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EQUITY VALUATION USING ACCOUNTING NUMBERS IN DIVIDEND AND NON-DIVIDEND PAYING COMPANIES

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ABSTRACT

The aim of this thesis is to understand how firms with different payout policies impact the performance of equity valuation models and what characterizes them. After introducing theory regarding pertinent models and reviewing relevant literature, flow and stock-based model performances are analyzed across two large subsamples of US firms, dividend and non-dividend paying firms. The first group shows a better performance in general while a higher performance discrepancy between both subsamples is visible amongst the best performing models. This alerts the user of the fact that models value firms differently according to their payout ratio. Building on this breakdown, a small sample analysis, between two subsamples of UK firms, analyzes not only the models used by brokers' reports in reality but also other relevant variables. The most pronounced differences are the firms' size, investment opportunities, equity models used and brokers' recommendation.

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III ABBREVIATIONS

AIG	abnormal income growth
B_0^E	book value of equity
B/P	book value-to-price
C	operating activities of the company
CRSP	Centre for Research in Security Prices
C-I	free cash flow
d	dividends
DCFM	discounted cash flow model
DDM	discounted dividend model
D/P	dividends-to-price
EPS	earnings per share
EV	enterprise value
EV/S	enterprise value-to-sales
E(DPS)	expected dividend per share
E(NI)	expected net income
g	growth rate
I	amounts invested in the operating activities of the company
ICB	industry classification benchmark
IPO	initial public offering
I/B/E/S	Institutional Brokers' Estimation System
ke	cost of equity
NI	net income

NPV	net present value
OJM	Ohlson/Juettner-Nauroth model
OLS	ordinary least squares
P/B	price-to-book
P/E	price-to-earnings
RI	residual income
RIVM	residual income valuation model
R^2	explainability
V_0^D	debt value
V_0^E	equity value
V/P	value-to-price
WACC	weighted average cost of capital

1 Introduction

This year Apple, an American multinational company that creates and sells consumer electronics, personal computers and computer software, paid its first dividend over a decade. The payout marks a big shift for the company which after a near bankruptcy in the 90’s had not paid a dividend since.

The shift of these and other companies from non-dividend paying firms to dividend paying firms raises the question of what triggers a firm to pay out dividends. Consequently, if firms decide to change their payout policies then these firms’ characteristics most probably changed over the years setting off a new policy. The mean of this analysis in hence to study dissimilarities across these two types of firms under the light of equity valuation using accounting numbers.

In a large sample analysis, accounting-based valuation methods estimate dividend and non-dividend paying firms’ value, presenting the superior valuation models for each subsample. Besides ranking the models according to their performance, this analysis shows where the discrepancy between groups is most pronounced.

Then, a small sample analysis examines the differences amongst these subsamples within a selection of brokers’ reports. Besides outlining which models are used by practitioners in reality this analysis studies other variables that can hardly be collected from electronic databases.

Broadly, this thesis pursues the following structure: the subsequent section presents models relevant literature for equity valuations using accounting-based valuation models. Besides pointing out advantages and disadvantages, their relevance given the study intend is presented. Section 3 focuses on literature review and empirical findings from firms with different payout ratios specifically. Section 4 delivers the results of the large sample analysis while section 5 focuses on a small sample of analysts’ reports. Section 6 concludes the thesis with a summary of main results and suggests fields of further research.

2 Review of Theory and Relevant Literature

2.1 Informational Content of Accounting Numbers

Starting by explaining the need for equity valuation, this chapter follows with the introduction of both perspectives valuations can be conducted from and finishes by presenting a brief literature review on the informational content of accounting numbers.

Equity valuation relies on transforming forecasts of key variables into a value estimate (Penman, 2003). Undergoing this procedure might be questionable since obtaining the share price is the purpose of this operation and the share price is mostly available in a market that is assumed to be efficient (Malkiel, 1989).

Quoted share prices might, however, in some cases be insufficient. Private businesses that are not quoted and need to be valued for IPO's or acquisitions require equity valuations. If a company develops a strategy internally and the management intends to test its impact on the current value, equity valuation is necessary. Finally, equity valuation is also applied to verify if companies are correctly priced (Damodaran, 2002). Assuming that markets are efficient does not mean that all stocks are constantly correctly priced (Malkiel, 1989). Equity valuation provides in these cases a reality check on forecasts implied by market prices.

A firm's valuation can be implemented through two points of view, the entity perspective and the equity perspective. The entity perspective neglects the source of funding to finance the operating assets. It values the operating entity as a whole, combining debt and equity shareholders' funds. The equity perspective distinguishes between capital provided by shareholders and debt holders, focusing on the first one. Valuations can be conducted from either perspective, moving from one to the other by adding or deducting the capital provided by debt holders (Citigroup Global Markets, 2008).

Accounting data has not always been seen as a useful tool. Versions of the argument that income numbers lack meaning and are consequently of questionable utility appear in Canning (1929); Gilman (1939); Paton and Littleton (1940), among others.

Ball and Brown (1968) argue that this line of thought is mainly based on the constant development of accounting practices facing new incidents. The inexistence of an identical cross-border framework creates divergences in accounting practices, making net income figures inconsistent. Being aware of these differences, but also of the fact that net income is a number of particular interests for investors, Ball and Brown analyze the net income significance in terms of content and timing and conclude that of all the information becoming available about a firm over the year, most is captured in that year's income number. The net income content is therefore considerable. In this study net income is, however, not considered a timely medium, once most of its information is captured in other, more timely, media such as interim reports.

Beaver (1968) addresses the same issue by examining the extent to which common stock investors perceive earnings to have informational value. He particularly focuses towards the investor's reaction to earnings announcements in terms of volume and price movements of common stock in the weeks nearby the announcement date. According to his approach there are two main reasons to believe that earnings lack information value. First, measurement errors in earnings are too large and second, even when earnings convey information there are other sources available to investors that contain the same, but timelier, information. During his analysis, Beaver observes a price reaction as well as a volume reaction, indicating that not only expectations on individual investors are altered by the earnings report, but also the expectations of the market as a whole.

Both papers conclude that even though accounting numbers might not be the ideal source of information, they are still the best available alternative and extremely important for investors and equity valuations.

2.2 Theoretical Models

There are many approaches for equity valuations, from very detailed analyses to rather simple implementations. The ones that matter for this review are the stock-based valuation models and within the flow-based valuation models: the discounted dividend, the residual income valuation and the Ohlson/Juettner-Nauroth model, due to their international spread and acceptance.

Given the aim of this study, theoretical models and later presented empirical evidence are analyzed in terms of their contribution towards the research intend, shedding a light on how models and findings influence the performance of firms with different payout ratios.

2.2.1 Stock-Based Valuation Models (Market Multiples)

Fundamental analysis is detailed and costly so a simple approach is sometimes preferable avoiding forecasting and minimizing information breakdown (Penman, 2003). One of the most common methods is the market multiples method.

As Penman (2003) points out, the multiples method starts by identifying firms that have similar characteristics to the firm that is seeking to be valued, the target firm. After identifying the comparable firms it is time to identify measures or value drivers in their financial statements and compute benchmark multiples of those measures at which the firms trade. Finally the calculated benchmark multiples need to be applied to the corresponding measures for the target to estimate that firm's value.

The general method for price multiples can be written as follows:

$$Value\ estimate_i = Value\ driver_i * Multiple\ derived\ from\ comparable\ firms$$

The multiple-based valuation can either be implemented through equity-level or entity-level multiples. The reason to choose one perspective over the other depends on the company being considered. In case accounting and financing policy differences make comparing equity multiples difficult or when non-core businesses distort comparability, then the use of enterprise-value (EV) multiples is preferable. Relying on equity multiples is encouraged, when EV multiples are less meaningful or when additional forecast inputs want to be avoided (Citigroup Global Markets, 2008).

Despite its apparent simplicity, multiple-based valuation requires complex decision making processes which are described below.

2.2.1.1 Selection of Comparable Firms

The first implementation issue is the selection of comparable firms. The goal is to find one or several firms that best represent the target firm. The advantage of choosing a single comparable firm is that the probability of identifying a closer match of the target firm is higher. A set of firms, however, provides the benefit of canceling out firm specific characteristics leaving only average factors. One possible approach is to select comparables operating in the same industry, which are more likely to be affected by the same set of factors, being the most closely related to the firm being valued. In case an industry is, however, not well defined, the intra-industry differences can be significant, making the comparable selection difficult (Penman, 2003).

2.2.1.2 Selection of Relevant Value Driver

The second implementation issue is the selection of the most appropriate value driver. The principal criterion is to choose the value driver that is most closely correlated with value/price relation. Based on the fact that accruals help overcome the timing and mismatching problems inherent in cash flows, tied with the reality that current earnings provide a more reliable prediction for future cash flows than current cash flows, earnings are generally the preferred value driver (Liu et al., 2002).

Some multiples, including the Price/Earnings (P/E) multiple, are affected by leverage. Unless it can be assumed that the leverage of the comparable and target firms are similar, it might be sensible to use P/E ratio formulations that focus on entity-level value drivers rather than equity-level value drivers (Penman, 2003).

