Market Risk-Adjusted Dividend Policy and Price-to-Book Ratio

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Abstract

This paper offers a new mathematical formulation that addresses the relationship between expected price-to-book ratio, dividend per share, dividend payout ratio, systematic and unsystematic risks. The sample includes the non-financial firms in the DJIA covering the period 1997-2006. The general results show that the expected price-to-book ratios are: (a) positively associated with the expected dividend payout ratios, (b) negatively associated with the current dividend payout ratios, (c) due to an improvement in the expected firm profitability.

The paper contributes to the current literature in two ways. First, the variations in price-to-book ratios, systematic and unsystematic risks are not due to dividends *per se*. Second, the relationships between expected price-to-book ratio and dividend payout ratios are intrinsically nonlinear, which is not addressed in the relevant literature. Third, the expected dividend payout ratios can be used efficiently for signaling purposes as well as a proxy for measuring the agency problem.

JEL classification: G32, G35

Key Words: Dividend Signaling Hypotheses, Systematic Risk, Unsystematic Risk, Price-to-Book Ratio, DJIA

Introduction

The advances in the literature of corporate finance have raised the necessity to further examine two issues. First, what are the impacts of different types of risks on the financial decisions? Second, what are the impacts of corporate financial decisions on the market? This paper develops a mathematical formulation that integrates the basic components of a dividends policy (dividends per share and dividends payout ratio) and shareholder value. This integration includes also the impacts of systematic and unsystematic risks on shareholder value.

Shareholders' reaction towards dividends has been subject to an on-going research. The literature cites mixed results: positive and negative effects on stock returns. These effects are known in the literature as "Dividends Signaling Hypotheses." This paper examines the effects of dividends per share and dividends payout ratios on price-to-book ratio (being used as a proxy for the shareholder value). The paper adopts the risk-return approach which is a new approach suggested by the author for testing the dividend signaling hypothesis.

The return part considers the two elements of a dividend policy: dividend per share and dividend payout ratio. The risk part considers the systematic and unsystematic risk.

Concerning the return part, the Dividend Yield (DY) ratio is employed to come up with a relationship between dividends and shareholder value. The mathematical derivation is described in part II. The risk part considers the use of dividend yield as a suggested method for the calculation of systematic and unsystematic risk in addition to the conventional approach that uses the stock returns.

Objectives of the Study

This paper aims at examining the objectives that follow.

1. Examine the effects of the dividends per share on price-to-book ratio.
2. Examine the effects of the dividend payout ratio on the price-to-book ratio.
3. Examine the effects of systematic risk-adjusted dividends on price-to-book ratio.
4. Examine the effects of unsystematic risk-adjusted dividends on price-to-book ratio.

5. Examine the most important factors (among the above mentioned factors) that can be used to improve price-to-book ratio.

Contribution of the Study

This study contributes to the current literature as follows.

1- The study offers a mathematical formulation that adjusts dividends according to the systematic as well as the unsystematic risks.
2- The study offers an integrated model that recognizes both dividends and risk-adjusted dividends.
3- The study offers a mathematical formulation that links risk-adjusted dividends to price-to-book ratio which is used in the literature as one proxy for shareholder value.

The paper is organized as follows. Section I discusses the theoretical background of dividends decisions. Section II discusses the elements of the methodology such as a mathematical formulation that integrates expected price-to-book ratio, dividends per share, dividends payout ratio, systematic risk and unsystematic risk. Section II includes also the development of research hypotheses and model estimation. Section III reports and discusses the results. Section IV concludes.

Corporate Dividend Policy: Theoretical Background

Explaining dividend policy has been one of the most difficult challenges facing financial economists. For long time this topic has been studied without being understood completely, there is still the unsolved question which factors influence the dividend policy and how are those factors interacting. Black (1976) states that: "The harder we look at the dividend picture, the more it seems like a puzzle, with pieces that just don't fit together". The situation is almost the same today. Allen and Michaely (1995) concluded that "much more empirical and theoretical research on the subject of dividends is required before a consensus can be reached".

The first empirical study of dividend policy was provided by Lintner (1956), who surveyed corporate managers to understand how they arrived at the dividend policy.

He concluded that managers usually have reasonably definitive target payout ratios. Miller and Modigliani (1961) prove under conditions of perfect capital markets, that Firm's value is independent of its dividend policy. Unfortunately markets are not perfect and previous studies suggest that the dividend policy continues to affect the value of common shares as suggested by dividend discount model.

Dividend Signalling: The Effect of Information Asymmetry

The dividend discount model was very proactive starting point to the extent that series of research papers examined many aspects of the relationship between dividends and stock prices. Consequently, a theory of information asymmetry has been developed and progressed that provides generic explanation of the mutual effects between changes in prices and changes in dividends. The literature on information asymmetry, its effects and applications were nobelized due to the works of George A. Akerlof (1970), Andrew M. Spence (1973, 1974) and Joseph E. Stiglitz (1981) and Greenwald and Stiglitz (1986).

In the context of corporate finance, it is widely accepted that firm's managers have more information regarding the future performance of the firm than its shareholders do. Watts (1973) proposes that management may use dividends to convey information to the market and shareholders. Thus, dividend payments decrease the firm's information asymmetries. Bhattacharyya (1979) argues that managers have insider information about the distribution of the paper cash flow and therefore can, signal this knowledge to the market through their choice of dividends. Bhattacharyya concludes that the better the news, the higher are the dividends. Bhattacharyya (1979) argues that some investors need periodic cash income from their investments. For such investors, the alternatives include receiving periodic dividends or selling small portions of their investments. However, selling securities incurs transaction costs. For some investors it may be more cost efficient to have management pay dividends to generate income instead of shareholders generating their own income by periodically selling small portions of their holdings.

Significant research in signalling paradigm of dividend policy is presented by Miller and Rock (1985), John and Williams (1985), Ambarish *et al.* (1987), and Williams (1988). These signalling models typically characterize the informational asymmetry by bestowing the manager or the insider with information about some aspects of the future cash flow. The equilibrium in these models shows that the higher the expected cash flow the higher is the dividend. Bar-Yosef and Venezia (1991) came up with a rational equilibrium expectation model. It states that Bayesian investors expect that dividends will be proportional to cash flows because managers have advance information about the future cash flow. Thus, investors update their belief about the cash flow. Brennan and Thakor (1990) focus on new questions in this topic assuming that there are two classes of shareholders - informed and uninformed. They show that in a tender offer the uninformed shareholder always tenders, whereas the informed holds onto his/her shares. The situation is reversed in an open market operation, where the informed shareholder always sells his/her holding and the uninformed never does.

