more about the specific dynamics of the respective industries in the relevant time periods. In several of the significantly negative PVGO1 situations the time periods followed years of recession, perhaps indicating that certain industries' growth prospects are particularly compromised post-recession. In that regard it may be noteworthy that several of the industries were commodities-related and these will tend to be severely impacted when macro-economic growth slows. The case of amusement parks is bemusing though perhaps with the evolution of alternative forms of entertainment these have been adversely affected as concerns their growth prospects.

There are industries that may warrant a different approach to the type of analysis contemplated in this dissertation. Any industry involving a significant element of technological innovation may display a particular financial dynamic for some period of time. Examples include biotechnology within healthcare and the software or online media-based industries. Pharmaceutical companies have proven notoriously difficult to value over the years based on traditional valuation metrics because a significant component of their business models is driven by the quality of their intellectual property and their consequent innovation in medical therapeutics. The amount of spending on research and development has not always proven to correlate with the degree of innovation achieved, therefore analysis of the R&D spending variable by itself is not always useful. Biotechnology pharmaceutical companies are a special subset of the pharmaceutical industry where investors have historically tolerated negative earnings and low returns for many years as they anticipate the coming of the next breakthrough medical technology and the attendant excess returns associated with that breakthrough. This type of industry makes a financial statement-based analysis particularly difficult and the market-based valuation may not seem rational using commonly applied financial metrics. As an example, negative P/E ratios may persist in these companies for many years until their earnings turn positive. Even then these stocks can trade at very high P/E ratios for a long time. Most of the companies in the biotechnology sector within the pharmaceutical industry do not pay dividends but as they mature some eventually do, when their growth slows (e.g. Amgen). The same difficulties apply to companies like

Microsoft and Google, especially in their early years, and today for companies like Facebook and even Apple. If I applied this dissertation's model to those specific companies or industry subsets I might find extraordinarily high values for PVGO1 without demonstrable explanations for those values. This leads one to suspect there is an intangible component to equity valuations that cannot be uncovered in company financial statement data nor from any application of standard finance theory. Might this be supportive of real options theory? I cannot prove it here though there is anecdotal evidence of such. In the end it still appears that all roads lead back to growth and expectations for it. Even a real options component of firm value may mean that something will cause the firm to grow faster in the future and to produce returns in excess of cost of capital for a meaningful period of time. Other work has shown it may be easier to apply real options analysis to specific project analysis than to firm valuations in general (see references related to real options research and applications).

One conclusion is clear from comparing the two models. Market-based valuations assume growth rates that are, on average, higher than those supported by sustainable growth theory and financial statement data. This result holds when growth is calculated using actual earnings growth vs. using the sustainable growth formula of RR x ROE or RR x ROA in the financial statement-based model.

I also ran the analysis on positive earnings growth observations only and negative growth observations only. The conclusions for the positive growth scenario did not change for either PVGO1 or PVGO2 though the standard errors were lower and the t-

statistics of lower absolute value while remaining significant. The conclusions for PVGO1 also did not change for the negative growth scenario. The conclusions for PVGO2 under negative growth are not meaningful by definition from the equation for PVGO2 as all values for PVGO2 become positive. This just means that the financial statement-based model cannot be generally applied to negative growth situations because financial statement data alone does not well-inform stock valuations when growth is negative. Perhaps the equity markets know best how to value firms with negative earnings growth.

CHAPTER 6

CONCLUSION AND TOPICS FOR FURTHER RESEARCH

In this dissertation I derived two models for analyzing stock valuations. One seeks to use a market-based approach to isolate the value in stocks related to future growth opportunities. The other seeks to isolate this same value using a financial statement-based model that does not include any equity market data.

I expected to find a significant difference between the two models and that is what the results showed. Under the market-based model the variable for the present value of future growth opportunities is positive and highly significant. This value represents on average as much as two-thirds to three-quarters of stock value and may perhaps be even higher. The financial statement-based model computes a value for future growth that consists of two components. One relates to a Franchise Factor, a concept originated by Leibowitz and Kogelman and adopted here with some modification for use within this dissertation's model, that captures the value from a firm's ability to produce returns in excess of the cost of equity capital. The other captures the value from growing current period earnings using sustainable growth rate theory. The financial statement-based value of future growth turns out to be negative and significant under an ROA-based version of the model though it is not significant under an ROE-based version. This means that we cannot justify equity market valuations by only using financial statement data. The

information available to us in firms' financial statements does not support the growth expectations embedded in equity market stock prices. It is hard to say whether the difference relates to assumptions for returns or for growth rates. It is reasonable to assume that equity markets believe future returns will be in excess of cost of capital, otherwise the embedded growth assumption would have no current value.

There are some interesting differences in the results by time period with those mainly relating to years that precede or include recessions and stock market crashes. In these periods the value of future growth opportunities becomes even greater in the market-based model.