Finally, the selected value driver should, when using an earnings value driver, rather be a forecast of profits than a historical profits figure. Following the theory of finance, the value of an asset depends on the stream of expected future cash flows. The correlation between the firm’s price, the expected future cash flows, and the expected future profits is likely to be higher than the correlation between the firm's price and historical profits figure (Penman, 2003).

2.2.1.3 Computing the Benchmark Multiple

The final implementation issue is the computation of the benchmark multiple. The calculation of the benchmark multiple is a crucial step in this valuation method as it highly influences the target firm's value (Liu et al., 2002). Calculating the arithmetic average is one possibility.

$$\frac{1}{n}\sum_{j=1}^{n}\frac{Pj}{VDj}$$

The problem in implementing this option is the possible existence of outliers. Outliers are often encountered in accounting research and influence the mean considerably. Alternative calculations that alleviate this problem are the use of the median or the weighted average. A third alternative would be the use of the harmonic mean, the reciprocal of the mean of the reciprocals of the ratio. The harmonic mean diminishes the effect of small denominators as well as it yields less upward-biased estimates. Note that in any of the presented possibilities the target firm is always excluded from the comparable group when estimating its benchmark multiple (Liu et al., 2002).

Summarizing, the multiple-based approach owes its popularity to its simplicity and its absence of multiyear forecasts of parameters. Users rely on the market to undertake the task of forecasting. The success of this valuation method relies on the assumption that future cash flows and risk profiles of comparables firms are similar to the target firm and that the value driver is proportional to value (Damodaran, 2002). This approach can however not safeguard against a sector or even the market being wrongly priced.

The use of this method is adequate for the aim of this study as it allows firms with different payout ratios to be valued. Given the properties of this method, similar firms in terms of business strategy, operational sector as well as dividend policies can be selected as comparable firms, enabling an adequate valuation for each firm.

2.2.2 Flow-Based Valuation Models

2.2.2.1 Discounted Dividend Model (DDM)

The DDM, attributed to Williams (1938), values a firm's intrinsic equity value by forecasting and discounting future dividends. The model discounts future dividends ($E(DPS)$) at the cost of equity giving (ke) rise to the firm's present value (V_0^E).

Forecasting infinite future flows is highly impracticable. As a result, valuation models using forecasts of flows often comprise these up to a certain horizon and establish then a continuing-value term. This continuing-value term can then assume two scenarios. One possible assumption is expecting the firm to pay the same dividend to infinity, neglecting any growth factor after the horizon time. Assuming that the firm pays dividends that are a growing perpetuity is the second scenario, also known as the Gordon growth model (Damodaran, 2002). Finally, by multiplying the value per share by the number of shares, the Firm's equity value is calculated.

Value per share of stock (no growth):

$$V_0^E = \sum \frac{E(DPS)_n}{(1+ke)} + \frac{E(DPS)_{n+1}}{ke} * \frac{1}{(1+ke)^n}$$

Value per share of stock (growth = g):

$$V_0^E = \sum \frac{E(DPS)_n}{(1+ke)} + \frac{E(DPS)_{n+1}}{ke-g} * \frac{1}{(1+ke)^n}$$

At first sight this model seems to be very appealing. Based on an easy concept it forecasts what shareholders get. Once dividends are usually relatively stable, in the short run, they are fairly easy to forecast. At a closer look this model reveals, however, some shortcomings. A company's dividend policy is not directly linked to value added and can instead be arbitrary. A company can increase its leverage to pay dividends, while not creating value. Dividends represent hence the distribution of wealth, rather than the creation of wealth. Moreover, flow based valuations require forecasts for long periods. A company's dividend policy can be stable in the short run, but it is not very predictable in the long run, incorporating easily errors in estimating key ingredients. Finally, the DDM only applies to companies that pay out dividends. There are, however, many firms that do not pay out dividends. In these cases, the application of this model is not possible (Penman, 2003).

Summarizing, this model is not always applicable, but it works best when a company's payout is permanently tied to the value generation of the firm, such as when a firm has a fixed payout ratio (Penman, 2003).

With the aim of comparing the performance of firms with different payout ratios for several valuation models, this method shows to be inadequate. Once the valuation model relies on dividends, non-dividend paying firms are automatically not valuable through this method. Hence, a comparison between groups' performance (dividend and non-dividend paying) is here impossible.

2.2.2.2 Discounted Cash Flow Model (DCFM)

The intrinsic value of equity can be calculated directly by forecasting cash flows to equity holders, as presented by the DDM. Alternatively, the value of equity can be estimated by forecasting the free cash flow (the value of the firm), arising from the operating activities of the company, *C*, net of amounts invested in the operating activities, *I*, followed by the deduction of the debt value (V_0^D) (Penman, 2003). The DCFM estimates hence the value of the firm rather than the equity's intrinsic value and requires therefore the subsequent deduction of the firm's debt. The DCFM is one of the most accurate and flexible methods for valuing projects, divisions or even entire companies. Any analysis is, however, only as accurate as the forecasts it relies up on, highlighting the importance of the right free cash flow forecasts as well as of the appropriate weighted average cost of capital (Copeland et al., 2000).

After forecasting a firms free cash flows *(C-I)* these are discounted at the weighted average cost of capital (WACC), the cost of capital for the entity perspective.

A terminal value is assumed, avoiding infinite free cash flow forecasts, which can either represent a flat or growing perpetuity.

Equity Value (no growth):

$$V_0^E = \sum \frac{(C-I)_n}{(1+WACC)^n} + \frac{(C-I)_{n+1}}{(WACC)} * \frac{1}{(1+WACC)^n} - V_0^D$$

Equity Value (growth):

$$V_0^E = \sum \frac{(C-I)_n}{(1+WACC)^n} + \frac{(C-I)_{n+1}}{(WACC-g)} * \frac{1}{(1+WACC)^n} - V_0^D$$

The DCFM owes its popularity to its familiar concept and its detailed analysis. Cash flows are not affected by accruals and are therefore easily considered.

The same model incorporates nevertheless some weaknesses. The DCFM does not measure value added over the short run. If a firm invests more cash in operations than it makes from operations, the free cash flow is negative even if the NPV of the project is positive, treating investment as a value loss. In the long run the free cash flow will be positive but the greater the current investment is, the longer the forecasting horizon has to be to take into consideration these cash inflows. A highly extended forecasting horizon results then in less accurate forecasts and threatens the valuation estimate precision. Also, the DCFM is a highly liquid concept. A firm’s free cash flow increases as soon as the investments are cut. This, results in a higher value estimate even if investments are reduced (Penman, 2003). Additionally, this model is not aligned with what professionals forecast. Analyst forecast earnings, not free cash flows. As Damodaran (2002) points out, the use of this model requires therefore further adjustments to convert earnings into free cash flows. Finally, this model is unsuccessful in recognizing value that is not incorporated directly in cash flows.

Summarizing, this model values firms with different payout ratios, providing a more detailed analysis of the firm’s intrinsic value. Due to its limitations Penman (2003) suggests the model is best applied to companies whose investment pattern produces a stable free cash flow, such as cash cows.

2.2.2.3 The Residual Income Valuation Model (RIVM)

Being already mentioned by Preinreich (1938) and Peasenell (1982) the RIVM is not a new discovery, nevertheless it was recently revived by the work of

Ohlson (1995) and Feltham and Ohlson (1996) resulting in an outburst of interest.

Feltham and Ohlson (1999) base the usefulness of this valuation method on the focus shift from wealth distribution, dividends, to accounting measures of wealth creation, book value and abnormal earnings. The wealth creation depends therefore only on the firm's activity as opposed to the financing of those activities. As shown in Appendix 1, the RIVM is derived from the essential expression of the DDM.

Equity Value:

$$V_0^E = B_0^E + \sum \frac{RI_n}{(1 + ke)^n}$$

Residual Income:

$$\mathrm{RI_n = NI_n - ke * B_{n-1}^E}$$

As presented in the equation above, the equity perspective application of the RIVM involves the observation of the accounting book value of equity and the forecasted residual income discounted at the cost of equity, including a continuing value term. Residual income, also known as abnormal earnings, are the earnings in excess of a normal return on capital employed (Penman, 2003). Alternatively, the model can be applied from the entity perspective, adjusting the equity perspective items to entity perspective items.

This valuation model comprises an anchor, the book value, and a premium over the book value, the present value of forecasted residual income (Ohlson, 2005). Consequently, if a firm expects to earn a normal rate of return on the capital employed, the intrinsic value of the firm equals the book value of equity, including no premium, from the equity perspective. If, however, the company expect to earn more than a normal return on capital employed the equity value will exceed its book value. The same applies to the entity valuation method.

The strength of this model, applicable to firms with any kind of payout ratio, relies on using the value component recognized in the balance sheet, the book value, which does not form part of the forecast-flow component. Additionally, the RIVM uses properties of accrual accounting. These properties recognize value in advance, matching value added to value given up. Contrary to the DCFM, the RIVM treats investment as an asset instead of a cost, resulting in smoother series of cash flows. Consequently, the forecast horizon for this model is shorter than when using the DCFM (Penman, 2003).