Benartzi et al., (1997) show that a firm's stock price changes with changes in its dividend policy. Yet, the factors that affect this relation continue to be topics of debate and academic research. The propositions that are attempting to explain the dividend policy include arguments suggesting that (1) the dividend policy serves as a signal of future earnings growth, (2) investors feel that cash in hand is superior to an unrealized capital gain, (3) investors value dividends when the alternative ways to distribute money to shareholders are more costly, and (4) as a way to decrease the potential waste of resources by management. The issues of dividend policy have been examined as well. Fama and French (2001) argue that transaction costs have decreased over time. Therefore, the desirability for dividends may have decreased as some investors are now creating their own homemade dividend. Bhattacharyya (2000, 2007) state that research on the effects of dividends still puzzling.

Dividend Payouts and "Signaling Effect"

Early literature (Graham and Dodd 1951; Durrand 1955) focuses on how the dividend payout ratio affects common stock prices. It concludes that firms can affect the market value of their common stock by changing their dividend policy. Subsequent studies reveal that the relationship between dividends and stock prices is enormously complex and inconclusive. By isolating the impact on systematic risk, conclusions about how firm value is affected by dividend policy in the absence of other mitigating factors, can be drawn. Several empirical studies have focused on how dividend policy affects stock price volatility and the firm's level of systematic risk. A negative relationship is found between payout ratios and firms' betas in studies by Beaver, et al. (1970) and Ben-Zion and Shalit (1975). The thinking behind this theory stems from how variances in dividends affect the timing of an asset's cash flows. Dyl and Hoffmeister (1986) argue that dividend policy affects security duration and, ultimately, the riskiness of the underlying stock.[1] A high dividend paying stock has a shorter duration because of more near-term cash flow. The earlier one receives payment, the less susceptible is the value of a capital asset to changes in the discount factor. With the dividend in hand, investors are subject to less interest rate risk, thus reduced level of systematic risk. All other things being equal, the reduced level of systematic risk will influence the firm's cost of capital and, eventually, the firm's stock price (Gordon, 1959).

The practice of dividends payout is examined by Brav, et al., (2005) who surveyed and interviewed 384 financial executives to determine why they pay dividends. The results of their survey indicate the predictable reasons that include avoidance of negative consequences, signaling, common stock valuation, making the firm less risky. Nevertheless, no quantifiable reason is given for how or why the firm becomes less risky even though financial executives continue to site it as a reason for paying dividends.

The study of Carter and Schmidt (2008) fills this gap in the literature and addresses the concerns raised by Dyl and Hoffmeister (1986) by providing a mathematical model illustrating the relationship between dividend yield and systematic risk. A significant inverse relationship between a firm's dividend yield and the corresponding level of systematic risk has been found. This confirms that a firm's dividend yield should be considered as a determining factor in the assessment of a firm's level of systematic risk. Moreover, individual firms may be able to affect the risk level of their common stock by altering their dividend policy. In so doing, firms may be able to realize the benefits of a lower cost of

[1] Duration, as demonstrated by Macaulay (1938), is the elasticity of the value of a capital asset with respect to changes in the discount factor. It is calculated as the weighted average of the length of time needed to recover the current cost of the asset.

capital and broader access to long term capital markets. At this point, their model is not robust with regard to signaling effects. This offers a chance for further research on the signaling issue.

Fama and French (2001) document changes in managerial behavior towards dividends over the past 25 years. They find that firms that pay dividends usually have specific characteristics that distinguish them from other firms. Once they control for these characteristics, they find that firms that posses them have a declining propensity to pay dividends. Furthermore, they report that these characteristics are becoming less common in firms who are now listing on stock exchanges. DeAngelo, et al., (2004) consider the same time period that is examined by Fama and French (2001) and find that the total payout of dividends in real dollars has actually increased. This leads to the conclusion that fewer firms are paying dividends, but those who do pay dividends are actually paying larger amounts. In addition, DeAngelo, et al., (2000) consider the role of special dividends in the payout policies. They observe that the use of special dividends as a way to distribute earnings has been declining. They hypothesize that share repurchases may have replaced special dividends as a method of returning money to shareholders when the firm does not want to commit to a higher dividend level. However, they conclude that special dividends are used less often because they served as a substitute to regular dividends. Allen and Michaely (2003) provide an extensive review of the payout policies of corporations including both share repurchases and dividend payments. They suggest that, historically, dividends have been the most important form of payout but share repurchases are becoming a more important part of a firm's payout policy. For example the average dividend and share repurchases payouts (payout is defined as dividends paid or expenditure on repurchases divided by the firm's earnings) in the 1970s were 38% and 3% respectively. In the 1980s the average dividend payout increased to 58% while the average share repurchase payout increased 9 times to 27%. In addition, corporations smooth dividends relative to earnings, which is not surprising as Lintner (1956) came to the same conclusion. Lintner found that management sets the dividend policy first, and then adjusts other policies as needed. For example, if a firm was undertaking a large investment that requires more cash than was available, management would not consider cutting the dividend but would instead look for other sources of capital. The market reacts positively to firms that either increase their dividends or initiate a share repurchase. In contrast, the market reacts negatively to a firm that decreases its payout policy. Fracassi (2008) classifies the reasons for positive (negative) price reaction to dividends increases (decreases). His results provide empirical evidence that positive stock price response to dividend increases is due primarily to the signaling of higher future earnings, to the managers catering to the time-varying premium assigned by the market to dividend paying stocks, and partially to the reduction of agency problems. The negative price response to dividend decreases is mainly due to the transition from a mature life-cycle stage to a decline stage with higher systematic risk.

Methodology and Data

The methodology is designed to examine the effects of the two components of a dividend policy (dividend per share and dividends payout ratio) on the expected Price-to-Book ratio. The latter is commonly used as a proxy for shareholder value. As indicated earlier, the main objective is to design a risk-adjusted dividend policy that takes into account systematic and unsystematic risks. The methodology is outlined in figure 1 that follows. The data include the non-financial firms listed in the Dow Jones Industrial Average (DJIA). The data covers the years 1997-2006. The data are obtained from the Reuters© finance center.

Insert figure 1 about here

Extending the Coefficient of Variation to address Systematic and Unsystematic Risks

The idea of the model suggests a risk-adjusted dividend yield that corporate managers can use to develop a risk-based dividend policy. The latter includes the effects of systematic and unsystematic risk. This idea requires that dividend yield is to increase according to the ‘coefficient of variation’ $CV = \left(\frac{\sigma_j}{\overline{R}_i} \right)$.

The CV is one of the oldest measures of risk in investment (Holzinger, 1928). The use of CV has long been recognized for its advantage of addressing the very common relationship in finance which is risk-return relationship (Sharpe, 1964, 1970; Black, et al., 1972; Bower and Lessard, 1973). The CV is also used as a measure of risk for adjusting the return when making the capital budgeting decisions (Rubinstein, 1973; Osteryoung, et al., 1977a, b). The usefulness of the CV, in general, was extended in the field of investments as a performance measure that addresses the safety of an investment (Roy, 1952; Wachowicz and Shrieves, 1980).