I also find some evidence of differences by industry based on SIC codes though I was not able to demonstrate a pattern in those results. Some of the anomalous results seem to fall within commodities-related industries which may be particularly sensitive to recessionary economic environments.

Finally, I performed the analysis in three different ways to check the robustness of the results:

- using ROE as the variable in the PVGO2 formula and the sustainable growth approach to calculate g
- using ROA as the variable in the PVGO2 formula and the sustainable growth approach to calculate g
- using actual earnings growth to calculate g rather than RR x ROE or RR x ROA

The statistical results and conclusions for PVGO1 did not change under any of these scenarios. For PVGO2, its sign was negative under all the scenarios. It was not statistically significant using ROE and the sustainable growth approach. It was statistically significant using ROA and the sustainable growth approach and using the actual earnings growth approach. Its relative magnitude was always lower than that of PVGO1.

The overall analysis and interpretation of the results seems to be somewhat improved using ROA data vs. ROE data. It may be that ROA reduces the impact of problems inherent in accounting data.

The results of the ROE and ROA analysis may be relevant for the topic of financial disclosure. The information required in firms' financial statement filings and disclosures should be helpful for all of the firms' stakeholders and providers of capital. With respect to equity holders, perhaps it would be useful to require firms to provide ROE, ROA and ROIC (Return on Invested Capital) data under an agreed-upon methodology for their calculation. This would put such information readily available to readers of the financial statements. Firms could also be required to compute and provide their debt, equity and weighted average costs of capital, again using an agreed-upon methodology. Financial statement readers could then easily compare ROE, ROA and ROIC to a firm's cost of capital and draw conclusions about those returns, including their sustainability and the firm's ability to grow earnings at returns in excess of cost of capital. The ability to assess sustainability of returns in excess of cost of capital could

then inform expectations for future growth. On the other hand, if a firm does not produce returns in excess of its cost of capital investors could then decide for how long they are willing to tolerate that situation. It seems this type of information would be a useful addition to firms' financial statement disclosures.

Because the present model attempts to examine the gap between equity market valuations and financial statement-based valuations and the growth assumptions embedded in each, it could be further enhanced with continued study of the financial statement data and its use within the model. One example might be to use ROIC instead of ROE or ROA. There are also adjustments that could be made to the accounting data like removing material one-time items impacting earnings, but I avoided these in order to keep the analysis as simple as possible.

Additional analysis could be done by industry or by individual firm. I suggest that moving away from a SIC code-based industry classification to an approach where industry groupings are created by selecting firms to be part of industry groups - such as consumer packaged goods, agribusiness, software, retailers non-food, retailers food, general pharmaceutical, biotechnology, medical device, car manufacturers, etc. - would make that analysis more meaningful. Using this model to analyze individual valuations for companies with long histories could also prove interesting, both for negative and positive growth situations and for both positive and negative returns situations.

Finally, given that this analysis included data prior to the extreme financial market duress of 2008 and the ensuing recessionary or slow growth period post-2008 to

today, applying this model to that time period could be of interest. Attempting to analyze the results for different industries or for specific firms within that special 2008 and post-2008 time period might also prove useful.

I hope this work lays an initial foundation, rudimentary though it may be, on which future work can build to form the bridge that may eventually better connect equity market perceptions with financial statement information and thus potentially lead to smaller differences in growth expectations as well as possible financial disclosure enhancements. Perhaps something in this work may also help to better inform firm managers' decisions regarding investing for future growth, returns on those investments and how those decisions are communicated to investors.

In the end, with stock valuations it's all about growth. The theoretical models support this and the data produced here supports this. The empirical results here support that there is a substantial component of valuation associated with growth opportunities beyond current earnings discounted into perpetuity at the market equity cost of capital. The financial statement data showed that opportunities are out there to produce returns in excess of the discount rate but that those franchise opportunities only have value if firms can grow. In addition this analysis showed that the information contained in financial statement data does not produce valuations that are as high as those found in equity markets and the inference is that the growth expectations built into equity market valuations are much higher than those that might be inferred from financial statement data. This work has produced empirical results, via a pragmatic expression of the model

and using actual data, that support much of finance theory and which narrow down the driver of the gap between equity market valuations and financial statement-based valuations. That gap is caused by one or all of the following: unrealistic and unsustainable growth expectations embedded in equity markets, the challenges of using accounting data within theoretical model constructs (for example financial statement data will never capture potential growth from acquisition opportunities), a real options component of value included in equity market valuations and which must come back to growth or some weakness in the model itself, particularly the expression of PVGO2. Further study and thought might address any or all of these.

Unfortunately it appears that for company managers the growth treadmill is here to stay and keeping up with it, while producing attractive returns, is the only way to sustain and increase stock valuation and consequently avoid undue P/E compression. At the same time, pursuing growth for growth's sake may lead to lower returns on investment and eventually feed back into negative P/E and valuation consequences. Managing investor expectations concerning growth may be one way to reduce volatility in firm valuations over time and improving financial disclosures on returns and organic growth could further improve communications with investors as well.

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