The downside of this model is its accounting complexity (Penman, 2003). Requiring some understanding of how accrual accounting works is necessary to facilitate the identification of causes of concern. Also, residual income is not a natural focus of attention for analysts which are more familiar with the use of forecasted earnings. Finally, this model relies on clean surplus accounting while existing literature recognize that GAAP's earnings construction violate the clean surplus relation (Ohlson, 2005).

2.2.2.4 Ohlson/Juettner-Nauroth Model (OJM)

The Ohlson/Juettner-Nauroth (OJ) Model, also known as the Abnormal Income Growth (AIG) Model, is derived from the DDM as shown in Appendix 2 (Ohlson & Juettner-Nauroth, 2005). The intention is to overcome some shortcomings presented by the RIVM by replacing the anchor used in this model, the current book value, with the subsequent period capitalized earnings (Ohlson, 2005). Additionally, to estimate the firm's equity value, the present value of capitalized abnormal income growth (AIG) of next-periods, where AIG is the difference in income minus the normal return on previous-period retained income, is added.

Equity Value:

$$V_0^E = \frac{E_0(NI_1)}{k_e} + \sum \frac{AIG_{n+1}}{k_e(1+k_e)^n}$$

Where

$$AIG_{n+1} = (NI_{n+1} - NI_n) - k_e(NI_n - d_t)$$

Note that also the OJM can be written in terms of the entity perspective by adjusting the equity perspective items to entity perspective items.

Analyzing this model it appears to have some advantages over the previously presented RIVM. When looking closely at the anchor term it is visible that the capitalized next-period income can be rewritten as current book value plus capitalized subsequent period residual income.

OJM Anchor from equity perspective:

$$\frac{E_0(NI_1)}{k_e} = \frac{E_0(k_e B_0^E + RI_1)}{k_e} = B_0^E + \frac{E_0(RI_1)}{k_e}$$

Compared to the RIVM anchor it is clear that the OJM anchor incorporates a larger portion of value, making the terminal value less influential. Additionally, this model does not rely on clean surplus. Then, focusing on income cannot be worse than to focus on book value, but the reverse is false, as stated by Ohlson (2005). Ohlson argues also that capitalized income approximates market values more closely than book values. Finally, investment practices rotate around income and their growth, not book value and their growth, (Penman, 2003).

The use of this model requires, however, an understanding of accrual accounting (Penman, 2003). The forecast horizon in the OJM might be shorter than the one for the DCFM but the forecasts do depend on the quality of the accrual accounting.

2.3 Empirical Evidence

2.3.1 Empirical Evidence on Stock-Based Valuation Models

Multiples and their implementation issues have been a major focus for published papers by Boatsman and Baskin (1981), Alford (1992), Kaplan and Ruback (1995), Kim and Ritter (1999), Baker and Ruback (1999), amongst many others. Most of these papers perform their examination, however, only over a limited period of time and consider merely a subset of multiples. Additionally, as the methodology differs across studies a comparison between those is difficult.

The focus will therefore shift to the paper published by Liu et al. (2002). This paper focuses on how the accuracy of multiple-based valuation varies when it is specified differently: across different peer groups, across different value drivers and across different estimations of the benchmark multiples.

The primary focus is the traditional approach, assuming direct proportionality among price and value driver, selecting comparable firms based on their industry. In a further stage a less restrictive approach is considered, allowing for an intercept and expanding the group of comparables to the whole sample.

To avoid negative predicted prices, the authors restrict their sample to positive multiples, eliminating negative firm-years in general (Liu et al, 2002, p. 145). The multiples used in calculating the pricing errors during this study are estimated using the harmonic mean. To make results comparable with other studies (e.g. Alford (1992)) the procedure is repeated using the median. In line with results in Baker and Ruback (1999), the multiples performance is worse when making use of the median as opposed to when using the harmonic mean.

The study finds that multiples based on forward earnings explain stock prices relatively well for the majority of the sample. Historical earnings are ranked second, book value and cash flow measures are the third best alternative and sales-based have the worst performance. Contradicting findings from Tasker (1998), this ranking is consistent across several industries and across a wide time range. Selecting companies from the same industry seems to improve the performance of all value drivers and relaxing the restriction, allowing the use of an intercept, improves mostly measures that performed worse previously. Note that, due to the imposed restrictions on forecasts and positive values, the results might not representative for firm-years excluded from the sample. The sample is unlikely to contain emerging technology firms such as Internet stocks (Hand 1999, 2000).

A different implementation issue is analyzed by Bhojraj and Lee (2002). Bhojraj and Lee suggest that comparable firms should be identified in accordance to a measure, the warranted multiple, rather than selecting comparables based on industry or size. This measure combines characteristics specific to the target firm and the market association between these characteristics and the multiple. For each target firm its comparables are hence the ones whose warranted multiples are the closest to the warranted multiple of the firm under analysis.

During their study, Bohjraj and Lee restrict their analysis to only two valuation multiples: the Entity Value/Sales (EV/S) and the Price/Book (P/B) multiple. The reason for selecting these two multiples is based on the fact that these are highly unlikely to adopt negative values.

The authors compare this approach to traditional approaches selecting comparables based on their industry and size. Bohjraj and Lee conclude that comparable firms selected through a similar warranted multiple perform better relative to traditional comparable firm selection methods, improving significantly the valuation outcome.

Considering this finding, it is important to remember that the implementation of complex warranted multiples improves the outcome, compromising however the simplicity multiples owe its popularity to.

2.3.2 Empirical Evidence on Flow-Based Valuation Models:

To study the performance of different flow based valuation models Francis et al. (2000) examine the value estimated of three theoretically equivalent valuation models. Several studies examined flow based methods previously such as Kaplan and Ruback (1995), Frankel and Lee (1995; 1996), Bernard (1995), but particularly Penman and Sougiannis (1998). Knowing that Penman and Sougiannis (1998) had performed their analysis on realized portfolio payoffs and signed prediction errors, Francis et al. (2000) base their study on forecasted payoffs of individual securities and extended their focus on accuracy and explainability.

Driven by the question of which model to use to measure a firm’s intrinsic value the authors examine three flow based models: the DDM, the DCFM and the RIVM. In line with previous studies, the results show that the RIVM consistently outperforms the DDM and the DCFM in terms of aggregation, type of data and performance metric.

This constant superiority of the RIVM might be based on the book value implementation, containing not only a flow based component, but also a stock component. This superiority holds as long as distortions in book values resulting from management discretion are less severe than forecast errors in growth and discount rates. Alternatively, the superiority might be a result of a greater precision in terms of residual income forecasts.

With the outburst of interest in the role of the RIVM due to the works of Ohlson (1995) and Feltham and Ohlson (1995), Frankel and Lee (1998) decide to compare different implementations of the RIVM. Frankel and Lee determine a value-to-price ratio (V/P), based on this model, to observe market efficiencies and predictability of cross-sectional stock returns.

They find that this V/P ratio outperforms the P/B ratio at explaining cross-sectional prices. Additionally, this ratio is a better predictor for long term returns. Also, a link between the V/P ratio and returns is established. High (low) V/P firms are linked to higher (lower) long term returns. The authors show that, taking advantage of these finding, an investment strategy based on buying high V/P stocks and selling low V/P stocks generates a 3 year cumulative return of 35%.

While the previous presented literature uses market prices as a benchmark for their analysis, Lee, Myers and Swaminathan (1999) compare the intrinsic value estimate of the RIVM (V) against other traditional models in terms of their tracking ability of price variation and their predictive power for future returns. The motivation of their study is to examine the autocorrelation and predictive power of future returns of the V/P ratio, based on the RIVM, against dividends (D/P), earnings (E/P) and book value (B/P) ratios.

During the analysis, the V/P ratio shows a smaller first-order autocorrelation, indicating a faster recovery when deviating from the mean, leading to the conclusion that the RIVM value estimate tracks the intrinsic value better than the other traditional models. Consistent with previous results, the V/P measures also outperforms the remaining measures in terms of significance power.

The study shows that earnings forecast methods and the risk free rate are the most important factors for the distinctive success of the RIVM. In line with previous findings Lee et al. (1999) conclude hence that time varying interest rates and analysts' earnings forecasts improve the performance of the V/P measures significantly.

2.4 Concluding Remarks

This review addresses the most common equity valuation methods, looking at the advantages and disadvantages of each method. Then, empirical research on these models is presented, concluding that in terms of the stock-based method the P/E ratio is the most recommended multiple followed by the P/B ratio. In terms of the flow-based models the RIVM consistently outperforms the other models. The OJM, a newly revived model, is not considered in most studies leaving its relative performance unknown.

With the aim of this study, the model that is inadequate to pursue further is the DDM. Its reliance on only dividend paying firms hinders any comparison between firms with different payout ratios. Also, empirical evidence suggests that for the later study market prices as benchmark of the analysis of different models are recommended as the tracking ability of price variations surpasses the scope of this analysis.

3 Dividend and Non-Dividend Paying Firms

3.1 Introduction

Each firm chooses if and how much dividends to pay its shareholders. Reasons that influence a firms' willingness to pay out dividends might be based on the firms' desire for stability, future investment needs, taxation factors, signaling effects or managerial interests (Damodaran, 2002).