In this paper, the author extends the use of the CV to recognize and examine the two components of the total risk (standard deviation): systematic and unsystematic risks. This view is not addressed in the relevant literature. Statistically, the use of CV as a risk measure can offer the smallest asymptotic variances that are associated with precise confidence interval (Iglewicz, 1967; Brief and Owen, 1969; Bennett, 1977; Doornbos and Dijkstra, 1983; Miller, 1991; Ahmed, 1994, 1995; Gupta and Ma, 1996; Boyle and Rao, 2001; Curto and Pinto, 2009).

The sections that follow discuss the proposed formulation for adjusting the dividends per share and dividend payout ratio according to the systematic and unsystematic risks. It is plausible to assume that a risk-adjusted dividend yield would add value to shareholders.

The abbreviations and definitions of the variables used in the mathematical formulation are summarized in table (1).

Insert Table 1 about here

In terms of dividing total riskiness of the stock (standard deviation) into systematic and unsystematic risks, the conventional approach is as follows (Ben-Horim and Levy, 1980; Bohren, 1997).

$$\text{Systematic Risk} = \beta \times \sigma_{M} \text{ ....(1)}$$
$$\text{Unsystematic Risk } \beta' = \sigma_{j} \text{ - Systematic Risk ....(2)}$$

The total market risks (beta) are calculated as follows.

$$\beta = \frac{COV(R_j, R_M)}{\sigma_M^2} \text{..............(3)}$$

Where the return is calculated as the natural logarithm of changes in stock prices

$$R_t = \ln\left(\frac{P_t}{P_{t-1}}\right)$$

How is the link between Dividends and Price-to-Book ratio Developed?

The Dividend Yield $DY_t = \frac{D_t}{P_t}$ is used to derive a simple mathematical formulation that can be used to examine the effects of Dividends per Share (D_t) and Dividend Payout Ratio ($D_{PR,t}$) on price-to-book ratio (being a proxy for shareholder value). The formulation is based on transforming the conventional Dividend Yield ratio into 'Risk-based Dividend Yield.'

The development of the model is as follows.

$$DY_{t+1} = DY_t(1 + CV_t)$$

$$\frac{D_{t+1}}{P_{t+1}} = \frac{D_t}{P_t}(1 + CV_t)$$

In order to address the PB ratio, both sides are to be multiplied by B_{t+1}

$$\frac{B_{t+1}\,D_{t+1}}{P_{t+1}} = \frac{B_{t+1}}{P_t}D_t(1 + CV_t)$$

$$\frac{P_{t+1}}{B_{t+1}\,D_{t+1}} = \frac{P_t}{B_{t+1}\,D_t(1 + CV_t)}$$

$$\frac{P_{t+1}}{B_{t+1}} = \frac{P_t\,D_{t+1}}{B_{t+1}\,D_t(1 + CV_t)}$$

$$\frac{P_{t+1}}{B_{t+1}} = \frac{P_t}{B_{t+1}} \times \frac{D_{t+1}}{D_t(1 + CV_t)} \text{..............................(5)}$$

Equation (5) addresses the relationship between (D_t) and expected shareholder value $\frac{P_{t+1}}{B_{t+1}}$. In order to address the relationship between ($D_{PR,t}$) and expected shareholder value, the right-hand side of equation (5) is to be multiplied by $\frac{EPS_{t+1}}{EPS_{t+1}}$ as follows.

$$\frac{P_{t+1}}{B_{t+1}} = \frac{P_t}{B_{t+1}} \times D_{PR,t+1} \times \frac{E_{PS,t+1}}{D_t(1+CV_t)}$$

It is also required that the denominator of the last term at the right-hand side to be multiplied by $\frac{EPS_t}{EPS_t}$ in order to convert the D_t into $D_{PR,t}$ as follows.

$$\frac{P_{t+1}}{B_{t+1}} = \frac{P_t}{B_{t+1}} \times D_{PR,t+1} \times \frac{EPS_{t+1}}{D_t(1+CV_t)\frac{EPS_t}{EPS_t}}$$

$$\frac{P_{t+1}}{B_{t+1}} = \frac{P_t}{B_{t+1}} \times D_{PR,t+1} \times \frac{EPS_{t+1}}{EPS_t} \times \frac{1}{D_{PR,t}(1+CV_t)}$$

$$\frac{P_{t+1}}{B_{t+1}} = \frac{P_t}{EPS_t} \times D_{PR,t+1} \times \frac{EPS_{t+1}}{B_{t+1}} \times \frac{1}{D_{PR,t}(1+CV_t)}$$

$$\frac{P_{t+1}}{B_{t+1}} = \frac{P_{E,t} \times R_{OE,t+1} \times D_{PR,t+1}}{D_{PR,t}(1+CV_t)} \quad \text{.........................(6)}$$

In equation (5), D_{t+1} represents the expected dividends. The term $D_t(1+CV_t)$ represents the risk-adjusted dividends based on a coefficient of variation (CV). This term $D_t(1+CV_t)$ is calculated assuming two types of risks. The first type is a stock return-based systematic and unsystematic risk. The second type is a dividend yield-based systematic and unsystematic risk. The objective is to examine the significance of the expected dividends D_{t+1} and the risk-adjusted dividends $D_t(1+CV_t)$. The latter term is solved as follows taking into account that the total risk of a stock (σ) is divided into its two main components: systematic risk (β) and unsystematic risk (β').

$$\text{Risk - adjusted Dividends} = D_t\left(1+\frac{\sigma}{\psi}\right)$$

$$\text{Risk - adjusted Dividends} = D_t\left(1+\frac{\beta}{\psi}+\frac{\beta'}{\psi}\right)$$

$$\text{Risk - adjusted Dividends} = D_t + \left(D_t\frac{\beta}{\psi}\right) + \left(D_t\frac{\beta'}{\psi}\right)$$

The term $\mathrm{D_t} + \left(\mathrm{D_t}\,\frac{\beta}{\psi}\right)$ represents the systematic risk-adjusted dividend per share and the term $\mathrm{D_t} + \left(\mathrm{D_t}\,\frac{\beta'}{\psi}\right)$ represents the unsystematic risk-adjusted dividend per share. Equation (5) is re-written as follows.

$$\mathrm{PB_{t+1}} = \frac{\mathrm{P_t}}{\mathrm{B_{t+1}}} \times \frac{\mathrm{D_{t+1}}}{\mathrm{D_t} + \left(\mathrm{D_t}\,\frac{\beta}{\psi_{\mathrm{DPS}}}\right) + \left(\mathrm{D_t}\,\frac{\beta'}{\psi_{\mathrm{DPS}}}\right)} \quad \text{..................}(7)$$

Where $\frac{\beta}{\psi}$ = systematic coefficient of variation and $\frac{\beta'}{\psi}$ = Unsystematic coefficient of variation.