The variability in dividends is lower than the variability in earnings as firms are unenthusiastic to change their dividend policy once the payout began. To prevent future cuts and with the uncertainty of future earnings, firms often reject a dividend increase, maintaining a constant or no payout policy at all. Additionally, if a company expects future investment opportunities its reluctance to pay out dividends decreases, once issuing securities might exceed the costs of keeping excess cash for future financing. Also, different tax rates might influence a firm's payout rate. In case dividend gains are taxed at a higher rate than capital gains a firm might be more reluctant to payout dividends and vice versa. Furthermore, some argue, dividends often signal earnings quality, where a payout increase suggests a positive sign and a payout decrease, or no payout at all, suggests a negative sign. Finally, a firm's payout decision might be influenced by managerial incentives. Retained earnings gives managers discretion to act in their interest and enables them to build up a cash cushion protecting their performance when earnings decrease (Damodaran, 2002).

3.2 Review of Relevant Literature

Given the complexity of this subject authors have, over time, come to different conclusions. It is the goal of this review to present the evolution of different findings, interpretations and theories issued by authors such as Modigliani and Miller, Fama and French, DeAngelo and DeAngelo, and many others.

Modigliani and Millers (1961) irrelevance theorem indicates that, in a frictionless market with a fixed investment policy, all capital structures and dividend policies are optimal. This suggests that any dividend policy implies identical stockholder wealth, making the choice among them irrelevant.

Several years later, DeAngelo and DeAngelo (2006) state that the only policy a firm can choose in Modigliani and Miller's theorem is a 100% free cash flow payout. The authors propose that, contrary to Modigliani and Miller (1961), payout policy is not irrelevant and that investment policy is not the only value determinant in a frictionless market. Once retention is allowed dividend payout policy matters in the same way investment policy does. DeAngelo and DeAngelo (2006) also argue that the existence of benefits to retention do not eliminate the fact that these benefits must eventually be dominated by incentives for distribution. Hence, the suggestion of a trade off theory is made where flotation costs involved in issuing securities encourage retention and agency costs, managers and shareholders misalignment of interests, disencourage it.

DeAngelo and DeAngelo (2006) therefore conclude that firms in early years generate less internal capital then they have investment opportunities forcing them to rely on outside equity, hindering any payout policy. Firms in late years, however, usually have less profitable investment opportunities than internal generated cash, making agency problems appear. Given this scenario, firms mitigate opportunities for free cash flow waste paying out dividends.

Another striking finding was made by Fama and French (2001) documenting a major time-series change in dividend payout policy. In the time-span between 1978 and 1999, the percentage of firms that pay dividends decreased from 67% to 21%. Fama and French (2001) suggest that this decline is partly derived by the appearance of many small and unprofitable firms with strong growth opportunities. However, even after accounting for this trend Fama and French (2001) are still able to identify a considerable decline in the 'propensity to pay dividends', suggesting that even firms that pay dividends reduced their payout.

Additionally, Fama and French (2001) state the difficulty to explain the reason for firms to pay out dividends, since dividends are taxed at a higher tax rate making firms who pay dividends suffer a competitive disadvantage. The authors make therefore use of logit regressions and summary statistics to identify the characteristics of dividends payers. Both analyses indicate that the decision to pay out dividends relies on three factors: profitability, investment opportunities and size. Dividend paying firms are more profitable firms than non-payers, while non-payers have a higher investment rate. This finding seems to be consistent with the suggestion of Esterbrook (1984) and Jensen (1986) about the role of dividends in eliminating free cash flow agency costs. Finally, dividend paying firms are about 10 times larger than non-paying firms.

The appearance of new, small and unprofitable firms which do not pay dividends combined with the payout decline whatever their characteristics, due to deteriorating profitability, suggests a reduction in the alleged dividends benefits.

As possible explanations for dividends decline through time, Fama and French (2001) identify possibly lower transaction costs for trading stocks facilitating capital gains as well as better corporate government technologies controlling agency problems within a firm.

Intrigued by the question raised by Fama and French (2001), whether dividends are disappearing, DeAngelo et al. (2004) decide to take this analysis further. During their study, the authors discover that the final result is a significant decrease in the number of dividend payers, in line with Fama and French (2001), accompanied, however, by an increase in aggregate dividends. This finding indicates that the few top firms paying dividends dominate and increased the aggregate payout while the bottom firms have no or little impact on the dividend supply.

Supporting Linter's (1956) findings, that firms' dividend supply depends mainly on earnings, this suggests that the dividend concentration observed by DeAngelo et al. (2004) might be a result of significant earnings concentration. Also, knowing that the losses in 2000 exceeded the losses in 1978, found by Buegstahler and Dichev (1997), Fama and French (2001) and Ritter and Welch (2002), reinforce the fact that losses play an important role in dividend payout policy.

De Angelo et al. (2006) also question the empirical importance of signalling and clientele effect (Allen and Michaely, 1995). They argue that in case clientele effect was true, if investor were in fact attracted to different company policies, it would be possible to see top firms not paying dividends across several industries and not only the technology industry. The fact that dividends are highly concentrated among a small number of prominent firms with high earnings, questions also the singling effect. The signalling effect suggests that companies rely on dividends to communicate to stockholder. If this theory were to be true, significantly smaller, relative unknown firms with limited access to financial press would recur to dividend payouts. The majority of firms recurring to payout policies are, however, important companies.

Given this discovery DeAngelo et al. (2006) decided to empirically test the life-cycle theory. The idea of this theory is that in young firms with many investment opportunities but limited resources, retention dominates distribution, while mature firms have fewer profitable investment opportunities and higher profitability, making them optimal dividend payers.

The idea, already introduced by Frama and French (2001), DeAngelo et al. (2004) and Grullon et al. (2002), hints at a life cycle theory where the benefits of payout policy (elimination of agency costs) dominate retention (elimination of floating costs) at a later stage. The puzzling finding, made by Fama and French (2001), suggesting that in recent years firms are much less likely to pay dividends than they were in the mid 1970s DeAngelo et al. (2006) explain by a shift towards a massive amount of firms with less earned earnings. A possible justification is given by Fink et al. (2004) stating that the age for a typical firm at its IPO date has fallen significantly from 40 years in the early 1960s to less than 5 years in the late 1990. Combining this fact with the evidence that new firms usually have less stable earnings and more growth opportunities, firms have become less likely to pay dividend because they are younger (DeAngelo et al., 2006).

Besides ruling out signalling and clientele effects, the authors now also rule out the catering incentives presented by Baker and Wurgler (2004). This theory argues that companies have incentives to pay dividends when the market overvalues dividend payments. The prediction of this theory is however inconsistent with findings by DeAngelo et al. (2006).

DeAngelo et al. (2006) argue that agency costs, implied in the life cycle theory, most powerful explain the reason for payout decisions of mature firms. The same conclusion, choosing the life-cycle theory as explanation for payout policies, Chahyadi and Salas (2012) reach in their study. At the end they raise, however, an additional question. The authors question whether the recent increase in share repurchases has an effect on the likelihood that firms pay dividends.

It is this same question that Jain et al. (2009) chose to examine in their analysis, comparing share repurchases with dividend payout policies. According to these authors, there is an ongoing debate about the extent to which share repurchases substitute dividend payments. By analyzing the differences in dividend paying and stock repurchasing firms, the authors are able to point out several significant differences between both groups.

Dividend paying firms are characterized by a higher leverage, profitability, maturity, sales and total assets, while the growth prospects are significantly lower. Additionally, these firms are less likely to be supported by venture capitalists. Hence, dividend paying firms follow generally the typical life cycle characteristics, favoring distribution over retention.

Stock repurchasing firms appear to have completely different characteristics and do not appear to follow the life-cycle theory. Instead they tend to initiate repurchases at an early stage. The previous mentioned signaling effect is therefore much more appropriate for companies repurchasing shares than paying dividends.

Skinner and Soltes (2011) argue that in terms of earnings quality repurchases have a less credible sign of earnings quality than dividends. This finding is expectable, since dividends represent a commitment to pay out a certain amount indefinitely while repurchases do not.

3.3 Concluding Remarks

After DeAngelo and DeAngelo (2006) contradict the paper issued by Modigliani and Miller (1961), assuring that the payout decision is definitely not irrelevant, further studies agree and complement on each other. A life-cycle theory is identified for dividend paying firms, ruling out signaling and clientele effects as well as catering incentives. According to this theory firms that pay out dividends are generally big, profitable and mature firms with less growth opportunities. It is hence possible to say that dividend and non-dividend paying firms are two homogeneous groups within themselves and heterogeneous between themselves.

These two apparently very different groups form the basis for this research. It is this clear identification of two clusters that raises the question of whether the performance between both groups differs in equity valuations.

4 Large Sample Analysis

4.1 Introduction

The empirical evidence presented attributes specific characteristics to firms with different payout policies. With increasingly more young and small firms going public and therefore the amount of non-dividend paying firms increasing, the gap between these two groups widens. Linking this fact with the previous presented valuation methods, this clear distinction raises the question of whether certain models perform better on one group than on the other.

4.2 Hypothesis

The intention is to test which models perform best and where the discrepancy between both groups is the highest, alarming model users to the fact that certain models might have considerably different outcomes depending on firms' payout policies.

Given their characteristics it is expectable for dividend paying firms to perform according to previous presented empirical evidence on equity valuation models, as these rely on firms with the same characteristics for pursuing their analysis. Frankel and Lee (1998) eliminate all small firms from their sample by removing firms with stock prices under $1, Francis et al. (2000) also rely on large firms with a mean market capitalization of $2.6 billion, and even Liu et al. (2002) winsorize payout ratios to lie between 10% and 50%. For non-dividend paying firms the outcome might therefore be different, as different sample characteristics might influence the models' performance.

4.3 Valuation Models

The four valuation techniques considered in this analysis are two multiple based models and two flow based models. Within the multiple based models the first value driver used is forward earnings and the second value driver is book value. The selection of both value drivers relies on their outstanding performance presented in previous studies such as Liu et al. (2002). The two flow based models under analysis are the RIVM and the OJM. The research question conducting this analysis automatically eliminates models such as the DDM and sheds an interesting light on the RIVM and OJM.

4.4 Research Design (Data and Sample)

The dataset used to perform this analysis contains information for a sample of U.S. non-financial public firms between the years of 2005 and 2010. Compustat is the source for accounting variables. Other data such as share prices and analyst forecasts are withdrawn from I/B/E/S (short for the *International Brokers' Estimation System*) and betas are from CRSP. While Compustat collects accounting data mainly directly from financial statements, I/B/E/S gathers recommendations and forecasts from a broad selection of equity analysts. Besides forecasting data I/B/E/S also states 'actual' earnings per share (EPS) for the respective fiscal year end. Finally, to guarantee consistency between companies' stock prices and forecasted data, prices are gathered from I/B/E/S measured at the 15th of April of the relevant year.

The initial sample contains data for U.S. non-financial firms with publicly traded stock, with the fiscal year end in December, followed by at least one analyst and with a share price of at least $1. Imposing on this sample the additional request for at least one one-year and one two-year-ahead EPS forecasts and positive net income figures the sample reduces its observations from 11,493 to 7,741. These additional requests are necessary to guarantee the existence of relevant data for further analysis. Selecting only positive net income observations makes the usage of the P/E multiple a viable option. Within this sample 4,338 observations belong to non-dividend paying firms, while 3,403 observations belong to dividend paying firms (table 1).

TABLE 1
Sample Selection Procedure

Sample Characteristics	Number of Observations
Initial Sample [a]	11,493
Excluding firms with less than one one-year-ahead EPS forecasts	-10
Excluding firms with less than one two-year-ahead EPS forecasts	-417
Exclude loss making firms	-3,325
Final Sample (Full Sample)	7,741
Dividend paying firms	3,403
Non-Dividend paying firms	4,338

[a] The Initial Sample already requires a December fiscal year end, excludes financial firms and imposes the share price to be higher than $1.

Table 2 shows the sub-sample characteristics in terms of industry, profitability and size. Note that dividend and non-dividend paying firms are present in mostly the same industries. Profitability and size differ, however, considerably across both sub-samples.

TABLE 2
Sample Characteristics

Type	Industry Compatibility	Profitability	Size
Dividend Paying	0.999	696.820	3,906.135
Non-Dividend Paying	0.992	122.171	836.023

Industry presence across sub-samples. Profitability and size are measured in millions.

When performing the analysis on the P/E multiple, the median two-year-ahead EPS forecast provided by I/B/E/S is the chosen value driver. This selection relies on the superior performance of this value driver compared to the one-year-ahead EPS forecast and the actual earnings, both provided by I/B/E/S, as well as the two EPS values provided by Compustat adjusted for stock splits.

The second multiple-based analysis is the price to book multiple. This analysis incorporates the value driver from the Compustat data, once it is an accounting value. Common/Ordinary Equity is divided by Common Shares Outstanding, which are than adjusted for stock splits.

In both cases the multiples are calculated through the industry harmonic mean as this method diminishes the effect of extreme values, reporting less biased estimates. A more sophisticated method presented by Bhojraj and Lee (2002) is neglected as the practicality of the multiple based methods relies on its simplicity.

The first flow-based model presented is the RIVM. This model is estimated with a forecast period of two years, according to the Edwards-Bell-Ohlson-type approach, coined by Bernard (1994) as stated by Frankel and Lee (1998). The intrinsic value is therefore calculated by summing the book value per share at time zero, the residual income for period one and two and finally the terminal value as a growing perpetuity of two-year-ahead residual income.

The second flow based model is the OJM. This model is also estimated with a forecast period of two years. Each firms' intrinsic value is here calculated by summing the next years' capitalized earnings per share, the capitalized one-year-ahead and two-year-ahead abnormal earnings growth. At last, the terminal value is added as a growing perpetuity of the two-year-ahead abnormal earnings growth.

For both flow based models, the growth rate is initially retained at a conservative level of 0%. The cost of equity is estimated using the following industry cost of equity model:

$$r_E = r_f + \beta \, [E(r_m) - r_f]$$

Where:

$r_E = industry\ specific\ discount\ rate$

$r_f = 3 - month\ treasury\ bill\ rate$

$\beta = industry\ beta$

$E(r_m) - r_f = market\ risk\ premium = 5\%$

After testing long and short term risk free rates along with firm specific and industry specific betas, the short term risk free rate and the industry specific betas show the best results. Consequently, the cost of equity is calculated by summing the 3-month Treasury bill rate and the industry specific beta times the market risk premium which is assumed to be 5%.

If at a later stage the growth rate happens to exceed a firm's cost of equity the model assumes a zero growth rate preventing a negative denominator. Additionally, if the terminal value assumes negative values, the models replace the terminal value by zero. This is done to avoid negative valuation estimates which would inevitably appear by growing a negative perpetuity. It is hence assumed that if a firm has a negative residual income or a negative abnormal earnings growth for period two it will shortly go out of business.

Note that for each of the four models the respective data is trimmed by fiscal year for relevant variables to eliminate existing outliers which could influence the further analysis of each model.

4.5 Empirical Results

4.5.1 Descriptive Statistics

This analysis follows the work of Francis et al. (2000) using market prices as a benchmark, once using the tracking ability of price variations surpasses the scope of this analysis. The four models are tested in terms of their bias and accuracy, also known as signed prediction errors and absolute prediction errors, where the valuation estimate is set against the actual price.

TABLE 3
Descriptive Statistics - Valuation Errors

Panel A: Full Sample	Model	Mean	Median	SD	P1	Q1	Q3	P99
Signed Prediction Errors [a]	V(P/E)	0.006	-0.052	0.393	-0.665	-0.238	0.168	1.381
	V(P/B)	-0.019	-0.156	0.622	-0.827	-0.431	0.226	2.262
	V(RIV)	-0.284	-0.338	0.301	-0.731	-0.474	-0.169	0.775
	V(OJ)	0.067	-0.047	0.492	-0.593	-0.243	0.241	1.925
Absolute Prediction Errors [b]	V(P/E)	0.279	0.213	0.276	0.004	0.097	0.372	1.38
	V(P/B)	0.453	0.365	0.426	0.014	0.181	0.595	2.262
	V(RIV)	0.362	0.354	0.199	0.019	0.222	0.489	0.784
	V(OJ)	0.334	0.242	0.367	0.009	0.118	0.415	1.925
Panel B: Dividend Paying	Model	Mean	Median	SD	P1	Q1	Q3	P99
Signed Prediction Errors [a]	V(P/E)	0.000	-0.046	0.331	-0.600	-0.201	0.141	1.248
	V(P/B)	-0.066	-0.180	0.586	-0.824	-0.445	0.147	2.163
	V(RIV)	-0.271	-0.322	0.266	-0.674	-0.435	-0.178	0.693
	V(OJ)	0.061	-0.037	0.450	-0.581	-0.214	0.219	1.764
Absolute Prediction Errors [b]	V(P/E)	0.234	0.178	0.234	0.003	0.080	0.310	1.248
	V(P/B)	0.427	0.349	0.407	0.013	0.164	0.565	2.163
	V(RIV)	0.336	0.334	0.177	0.021	0.213	0.445	0.748
	V(OJ)	0.301	0.216	0.341	0.008	0.107	0.376	1.764
Panel C: Non-Dividend Paying	Model	Mean	Median	SD	P1	Q1	Q3	P99
Signed Prediction Errors [a]	V(P/E)	0.011	-0.060	0.436	-0.682	-0.275	0.205	1.439
	V(P/B)	0.017	-0.135	0.646	-0.829	-0.423	0.301	2.304
	V(RIV)	-0.295	-0.361	0.325	-0.747	-0.509	-0.156	0.874
	V(OJ)	0.072	-0.056	0.525	-0.601	-0.268	0.260	2.098
Absolute Prediction Errors [b]	V(P/E)	0.316	0.244	0.301	0.005	0.117	0.417	1.439
	V(P/B)	0.474	0.383	0.441	0.014	0.193	0.619	2.304
	V(RIV)	0.384	0.381	0.212	0.019	0.233	0.526	0.874
	V(OJ)	0.362	0.266	0.386	0.009	0.131	0.454	2.098

[a] Bias = (Vj-Pj)/Pj , [b] Accuracy = |Vj-Pj|/Pj, SD stands for Standard Deviation, P1 for 1st Percentile, Q1 for lower Quartile, Q3 for Upper Quartile and P99 for 99th Percentile.