Equation (6) is also re-written in terms of systematic and unsystematic risks as follows

$$\mathrm{PB_{t+1}} = \frac{\mathrm{P_{E,t}} \times \mathrm{R_{OE,t+1}} \times \mathrm{D_{PR,t+1}}}{\mathrm{D_{PR,t}} + \left(\mathrm{D_{PR,t}}\,\frac{\beta}{\psi_{\mathrm{DPR}}}\right) + \left(\mathrm{D_{PR,t}}\,\frac{\beta'}{\psi_{\mathrm{DPR}}}\right)} \quad \text{..................}(8)$$

Practically, the current (expected) dividends per share and current (expected) dividend payout ratio require an explicit consideration of firm's current (expected) investment. The rational is that the amount of dividends determines the amount of internal financing the firm may use for financing current and/or expected investments.

Dividend Policy and the Role of Free Cash Flow

The interdependence between current dividends D_t and cash flow requires a second-stage estimation equation. The free cash flow ($F_{CF,t}$) equation presents a practical formulation that takes into account firm's operating cash flows and investment decisions (investments in fixed assets as well as investments in working capital) simultaneously. The standard computation of the free cash flow is as follows.

$$\begin{aligned} F_{CF,t} &= OCF_t - \Delta F_t - \Delta NWC_t \\ &= EBIT_t + Dep_t - Tax_t - \Delta F_t - \Delta NWC_t \text{..............}(9) \end{aligned}$$

The free cash flow formulation presents further advantage that is included in the Earnings Before Interest and Taxes (EBIT). The accounting identity assures that

$$EBIT_t - Int_t - Tax_t = D_t + RE_t$$
$$EBIT_t = D_t + RE_t + Int_t + Tax_t \ldots\ldots\ldots\ldots\ldots(10)$$

Substituting equation (10) into (9) results in a wider perspective for calculating the free cash flows as follows.

$$F_{CF,t} = D_t + RE_t + Int_t + Dep_t - \Delta F_t - \Delta NWC_t \ldots\ldots\ldots\ldots\ldots(11)$$

In order to maintain a uniform measurement, the variables in the right and left hand side of equation (11) are measured per share.

A Structure for Estimating the Effect of Risk-adjusted Dividends per Share on Price-to-Book ratio

In equation (7), two parameters are to be predicted: the current dividend per share $\mathrm{D_t}$ and the expected dividend per share $\mathrm{D_{t+1}}$. The relationship between dividend per share and investment decisions can be examined by addressing the free cash flow computation.

The Prediction of Free Cash low

The interdependence between free cash flow ($F_{CF,t}$) and price-to-book (PB_t) requires the estimation of the predicted changes in free cash flow $\hat{F}_{CF,t}$ using a first-stage estimator as follows.

$$F_{CF,t} = \alpha + \xi_{i1} PB_t + \xi_{i2} D_t + \xi_{i3} RE_t + \xi_{i4} Int_t + \xi_{i5} Dep_t + \xi_{i6} \Delta F_t + \xi_{i7} \Delta NWC_t$$
$$+ \xi_{i,8}\mathrm{S} + \xi_{i,9}\mathrm{M} + \xi_{i,10}\mathrm{L} + \xi_{i,11}\mathrm{T} + \varepsilon_i \ldots\ldots\ldots\ldots\ldots(12)$$

The current dividends (D_t) in equation (7) can be calculated using the free cash flow equation (11) as follows.

$$D_t = F_{CF,t} - RE_t - Int_t - Dep_t + \Delta F_t + \Delta NWC_t \ldots\ldots\ldots\ldots\ldots(13)$$

The Prediction of Current Dividends

The interdependence between current dividends (D_t) and current price-to-book PB_t requires the estimation of the predicted current dividends ($\hat{D}_t$) using a first-stage estimator as follows.

$$D_t = \alpha + \xi_{i1} PB_t + \xi_{i2} F_{CF,t} + \xi_{i3} RE_t + \xi_{i4} Int_t + \xi_{i5} Dep_t + \xi_{i6} \Delta F_t + \xi_{i7} \Delta NWC_t + \xi_{i,8} \mathrm{S} + \xi_{i,9} \mathrm{M} + \xi_{i,10} \mathrm{L} + \xi_{i,11} \mathrm{T} + \varepsilon_i \text{..............}(14)$$

The Prediction of Excepted Dividends

In the same sense, the expected dividends (D_{t+1}) in equation (7) can be calculated using the free cash flow equation (11) as follows.

$$D_{t+1} = F_{CF,t+1} - RE_{t+1} - Int_{t+1} - Dep_{t+1} + \Delta F_{t+1} + \Delta NWC_{t+1} \text{..............}(15)$$

The interdependence between expected dividends D_{t+1} and expected price-to-book ratio PB_{t+1} requires the estimation of the predicted expected dividends $\hat{D}_{t+1}$ using a first-stage estimator as follows.

$$D_{t+1} = \alpha + \xi_{i1} PB_{t+1} + \xi_{i2} F_{CF,t+1} + \xi_{i3} RE_{t+1} + \xi_{i4} Int_{t+1} + \xi_{i5} Dep_{t+1} + \xi_{i6} \Delta F_{t+1} + \xi_{i7} \Delta NWC_{t+1} + \xi_{i,8} \mathrm{S} + \xi_{i,9} \mathrm{M} + \xi_{i,10} \mathrm{L} + \xi_{i,11} \mathrm{T} + \varepsilon_i \text{..............}(16)$$

The expected level of each variable calculates as $x_{t+1} = x_t (1 + g)$, where g = the average continuous compound growth rate.

A Structure for Estimating the Effect of Risk-adjusted Dividends Payout Ratio on Price-to-Book ratio

In equation (8), four parameters are to be predicted: the current dividend payout ratio $\mathrm{D_{PR,t}}$, the expected dividend payout ratio $\mathrm{D_{PR,t+1}}$, the current price-Earnings ratio $\mathrm{PE_t}$ and the expected return on equity $\mathrm{R_{OE,t+1}}$. The relationship between dividend payout ratio and investment decisions can be examined by addressing the free cash flow computation that can be used for predicting the dividend payout ratio. Dividing both sides of equation (11) by Net Income ($\mathrm{NI_t}$), rearrange it and solving for $\mathrm{D_{PR,t}}$ produces.

$$\mathrm{D_{PR,t}} = \frac{\mathrm{F_{CF,t}}}{\mathrm{NI_t}} - \frac{\mathrm{RE_t}}{\mathrm{NI_t}} - \frac{\mathrm{Int_t}}{\mathrm{NI_t}} - \frac{\mathrm{Dep_t}}{\mathrm{NI_t}} + \frac{\Delta \mathrm{F_t}}{\mathrm{NI_t}} + \frac{\Delta \mathrm{NWC_t}}{\mathrm{NI_t}} \text{..............}(17)$$