Panel A of table 3 reports the signed and absolute prediction errors of the full sample for the models under analysis, while panel B focuses on the dividend paying firms and panel C addresses the non-paying dividend firms within the same sample. For each panel and model the mean, median, standard deviation, percentiles and quartiles are presented. The difference between the mean and the median are existing outliers which can influence the mean heavily. As shown the results do not deviate much from each other but given their characteristics the median is a more stable indicator. The other measures indicate the discrepancy within each model and show that the dispersion is normal.

It is important to point out that over the three panels the median signed prediction errors is constantly negative meaning that the valuation estimates are lower than the actual price. This result can be explained by fact that these valuation methods capture the value only through accounting figures, leaving other factors aside and are therefore expected to predict a lower valuation estimate than the actual price.

Over the three panels it is possible to identify the lowest absolute valuation errors in P/E multiple, followed by the OJM, the RIVM and finally the P/B ratio. Also, the valuation errors perform better for dividend paying firm than for non-dividend paying firms. Finally, the better the overall performance of the model, the higher the absolute prediction errors discrepancy between dividend and non-dividend paying firms.

4.5.2 Significance Level Tests

Table 4 builds on the descriptive statistics presented before and tests the signed and absolute prediction errors for each model within and between sample partitions. First, as the median shows to be a more stable indicator (Damodaran, 2002) the Wilcoxon test is applied to test the difference in median within each model between dividend paying firms and non-dividend paying firms. This procedure is applied for both, signed prediction errors and absolute prediction errors. At last, the models are compared against each other. Here also, the Wilcoxon test is applied comparing the median of each model against the others. In all cases tested, the significant difference is enough to reject the null hypothesis claiming the same sample median. Consequently, it is possible to say that within each model as well as between the models the difference is significant.

TABLE 4

Comparison of Bias/Accuracy Prediction Errors between/within Sample Partitions

Panel A: Signed Prediction Errors (Bias) [a]

Model	Median % Difference	α-Level Difference = 0
V(P/E)	-0.052	0.000
V(P/B)	-0.156	0.000
V(RIV)	-0.338	0.000
V(OJ)	-0.047	0.000

Panel B: Absolute Prediction Errors (Accuracy) [b]

Model	Median % Difference	α-Level Difference = 0	versus V(P/B)	versus V(RIV)	versus V(OJ)
V(P/E)	0.213	0.000	0.000	0.000	0.000
V(P/B)	0.365	0.000		0.000	0.000
V(RIV)	0.354	0.000			0.000
V(OJ)	0.242	0.000			

[a] Panel A reports median signed prediction errors, equal to (Vj-Pj)/Pj. It also reports the significance level associated with the Wilcoxon test of whether the median prediction within the models errors are equal to zero.
[b] Panel B shows the median absolute prediction errors, |Vj-Pj|/Pj. The last three columns report the significance levels for the Wilcoxon tests comparing the median absolute prediction errors between models. The median values are from the full sample.

4.5.3 Univariate Regression

This analysis also examines the explainability of each model. Univariate regressions are used to measure the explainability (R^2) of stock prices on value estimates. Panel A of table 5 reports the R^2 OLS and the OLS coefficient for market prices on the 15th of April on each value estimate for dividend paying firms, while panel B focuses on non-dividend paying firms. In general the variability of the univariate regression ranges from 75% to 28%, and in particular from 75% to 31% and 68% to 28%, for dividend and non-dividend paying firms respectively. This builds on the previous presented valuation errors which were lower for dividend paying firms and performed particularly well for the P/E valuation model. Hence, in both panels the P/E valuation has the highest R^2 followed by the OJM, the RIVM and finally the P/B model. Also between both panels the dividend paying firms have a general higher R^2 than the non-dividend paying firms.

TABLE 5

Univariate Regression of Stock Price on Value Estimates

Panel A: Dividend Paying [a]				
	V(P/E)	V(P/B)	V(RIV)	V(OJ)
OLS Coefficient	0.873	0.708	1.349	0.623
OLS R^2	0.747	0.310	0.599	0.623
Panel B: Non-Dividend Paying [b]				
	V(P/E)	V(P/B)	V(RIV)	V(OJ)
OLS Coefficient	0.868	0.722	1.409	0.722
OLS R^2	0.679	0.278	0.481	0.581

[a] Panel A reports results of estimating the following regression: Pj,F=λ0 + λ1VFj+εj, where Pj,F=observed share price of Dividend Paying Firms j; VFj= Value for security j for the respective models. [b] Panel B reports results of estimating the following regression: Pj,F=λ0 + λ1VFj+εj, where Pj,F=observed share price of Non-Dividend Paying Firms j; VFj= Value for security j for the respective models.

4.5.4 Robustness Test

Many studies, like Francis et al. (2000), perform robustness tests to growth rates since this assumption influences the empirical outcome considerably. The growth rate impacts only two models, the RIVM and the OJM. Having set the growth rate at the beginning at a conservative level of 0% the growth rate will now be increased to 2%.

Table 6.1 compares the signed and absolute prediction errors for dividend paying firms and non-dividend paying firms. Across panels, the RIVM and the OJM show a slight improvement within absolute prediction errors, following the results shown by Francis et al. (2000) in which the prediction errors diminished with a higher growth rate. The OJM shows, however, positive signed prediction errors. This means that with an increasing growth rate the OJM predicts valuation estimates which exceed the actual price making the signed prediction errors positive.

TABLE 6.1

Robustness Test

Descriptive Statistics					
Panel A: Dividend Paying		Growth rate = 0%		Growth rate = 2%	
Signed Prediction Errors [a]	Model	Mean	Median	Mean	Median
	V(RIV)	-0.271	-0.322	-0.242	-0.327
	V(OJ)	0.061	-0.037	0.128	0.043
Absolute Prediction Errors [b]	Model	Mean	Median	Mean	Median
	V(RIV)	0.336	0.334	0.312	0.303
	V(OJ)	0.301	0.216	0.302	0.213
Panel B: Non Dividend Paying		Growth rate = 0%		Growth rate = 2%	
Signed Prediction Errors [a]	Model	Mean	Median	Mean	Median
	V(RIV)	-0.295	-0.361	-0.247	-0.327
	V(OJ)	0.072	-0.056	0.149	0.037
Absolute Prediction Errors [b]	Model	Mean	Median	Mean	Median
	V(RIV)	0.384	0.381	0.373	0.363
	V(OJ)	0.362	0.266	0.368	0.253

[a] Bias = (Vj-Pj)/Pj , [b] Accuracy = |Vj-Pj|/Pj.

In table 6.2 the analysis shows that even though the absolute prediction errors decreased with an increasing growth rate, the sub-samples are still significantly different from each other to reject the null hypothesis of the medians within the sample are equal.

TABLE 6.2

Robustness Test - continued

Comparison of Bias/Accuracy Prediction Errors within Sample Partitions			
Panel A: Signed Prediction Errors (Bias) [a]			
Growth rate	Model	Median % Difference	α-Level Difference = 0
0%	V(RIV)	-0.338	0.000
0%	V(OJ)	-0.047	0.000
2%	V(RIV)	-0.308	0.000
2%	V(OJ)	0.041	0.000
Panel B: Absolute Prediction Errors (Accuracy) [b]			
Growth rate	Model	Median % Difference	α-Level Difference = 0
0%	V(RIV)	0.354	0.000
0%	V(OJ)	0.242	0.000
2%	V(RIV)	0.332	0.000
2%	V(OJ)	0.256	0.000

[a] Panel A reports median signed prediction errors, equal to (Vj-Pj)/Pj. It also reports the significance level associated with the Wilcoxon test of whether the median prediction within the models errors are equal to zero. [b] Panel B shows the median absolute prediction errors, |Vj-Pj|/Pj and its associated significance level. Both panels show results for two growth rates 0% and 2%.

Due to the higher growth rate and therefore lower absolute prediction errors the univariate regression changes accordingly. Table 6.3 presents the OLS R^2 for both scenarios. It is hence possible to verify that with an increased growth rate the explainability of both models improves slightly in both scenarios leaving, however, the previous ranking unchanged.

TABLE 6.3

Robustness Test - continued

Univariate Regression of Stock Price on Value Estimate				
Panel A: Dividend Paying [a]	Growth rate = 0%		Growth rate = 2%	
Model	V(RIV)	V(OJ)	V(RIV)	V(OJ)
OLS Coefficient	1.349	0.623	1.24	0.801
OLS R^2	0.599	0.623	0.614	0.625
Panel B: Non Dividend Paying [b]	Growth rate = 0%		Growth rate = 2%	
Model	V(RIV)	V(OJ)	V(RIV)	V(OJ)
OLS Coefficient	1.409	0.722	1.280	0.836
OLS R^2	0.481	0.581	0.491	0.606

[a] Panel A reports results of estimating the following regression: Pj,F=λ0 + λ1VFj+εj, where Pj,F=observed share price of Dividend Paying Firms j; VFj= Value for security j for the respective models. [b] Panel B reports results of estimating the following regression: Pj,F=λ0 + λ1VFj+εj, where Pj,F=observed share price of Non-Dividend Paying Firms j; VFj= Value for security j for the respective models. This regression is done with reference to two growth rates: 0% and 2%.

In summary, the results in tables 6.1, 6.2 and 6.3 indicate that a higher growth rate improves the absolute prediction errors, and consequently each model's explainability. Note, however, that this increase leads to positive signed prediction errors for the OJM.

4.6 Concluding Remarks

As expected, the results show that the valuation models on dividend paying firms perform better than on non-dividend paying firms. Superior valuation models indicate a higher valuation error discrepancy between firms with different payout ratios, while a lower or nearly no discrepancy is found within inferior valuation models. The P/B ratio shows the lowest valuation error discrepancy amongst these two types of firms, meaning that when choosing this model the impact of evaluating a dividend or non-dividend paying firm is minimal. This impact is however more significant when choosing one of the models with best performing results. In this case the valuation model user should be aware of the fact that the model values firms differently according to their payout decision, meaning that dividend paying firms' estimates will have lower valuation errors than non-dividend paying firms.

The signed and absolute prediction errors show that the P/E ratio has significantly lower absolute prediction errors, followed by the OJM, the RIVM and finally the P/B ratio. These results go hand in hand with the findings from Liu et al. (2002) and Ohlson (2005), which state that the P/E ratio outperforms the P/B ratio and that the OJM outperforms the RIVM, respectively.

The inferior quality of the valuation models applied to non-dividend paying firms indicates a higher prediction risk on valuing these firms. This result is consistent with these firms being in general younger and smaller firms, more prone to investing in new uncertain projects, whereas dividend paying firms are already in a cash cow mode, with less uncertainty regarding the future.

The high dispersion in terms of size and profitability across subsamples raise, however, the question of whether the performance differences are in fact caused by different payout policies or simply by differences in size and profitability.

5 Small Sample Analysis

5.1 Introduction

Emphasizing a different research approach then applied in the large sample, the small sample analysis aims to verify the divergence among firms with different payout ratios complementing insights provided in the large sample analysis component of the dissertation.

The goal of this approach is to study models and methods analysts use in practice as opposed to models recommended by empirical evidence. Additionally, by reducing heavily the number of firms under analysis, variables are analyzed that can hardly be collected from electronic databases.

5.2 Hypothesis

Previous presented literature on equity valuation models and empirical evidence on firms with different payout ratios, raise the question of whether in practice analysis adjust their valuation models and report structures according to the company's payout policies.

Knowing that dividend paying firms differentiate themselves from non-dividend paying firms, amongst others, by size, age and profitability, the intent is to study these variables in selected brokers' reports. Also, given the expectation that dividend paying firms are bigger and older firms, which are automatically better known than small and young firms, the analysts' reports from dividend paying firms are likely to be shorter than the reports from non-dividend paying firm, which have to be introduced and presented in more detail.

Given their characteristics it is also expectable for dividend paying firms to have less investment opportunities than non-dividend paying firms. Hence, a variable to be analyzed in this small sample is the analyst's announcement of further investments. The expectations towards this variable are clear. Dividend paying firms are expected to have less or none investment announcement whereas for non-dividend paying firms the investment opportunities and consequently announcement are expected to be many.

The next variable under analysis, following the work by Demirakos et al. (2004), is the recommendation given by analysts. Knowing that non-dividend paying firms are usually smaller and younger firms with many growth opportunities the likelihood for them to be undervalued is expected to be high. Consequently, analysts' recommendations for non-dividend paying firms are likely to be *buy* recommendations, whereas for dividend paying firms this recommendation is expected to be more towards *hold*, or even *sell*. The reason for this expectation is that dividend paying firms are well know by the market and therefore accordingly priced.

Finally, in terms of valuation models used it is expectable for non-dividend paying firms to dominate flow based valuation models once they allow detailed forecasts which might be necessary to convince shareholders about the potential of not so well known firms. For dividend paying firms, however, the multiple based models might be sufficient.

5.3 Tested Variables

The variables analysed are seven firm specific or report specific characteristics. The firm's size, age and profitability, the reports detailed explanation and brokers' investment recommendation, as well as the company's plan intention along with the equity valuation models used for estimating the company's value. The report's length or detailed explanation is considered by dividing the number of words by the number of pages within each report, resulting in an average measure of words per page for each report. Finally, as reported by Fernandez (2002) and Gleason et al. (2007), the consideration of valuation models follows the approach adopted by Demirakos et al. (2004), where a model is only valid and considered if the analyst discusses and analyzes the model in the report.

5.4 Research Design (Sample and Data)

The data set provided to perform this analysis contains brokers' reports for a subset of the largest non-financial firms listed on the London Stock Exchange as of April 2012. Thomson database is the source for brokers' reports, while the company's market value is withdrawn from DataStream. Additional information, such as the company's payout ratio is collected from the comprehensive database of company regulatory and market filings *pi-navigator*.

The initial data set contains 200 non-financial companies. Imposing on this sample the request for non-dividend paying firms reduces the sample to eleven firms. These eleven non-dividend paying firms are spread over eight different Industry Classification Benchmark (ICB) sectors. To make the comparison amongst different payout policies possible eleven dividend paying firms are then selected. This starts by choosing eleven dividend paying firms with the same ICB sectors, avoiding industry specific differences. The eight industries the companies belong to are displayed in the table below (table 7). Given that each sector contains by far much more firms then needed, the final decision is made based on the company's payout ratio. To reinforce the difference across both subsamples, the eleven selected dividend paying firms are the ones with the highest payout ratio across each ICB sector.

TABLE 7

Industries - ICB Classifications

Code	Sector [a]
530	Oil & Gas Producers
2770	Oil Equipment and Services
3720	Household Goods
4570	Pharmaceuticals and Biotechnology
5370	General Retailers
5750	Travel and Leisure
9530	Software and Computer Services
9570	Technology Hardware and Equipment

[a] Level 4

For each of the 22 companies, brokers' reports are chosen. To prevent a particular investment house to dominate the results, reports from multiple investment houses are chosen. The selection criteria for making the assortment as random as possible are length and publication date, as long as the report contains an investment recommendation. By choosing the longest report for each company within a time span of four months prior to April 2012, it is possible to avoid an investment house's specific preference for report structure or valuation methods. In total, eleven different investment houses are the source for the selected brokers' reports used for this analysis (table 8).

TABLE 8

Sample Selection

Panel A: Dividend Paying	Name	BR Broker	ICBSC	Div %
	BG GROUP	Morgan Stanley	530	0.190
	BP	Societe Generale	530	0.206
	CSR	Deutsche Bank	9570	0.542
	EASYJET	Liberum Capital	5750	0.865
	FIDESSA GROUP	Jefferies	9530	0.989
	GLAXOSMITHKLINE	Deutsche Bank	4570	0.644
	KESA ELECTRICALS	Deutsche Bank	5370	0.642
	RECKITT BENCKISER	HSBC	3720	0.506
	ROYAL DUTCH SHELL	Santander	530	0.171
	STOBART GROUP	Charles Stanley	2770	0.623
	TULLOW OIL	Morgan Stanley	530	0.166
Panel B: Non-Dividend Paying	Name	BR Broker	ICBSC	Div %
	AFREN	Morgan Stanley	530	0
	BTG	Jefferies	4570	0
	ENQUEST	JP Morgan	530	0
	IMAGINATION TECH.	Morningstar	9570	0
	MITCHELLS & BUTLERS	HSBC	5750	0
	NORTHGATE	Jefferies	2770	0
	PREMIER OIL	Morgan Stanley	530	0
	REDROW	Deutsche Bank	3720	0
	SOCO INTERNATIONAL	JP Morgan	530	0
	SPORTS DIRECT INT.	Panmure Gordon	5370	0
	TELECITY GROUP	Jefferies	9530	0

5.5 Empirical Results

5.5.1 Descriptive Statistics

The selected sample of 22 firms is then tested for the seven mentioned variables. splitting the sample in two subsamples: the dividend paying firms and the non-dividend paying firms.

TABEL 9

Descriptive Statistics

	Panel A: Dividend Paying	Panel B: Non-Dividend Paying
Age	53.5455	24.818
Size	28,449.553	990.181
Profitability	4,141,503.545	54,380.091
Recommendation	BUY/HOLD	BUY
Words	156.835	194.553
Investment	0.273	0.909
Model	P/E	DCFM

Age=average age of the panel's firms, Size=average market value in millions on the 31/12/11, Profitability=average Net Income, Recommendation=dominant Recommendation across firm reports, Words=average number of words per page, Investment=percentage of reports mentioning investment opportunities, Model=dominant model across investment reports.