The Prediction of Current Dividend Payout Ratio

The interdependence between current dividend payout ratio ($\mathrm{D}_{\mathrm{PR,t}}$) and current price-to-book PB_t requires the estimation of the predicted current dividend payout ratio ($\hat{D}_{PR,t}$) using a first-stage estimator as follows.

$$\mathrm{D}_{\mathrm{PR,t}} = \alpha + \xi_{i1}\mathrm{PB_t} + \xi_{i2}\frac{\mathrm{F_{CF,t}}}{\mathrm{NI_t}} + \xi_{i3}\frac{\mathrm{RE_t}}{\mathrm{NI_t}} + \xi_{i4}\frac{\mathrm{Int_t}}{\mathrm{NI_t}} + \xi_{i5}\frac{\mathrm{Dep_t}}{\mathrm{NI_t}} + \xi_{i6}\frac{\Delta\mathrm{F_t}}{\mathrm{NI_t}} + \xi_{i7}\frac{\Delta\mathrm{NWC_t}}{\mathrm{NI_t}} + \xi_{i,8}\mathrm{S} + \xi_{i,9}\mathrm{M} + \xi_{i,10}\mathrm{L} + \xi_{i,11}\mathrm{T} + \varepsilon_i \text{...............}(18)$$

The Prediction of Expected Dividend Payout Ratio

Likewise, the relationship between expected dividend payout ratio and price-to-book ratio requires a prediction of the expected dividend payout ratio ($\hat{D}_{PR,t+1}$) using a first-stage estimator as follows.

$$\mathrm{D}_{\mathrm{PR,t+1}} = \alpha + \xi_{i1}\mathrm{PB_{t+1}} + \xi_{i2}\frac{\mathrm{F_{CF,t+1}}}{\mathrm{NI_{t+1}}} + \xi_{i3}\frac{\mathrm{RE_{t+1}}}{\mathrm{NI_{t+1}}} + \xi_{i4}\frac{\mathrm{Int_{t+1}}}{\mathrm{NI_{t+1}}} + \xi_{i5}\frac{\mathrm{Dep_{t+1}}}{\mathrm{NI_{t+1}}} + \xi_{i6}\frac{\Delta\mathrm{F_{t+1}}}{\mathrm{NI_{t+1}}} + \xi_{i7}\frac{\Delta\mathrm{NWC_{t+1}}}{\mathrm{NI_{t+1}}} + \xi_{i,8}\mathrm{S} + \xi_{i,9}\mathrm{M} + \xi_{i,10}\mathrm{L} + \xi_{i,11}\mathrm{T} + \varepsilon_i \text{...............}(19)$$

The free cash flow equation can also be used to address ROE. The income statement equation reflects the dividend payout since the net income (NI) = Dividends + Retained Earnings. Therefore, the free cash flow equation (11) can be rewritten as follows.

$$F_{CF,t} = NI_t + Int_t + Dep_t - \Delta F_t - \Delta NWC_t \text{...............}(20)$$

Dividing both sides of equation (20) by the amount of total equity ($\mathrm{E_t}$) to address the $\mathrm{R_{OE,t}}$ and rearrange solving for $\mathrm{R_{OE,t}}$.

$$R_{OE,t} = \frac{F_{CF,t}}{E_t} - \frac{Int_t}{E_t} - \frac{Dep_t}{E_t} + \frac{\Delta F_t}{E_t} - \frac{\Delta NWC_t}{E_t} \text{...............}(21)$$

The Prediction of Expected Return on Equity

The interdependence between expected return on equity ($\mathrm{R}_{\mathrm{OE,t+1}}$) and expected price-to-book PB_{t+1} requires the prediction of the expected return on equity $\hat{R}_{OE,t+1}$ using a first-stage estimator as follows.

$$R_{OE,t+1} = \alpha + \xi_{i1}\mathrm{PB}_{\mathrm{t+1}} + \xi_{i2}\frac{F_{CF,t+1}}{E_{t+1}} + \xi_{i3}\frac{Int_{t+1}}{E_{t+1}} + \xi_{i4}\frac{Dep_{t+1}}{E_{t+1}} + \xi_{i5}\frac{\Delta F_{t+1}}{E_{t+1}} + \xi_{i6}\frac{\Delta NWC_{t+1}}{E_{t+1}} + \xi_{i,7}\mathrm{S} + \xi_{i,8}\mathrm{M} + \xi_{i,9}\mathrm{L} + \xi_{i,10}\mathrm{T} + \varepsilon_i \text{..............}(22)$$

The free cash flow equation can also be used to address the PE ratio. The first step is to address the Earning per Share (EPS). The second step is to address the PE ratio.

Dividing both sides of equation (20) by the number of shares outstanding (N) and rearranging for (EPS) produces.

$$EPS_t = \frac{F_{CF,t}}{N_t} - \frac{Int_t}{N_t} - \frac{Dep_t}{N_t} + \frac{\Delta F_t}{N_t} + \frac{\Delta NWC_t}{N_t} \text{..............}(23)$$

The PE ratio can be reached by dividing the price per share by both sides of equation (23)

$$\frac{P_t}{EPS_t} = \frac{P_t \times N_t}{F_{CF,t}} - \frac{P_t \times N_t}{Int_t} - \frac{P_t \times N_t}{Dep_t} + \frac{P_t \times N_t}{\Delta F_t} + \frac{P_t \times N_t}{\Delta NWC_t} \text{..............}(24)$$

The Prediction of Current Price-Earnings Ratio

The interdependence between current price-earnings ratio $\mathrm{P}_{\mathrm{E,t}}$ and expected price-to-book PB_{t+1} requires the prediction of the current price-earnings ratio $\hat{P}_{E,t}$ using a first-stage estimator as follows.

$$\frac{P_t}{EPS_t} = \alpha + \xi_{i1}\mathrm{PB}_{\mathrm{t}} + \xi_{i2}\frac{P_t \times N_t}{F_{CF,t}} + \xi_{i3}\frac{P_t \times N_t}{Int_t} + \xi_{i4}\frac{P_t \times N_t}{Dep_t} + \xi_{i5}\frac{P_t \times N_t}{\Delta F_t} + \xi_{i6}\frac{P_t \times N_t}{\Delta NWC_t} + \xi_{i,7}\mathrm{S} + \xi_{i,8}\mathrm{M} + \xi_{i,9}\mathrm{L} + \xi_{i,10}\mathrm{T} + \varepsilon_i \text{..............}(25)$$

The Prediction of Free Cash Flow/Net Income Ratio

The predicted free cash flow to net income $(\hat{\frac{\mathrm{F_{CF,t}}}{\mathrm{NI_t}}})$ is estimated using equation (18) as follows.