As shown in table 9, the age difference between subsamples is considerable making dividend paying firms nearly twice as old as non-dividend paying firms. The market value of each firm is the measure of their size and displays also a considerable difference, where non-dividend paying firms are substantially smaller than dividend paying firms. The same applies to the firms' profitability. Dividend paying firms show a considerably higher profitability than non-dividend paying firms. The dominant recommendation given by brokers shows also some difference between both sub-samples. Whereas for non-dividend paying firms the dominant recommendation was to *buy*, for dividend paying firms the dominant recommendations are both *buy* and *hold*. The next variable is the words per page used by an analyst when writing a report on dividend paying firms versus non-dividend paying firms. As expected, the words per page for dividend paying firms are less than for non-dividend paying firms. This difference is however not as significant as expected. Looking at the amount of reports that mention investment opportunities the expectation comes true. For dividend paying firms three out of eleven mention an investment opportunity, whereas for non-dividend paying firms only one out of eleven reports does not mention any investment opportunity. The final variable follows the approach suggested by Demirakos et al. (2004) by identifying the dominant model used in the report. A model is therefore only dominant if it is referenced and explained in the analyst's text. Consequently, the dominant model for dividend paying firms is the P/E ratio, reinforcing findings by Baker (1999), while for non-dividend paying firms the DCFM is the model of reference.

Hence, it’s possible to say that in general all variables show the expected differences between both groups. These differences are, depending on the variable, sometimes more significant than others.

5.5.2 Significance Level Tests

With the aim to prove statistically the differences referred to previously, the variables that allow this kind of test, the firm’s age, size, profitability and words per page, will be tested under a two sample t-test assuming unequal variances. This type of test is generally applicable for samples with at least 25 observations. Knowing that this sample contains only 22 observations for each variable, the sample size finds itself on the lower side of this restriction. The results in table 10 will therefore be considered only as indicative results given the sample’s lack in size.

TABLE 10

Comparison of Variables between Sample Partitions [a]

Variable	α-Level Difference = 0
Age	0.079
Size	0.011
Profitability	0.077
Words	0.115

[a] Two-sample t-test assuming unequal variances

Table 10 builds on the previously presented descriptive statistics and tests each variable between both subsamples. In the four cases tested, only the company’s size is significantly enough to reject the null hypothesis of both subsamples being considerably different. The other three measures, age, profitability and words per page, are only rejected with a higher significance level. This goes hand in hand with the presented descriptive statistics, which indicated a difference between groups, however not very significant especially for words per page. Note that the sample size does not correspond to the recommended sample size necessary to apply these techniques making the results merely indicative. Also, be reminded that these results might only be applicable to the industries the companies were selected from.

5.6 Concluding Remarks

Being aware of the difficulty to judge how representative small sample results are with respect to the wider population, it is possible to say that there are definitely differences across variables under analysis between dividend paying and non-dividend paying companies reports given within this sample. These differences are, however, more pronounced in some variables. The four statistically tested variables indicated a significant differences between groups in terms of size, finding however the difference in age, profitability and words per page not that significant. The other three variables are not tested statistically, showing, however, a clear difference through the descriptive statistics in terms of recommendation, investment opportunities and models used for estimating the company's equity value.

6 Conclusion

The qualitative results presented in the empirical section of this dissertation confirm results reported by previous literature, across both subsamples. The results show that the P/E ratio value estimates perform better than the OJM, followed by the RIVM and finally the P/B ratio. As outlined by Liu et al. (2002) the P/E multiple outperforms the P/B multiple considerably, the RIVM shows a superior performance than the P/B ratio as presented by Lee et al. (1998) and the OJM displays its superiority towards the RIVM as suggested by OJ and Ohlson (2005). Across all models, dividend paying firms outperform non-dividend paying firms in terms of valuation errors and explainability, reporting a higher valuation error discrepancy amongst the superior valuation models.

The empirical findings for dividend paying firms presented in the small sample analysis go hand in hand with literature presented by Barker (1999) suggesting the P/E multiple as one of analysts preferred methods of valuation. Non-dividend paying firms, however, contradict this finding by suggesting the DCFM as the preferred model. In total, seven variables are tested presenting a considerable difference between subsamples in terms of recommendation, investment opportunities, models used and firms' size. The firm's age, profitability and the ratio of words used per page in each report do not show significant differences.

The main caveat of this dissertation is the total exclusion of negative income values. This necessary restriction excludes firms in non-steady states and makes the results not generalizable, especially for non-dividend paying firms. Another caveat is the lack of observations for the empirical tests conducted on the small sample analysis.

These caveats outline fields for further research. Further insights may emerge from performing the same study, including, however, firms with negative earnings figures, on valuation model that allow the existence of loss making firms. This would then enable a conclusion on firms in general and not only on profit making firms. Also, insight might surface by increasing the sample size for the small sample analysis. This increase would then allow the empirical tests to be representative instead of indicative.

Finally, to eliminate the doubt of what causes in fact performance discrepancies across subsamples, a further study could be conducted. This study would compare firms with the same size and profitability but different payout policies.

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V Appendix

Appendix 1 – RIVM Derivation………………………………………………..……..X

Appendix 2 – OJM Derivation……………………………………………………….XI

Appendix 1 – RIVM Derivation

This Appendix describes the residual income valuation (RIVM) model origin. The RIVM is derived from the fundamental expression for the DDM, where the equity value is calculated in terms of the present value of expected dividends.

$$V_0^E = \sum \frac{d_n}{(1 + k_e)^n}$$

Meanwhile the following zero-sum expression is considered, knowing that the y can be represenative of anything.

$$0 = y_0 + \sum \frac{y_n - (1 + k_e)y_{n-1}}{(1 + k_e)^n}$$

Where $\quad y_n(1 + k_e)^{-n} \rightarrow 0 \quad$ as $\quad n \rightarrow \infty$

Adding the zero-sum expression to the fundamental expression of the DDM, results in the following:

$$V_0^E = \sum \frac{d_n}{(1 + k_e)^n} + y_0 + \sum \frac{y_t - (1 + k_e)y_{n-1}}{(1 + k_e)^n}$$

$$= y_0 + \sum \frac{y_n + d_n - (1 + k_e)y_{n-1}}{(1 + k_e)^n}$$

Define y in (3) as book value of equity:

$$V_0^E = B_0^E + \sum \frac{B_n^E + d_n - (1 + k_e)B_{n-1}^E}{(1 + k_e)^n}$$

Additionally, if the clean surplus relationship (CSR) holds, the closing book value equals the opening book value plus net income less dividends (net of equity issues):

$B_n = B_{n-1} + NI_n - d_t$ (CSR)

$$NI_n = B_n - B_{n-1} + d_t$$

Note that net income in accordance with the clean surplus relationship is occasionally named ‘comprehensive income’.

Using now the previously stated CSR, and rewriting one of the terms, gives rise to residual income:

$$B_n + d_n - (1 + k_e)B_{n-1} = B_n + d_t - B_{n-1} - k_e B_{n-1}$$

$$= NI_n - k_e B_{n-1}$$

$$= RI_n$$

Then,

$$V_0^E = B_0^E + \sum \frac{B_n^E + d_n - (1 + k_e)B_{n-1}^E}{(1 + k_e)^n}$$

Can be re-expressed as the RIVM:

$$V_0^E = B_0^E + \sum \frac{RI_n}{(1 + k_e)^n}$$

Appendix 2 – OJM Derivation

This appendix explains the derivation of the Ohlson/Juettner-Nauroth (OJM) model. As the RIVM, the OJM is derived from the fundamental expression for the DDM.

$$V_0^E = \sum \frac{d_n}{(1 + k_e)^n}$$

Again, the zero-sum term is added, knowing that the y can be represenative of anything.

$0 = y_0 + \sum \frac{y_n - (1+k_e)y_{n-1}}{(1+k_e)^n}$

Where $y_n(1 + k_e)^{-n} \to 0$ as $n \to \infty$

Adding the zero-sum expression to the fundamental expression of the DDM, results in the following:

$$V_0^E = \sum \frac{d_n}{(1 + k_e)^n} + y_0 + \sum \frac{y_t - (1 + k_e)y_{n-1}}{(1 + k_e)^n}$$

$$= y_0 + \sum \frac{y_n + d_n - (1 + k_e)y_{n-1}}{(1 + k_e)^n}$$

The unknown, y, is then defined as the expectation at time 0 of net income at time n+1, which are then capitalized as a perpetuity as time t:

$$y_t = \frac{NI_{n+1}}{k_e}$$

$$V_0^E = \frac{NI_1}{k_e} + \sum \frac{\frac{NI_{n+1}}{k_e} + d_t - (1+k_e)\frac{NI_n}{k_e}}{(1+k_e)^n}$$

Rearranging:

$$V_0^E = \frac{NI_1}{k_e} + \sum \frac{\frac{NI_{n+1}}{k_e} + d_t - (1+k_e)\frac{NI_n}{k_e}}{(1+k_e)^n}$$

$$V_0^E = \frac{NI_1}{k_e} + \sum \frac{NI_{n+1} + k_e d_t - (1+k_e)NI_n}{k_e(1+k_e)^n}$$

$$V_0^E = \frac{NI_1}{k_e} + \sum \frac{(NI_{n+1} - NI_n) - k_e(NI_n - d_n)}{k_e(1+k_e)^n}$$

$$V_0^E = \frac{NI_1}{k_e} + \sum \frac{AIG_{n+1}}{k_e(1+k_e)^n}$$

Where AIG_{n+1} represents the abnormal income growth for the time n+1:

$$AIG_{n+1} = (NI_{n+1} - NI_n) - k_e(NI_n - d_n)$$