$$\frac{\mathrm{F_{CF,t}}}{\mathrm{NI_t}} = \alpha + \xi_{i1}\mathrm{PB_t} + \xi_{i2}\mathrm{D_{PR,t}} + \xi_{i3}\frac{\mathrm{RE_t}}{\mathrm{NI_t}} + \xi_{i4}\frac{\mathrm{Int_t}}{\mathrm{NI_t}} + \xi_{i5}\frac{\mathrm{Dep_t}}{\mathrm{NI_t}} + \xi_{i6}\frac{\Delta\mathrm{F_t}}{\mathrm{NI_t}} + \xi_{i7}\frac{\Delta\mathrm{NWC_t}}{\mathrm{NI_t}}$$
$$+ \xi_{i,8}\mathrm{S} + \xi_{i,9}\mathrm{M} + \xi_{i,10}\mathrm{L} + \xi_{i,11}\mathrm{T} + \varepsilon_i \ldots\ldots\ldots\ldots..(26)$$

Research Hypotheses

In terms of dividend per share, two hypotheses are developed as follows.

H_1: "A positive relationship exists between expected dividend per share and expected price-to-book ratio."

H_2: "A negative relationship exists between systematic and unsystematic risk-adjusted dividend per share and expected price-to-book ratio."

In terms of dividends payout ratios, five hypotheses are developed as follows.

H_3: "A positive relationship exists between expected price-to-book ratio and current price-earnings ratio."

H_4: "A positive relationship exists between expected price-to-book ratio and expected return on equity."

H_5: "A positive relationship exists between expected price-to-book ratio and expected dividend payout ratio."

H_6: "A negative relationship exists between expected price-to-book ratio and current dividend payout ratio."

H_7: "A negative relationship exists between expected price-to-book ratio, systematic and unsystematic risk-adjusted dividend payout ratios."

Model Estimation

Since the data are cross section-time series panel, the Hausman specification test (Hausman, 1978; Hausman and Taylor, 1981) is required to determine whether the fixed or random effects model should be used. The test looks for the correlation between the observed x_{it} and the unobserved λ_{k}, thus is run under the hypotheses that follow.

$$\mathrm{H}_0 : \mathrm{cov}(x_{it}, \lambda_\mathrm{k}) = 0$$
$$\mathrm{H}_1 : \mathrm{cov}(x_{it}, \lambda_\mathrm{k}) \neq 0$$

Where x_{it} = regressors, and λ_k =error term.

The results of the test show that the coefficient of λ_k is significant at 1% level. Therefore, the random effect model is relevant and appropriate. The issue of linearity versus nonlinearity is addressed and examined as well. Regression Equation Specification Error Test, RESET (Ramsey, 1969; Thursby and Schmidt, 1977; Thursby, 1979; Sapra, 2005; Wooldridge, 2006) is employed to test the two hypotheses that follow.

$$\mathrm{H}_0 : \hat{\gamma}^2, \hat{\gamma}^3 = 0$$
$$\mathrm{H}_1 : \hat{\gamma}^2, \hat{\gamma}^3 \neq 0$$

The null hypothesis refers to linearity and the alternative refers to nonlinearity. The results of the F test $(\alpha = 5\%)$ for equations (12), (14) and (16) show that the F statistic is greater than the critical value leading to the rejection of the null hypothesis, thus a nonlinear model is appropriate.[2] The general estimating equation of the random effect nonlinear models in equations (12), (14) and (16) take the form of Least Squares Dummy Variables (LSDV) that follows.

$$\mathbf{y}_{\mathrm{tk}}^3 = \alpha_\mathrm{k} + \sum_{\mathrm{i}=1}^{\mathrm{k}} \beta_{\mathrm{ik}} \mathbf{X}_{\mathrm{itk}}^3 + \lambda_\mathrm{k} + \upsilon_{\mathrm{tk}}$$

Where t = 1, …..,n

k = number of firms in each group.

$\mathbf{y}_{\mathrm{tk}}$ = Current dividends, expected dividends and free cash flow per share respectively.

$\mathbf{X}_{\mathrm{itk}}$ = The predictors

λ_k = Random error term due to the individual effect.

υ_{tk} = Random error.

The Estimation of the Effect of Dividend per Share on Price-to-Book Ratio

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[2] $F - \mathrm{statistic} = \dfrac{(\mathrm{SSE}_\mathrm{R} - \mathrm{SSE}_\mathrm{U}) \div \mathrm{J}}{\mathrm{SSE}_\mathrm{U} \div (\mathrm{T} - \mathrm{K})}$ where SSE_R and SSE_U are the sum squared errors for the restricted and unrestricted models respectively, J refers to the two hypotheses under consideration, T is the number of observations, and K is the number of regressors.

The final estimation equation for the expected shareholder value takes the form of "Partial Adjustment Model' as follows.

$$\mathrm{PB}^{3}_{\mathrm{i,\,t+1}} = \alpha + \omega_{i,1}\mathrm{PB}^{3}_{\mathrm{t}} + \omega_{i,2}\hat{\mathrm{D}}^{3}_{\mathrm{t+1}} + \omega_{i,3}\left[\hat{\mathrm{D}}^{3}{}_{\mathrm{t}}\left(\frac{\beta}{\psi}\right)\right] + \omega_{i,4}\hat{\mathrm{F}}^{3}_{\mathrm{CF,t}}$$
$$+\,\omega_{i,5}\mathrm{S} + \omega_{i,6}\mathrm{M} + \omega_{i,7}\mathrm{L} + \omega_{i,8}\mathrm{T} + \varepsilon_{i}\,\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(27)$$

$$\mathrm{PB}^{3}_{\mathrm{i,\,t+1}} = \alpha + \omega_{i1}\mathrm{PB}^{3}_{\mathrm{t}} + \omega_{i,2}\hat{\mathrm{D}}^{3}_{\mathrm{t+1}} + \omega_{i,3}\left[\hat{\mathrm{D}}^{3}{}_{\mathrm{t}}\left(\frac{\beta'}{\psi}\right)\right] + \omega_{i,4}\hat{\mathrm{F}}^{3}_{\mathrm{CF,t}}$$
$$+\,\omega_{i,5}\mathrm{S} + \omega_{i,6}\mathrm{M} + \omega_{i,7}\mathrm{L} + \omega_{i,8}\mathrm{T} + \varepsilon_{i}\,\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(28)$$

Where

$\omega_{i,1}$ = speed of adjusting the current PB ratio to a target level.

S, M, and L are dummies for small, medium and large firm size respectively.

T is a dummy for the time effect.

The Estimation of the the Effect of Dividend Payout Ratio on Price-to-Book Ratio

Equation 8 is structured and examined as follows.

$$\mathrm{PB}^{3}_{\mathrm{i,t+1}} = \alpha + \omega_{i,1}\mathrm{PB}^{3}_{\mathrm{t}} + \omega_{i,2}\hat{\mathrm{P}}^{3}_{\mathrm{E,t}} + \omega_{i,3}\hat{\mathrm{R}}^{3}_{\mathrm{OE,t+1}} + \omega_{i,4}\hat{\mathrm{D}}^{3}_{\mathrm{PR,t+1}} + \omega_{i,5}\hat{\mathrm{D}}^{3}_{\mathrm{PR,t}}$$
$$+\,\omega_{i,6}\left[\hat{\mathrm{D}}^{3}_{\mathrm{PR,t}}\left(\frac{\beta}{\psi}\right)\right] + \omega_{i,7}\,\hat{(\frac{\mathrm{F}^{3}_{\mathrm{CF,t}}}{\mathrm{NI}^{3}_{\mathrm{t}}})} + \omega_{i,8}\mathrm{S} + \omega_{i,9}\mathrm{M} + \omega_{i,10}\mathrm{L} + \omega_{i,11}\mathrm{T} + \varepsilon_{\mathrm{i}}\,\ldots\ldots\ldots\ldots(29)$$

$$\mathrm{PB}^{3}_{\mathrm{i,t+1}} = \alpha + \omega_{i,1}\mathrm{PB}^{3}_{\mathrm{t}} + \omega_{i,2}\hat{\mathrm{P}}^{3}_{\mathrm{E,t}} + \omega_{i,3}\hat{\mathrm{R}}^{3}_{\mathrm{OE,t+1}} + \omega_{i,4}\hat{\mathrm{D}}^{3}_{\mathrm{PR,t+1}} + \omega_{i,5}\hat{\mathrm{D}}^{3}_{\mathrm{PR,t}}$$
$$+\,\omega_{i,6}\left[\hat{\mathrm{D}}^{3}_{\mathrm{PR,t}}\left(\frac{\beta'}{\psi}\right)\right] + \omega_{i,7}\,\hat{(\frac{\mathrm{F}^{3}_{\mathrm{CF,t}}}{\mathrm{NI}^{3}_{\mathrm{t}}})} + \omega_{i,8}\mathrm{S} + \omega_{i,9}\mathrm{M} + \omega_{i,10}\mathrm{L} + \omega_{i,11}\mathrm{T} + \varepsilon_{\mathrm{i}}\,\ldots\ldots\ldots\ldots(30)$$

Equations (29-30) take into account the systematic and unsystematic risks respectively.

The General Method of Moments (GMM) is recommended in the literature of econometrics due to its superiority to the OLS and GLS in cases of α is distributed randomly across the panel (Sargan, 1958; Newey, 1985; Ogaki, 1992; Greene, 2000; Hayashi, 2000; Chay and Powell, 2001; Baum, et al., 2003; Altonji, et al., 2005; Kleibergen, 2005; Lee, 2007).

The *J* test (denoted to Hansen's *J*) is used for testing the 'overidentifying restrictions.'[3] (Davidson and MacKinnon, 1981, 1993; Hansen, 1982; Hansen et al., 1996; Baum et al., 2007). The value *J* of the GMM objective function evaluated at the efficient GMM estimator is distributed as χ^2 with (*L*-*K*) degrees of freedom under the null hypothesis that the full set of orthogonality conditions are valid.

Results and Discussion

This section is divided into two parts. The first part reports the results of the first and second stage regression for the determinants of divided per share. The second part reports the results of the first and second stage regression for the determinants of divided payout ratio.

Part 1: The Effects of Risk-Adjusted Dividend per Share on Price-to-Book Ratio

The results of the first-stage regression for estimating the predicted variables $\hat{D}_t^3, \hat{D}_{t+1}^3, \hat{F}_{CF,t}^3$ in equations (27) and (28) are reported in tables (2) and (3).

Insert table 2 about here

The results in table 2 show that the coefficients of the determinants of free cash flow equation (12) have the true signs except for the change in new working capital ΔNWC_t^3. The results also show an advantage of using the two-stage regression estimation. That is, the positive and significant coefficient of price-to-book ratio reflects interdependence between the two parameters. The plausible explanation is that the appreciation in PB ratio implies an investment opportunity that call for an increasing free cash flow. The latter can be achieved by decreasing the dividends paid out.

In the dividends per share equation (14), the coefficients have the true signs except for the free cash flow per share, depreciation per share and change in net working capital per share. This result reflects, to a large extent, that the dividend

[3] This is known variously as the Sargan Statistic, Hansen J statistic, Sargan-Hansan J test or simply a test of overidentifying restrictions.

policy is not entirely designed based on free cash flow perspectives. In terms of signaling, the negative coefficient of the PB ratio shows that dividends per share are associated with negative impact on stock price.

Insert table 3 about here

The results in table 3 show that the retained earnings per share is the only significant variable associated with the true negative sign. The net interest per share and depreciation per share have the opposite signs. The other determinates are not statically significant. These results provide an extended support to the results reported in table 2 that the planning for dividend policy is not quite directed by the free cash flow perspectives.

The Relationship between Systematic and Unsystematic Risk-adjusted Dividend per Share and Price-to-Book Ratio

The regression estimates in equations (12), (14) and (16) are used for estimating the predicted values of free cash flow, dividends per share, and expected dividends per share ($\hat{F}^3_{CF,t}, \hat{D}^3_t, \hat{D}^3_{t+1}$) respectively. The predicted estimates are used in the second-stage regression runs for equations (17) and (18).

Table 4 reports the results of the determinants of expected price-to-book ratio using a systematic risk-adjusted and unsystematic risk-adjusted dividend per share.

Insert table 4 about here

Table 4 reports the results for the determinants of the expected PB ratio related to dividends per share. The table reports the results of regression equations 27 and 28. The results show that the only significant variable is the current PB ratio. These results show that almost all (in terms of $\overline{R}^2$) of the expected variations in PB ratio are associated with the current PB ratio. It is easy to conclude that a technical analysis is deriving price expectations rather than variations in dividends per share. Moreover, the latter is not deriving the systematic and unsystematic changes in stock returns. These results present a doubt to the usefulness of the 'birds-in-hands' explanation of dividend payout. The latter assumes that a certain class of investors appreciates the payout of dividends. A fair comparison calls for reverting to the other alternative explanation. That is, the DJIA investors represent a class that prefers reinvesting in the firm's business. This explanation is also not supported by the results since the coefficient of retained earnings is negative and statistically significant (Table 2).

Part 2: The Effects of Risk-Adjusted Dividend Payout Ratio on Price-to-Book Ratio

Equation (8) provides a structure for examining the relationship between dividend payout ratio and the expected shareholder value (PB ratio). Practically, the dividend payout ratio may have a separate effect on shareholders' reaction. A firm may announce a high dividend payout ratio but the expected dividend per share stays at the same amount when the company increases the number of shares outstanding proportionally. This possibility calls for a separate examination of the effect of dividend payout ratio on shareholder value (price-to-book ratio).

Table (5) reports the results of the first stage regression for estimating the predicted variables $\hat{P}^3_{E,t}, \hat{R}^3_{OE,t+1}, \hat{D}^3_{PR,t+1}, \hat{D}^3_{PR,t}, \hat{(\frac{F^3_{CF,t}}{NI^3_t})}$ in equations (29) and (30). These are the results of the regression runs for equations (18), (19), (22), (25) and (26).

Insert table 5 about here

The results in the 1st column in table 5 show the results for the PE ratio equation (25). The coefficient of the market value /net interests is the only significant coefficients associated with the true sign. Other coefficients are not statistically significant. The positive and statistically significant coefficient of the current PB ratio materializes the advantage of using the two-stage estimation for considering the mutual effects between PB and PE ratios.

The 2nd column in table 5 reports the results for the ROE equation (22). The coefficient of net interest/equity ratio is the only significant coefficient associated with the true sign. The positive and statistically significant coefficient of the expected PB ratio materializes the advantage of using the two-stage estimation for considering the mutual effects between expected PB and expected ROE.

The 3rd column in table 5 reports the results for the expected dividend payout ratio equation (19). The coefficients of the retained earnings/net income and change in fixed assets/net income are associate with the true sign and statistically significant. The other variables are associated with the opposite sign, although statistically significant.

The 4th column in table 5 reports the results for the current dividend payout ratio equation (18). The positive and statistically coefficient of retained earnings/net income is the only one that comes with the true sign. The other variables are associated with the opposite sign and/or statistically insignificant. Nevertheless, a profound result is the negative and mutual relationship between current dividend payout ratio and current price-to-book ratio. This result shows that the dividends payout ratio, rather than dividends per share, are to be considered for examining the signaling effect.

The 5th column in table 5 reports the results for the free cash flow/net income equation (26). The negative coefficient of the change in fixed assets/net income is the only statistically significant estimate that comes with the true sign. Although the other variables are statically significant, they are associated with the opposite signs.

The Relationship between Systematic and Unsystematic Risk-adjusted Dividend Payout Ratio and Price-to-Book Ratio

The regression estimates in equations (18), (19), (22), (25) and (26) are used for estimating the predicted values of price-Earnings ratio $P^3_{E,t}$, Return on Equity $R^3_{OE,t+1}$, Current and Expected Dividend Payout Ratio $D^3_{PR,t}, D^3_{PR,t+1}$ and Free Cash flow/Net Income ratio $\frac{F^3_{CF,t}}{NI^3_t}$. The predicted estimates are used in the second-stage regression runs for equations (29) and (30). Table 6 reports the results of the determinants of expected price-to-book ratio using a systematic risk-adjusted and unsystematic risk-adjusted dividend payout ratio.

Insert table 6 about here

Table 6 reports the results for the determinants of the expected PB ratio related to dividend payout ratio. The table reports the results of regression equations 29 and 30. Overall, the results carry important implications related to the dividends signaling effect. Specifically, the results show that:

1- A positive and statistically significant relationship exists between current and expected PB ratio. In the two regression equations (systematic and unsystematic dividend payout ratio), the coefficient of $P^{3}_{B,t}$ measures the speed of adjusting the current PB ratio to the expected (target) PB ratio. In the two regression equations, the speed of adjustment is close to 100% (98.50% and 98.44%) which indicates that the calculation of the target (expected) PB ratio using the geometric growth rate provides an efficient estimation of the true variations in the observed PB ratios.
2- The coefficients of the predicted PE ratio, ROE, expected and current dividend payout ratios are associated with the true signs as stated in equation (8). This is a profound result indicating that equation (8) is a true representation of the relationship between dividend payout ratios and price-to-book ratio.
3- In terms of dividends signaling, the results show that the current dividend payout ratios are associated with negative and statistically significant coefficients with the expected PB ratios, while the expected dividend payout ratios are associated with positive and statistically significant coefficients with the expected PB ratios.
4- The systematic and unsystematic risk adjusted dividends payout ratios are not statistically significant although they are associated with the true negative signs.

Conclusion

This paper offers an approach that integrates Price-to-Book (PB) ratio, dividends per share, dividends payout ratio, systematic and unsystematic risks. Since the dividends (part of the financing decisions) and investment decisions (in terms of the variations in fixed assets) are interrelated intrinsically, the free cash flow computation is used to empirically examine the determinants of dividends. The relationship between expected PB ratio and dividends is categorized in the literature of corporate finance as "Dividends Signaling Hypotheses." The new approach suggested in this paper extends the signaling relationship to take into account the elements of systematic and unsystematic risks. The underlying assumption states that since dividends send signals to shareholders, the changes in prices imply changes in systematic and unsystematic risks as well. Overall, the results conclude what follows.

1- The relationships between dividends per share (in terms of current and expected dividends as well as systematic and unsystematic risk-adjusted dividends) and price-to-book are statistically insignificant. These results provide solid and robust evidence that the variations in systematic and unsystematic risks are not due to variations in dividends per share. That is, the variations in stock prices are due to other factors than dividend per share.
2- The relationships between current and expected dividend payout ratios and price-to-book are statistically significant. In addition, their behavior reflects the true signs as stated in equation (8).
3- The results carry important implications to the 'signaling hypotheses,' that, when planning for the dividend policy, the information about dividend payout ratio can be used efficiently for signaling purposes.
4- The results carry also important implications to the 'agency problem,' that dividend payout ratios can be used efficiently as a proxy for the agency problem.

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Appendix

Thirty Companies of the Dow Jones Industrial Average Index

Company	Symbol	*Industry*
3M	MMM	Diversified industrials
Alcoa	AA	Aluminum
American Express	AXP	Consumer finance
AT&T	T	Telecommunication
Bank of America	BAC	Institutional and retail banking
Boeing	BA	Aerospace & defense
Caterpillar	CAT	Construction and mining equipment
Chevron Corporation	CVX	Oil and Gas
Cisco Systems	CSCO	Computer networking
Coca-Cola	KO	Beverages
DuPont	DD	Commodity chemicals
ExxonMobil	XOM	Integrated oil & gas
General Electric	GE	Conglomerate
Hewlett- Packard	HPQ	Diversified computer systems
The Home Depot	HD	Home improvement retailers
Intel	INTC	Semiconductors
IBM	IBM	Computer services
Johnson & Johnson	JNJ	Pharmaceuticals
JPMorgan Chase	JPM	Banking
Kraft Foods	KFT	Food processing
McDonald's	MCD	Restaurant & bars
Merck	MRK	Pharmaceuticals
Microsoft	MSFT	Software
Pfizer	PFE	Pharmaceuticals
Procter & Gamble	PFE	Non-durable household products
Travelers	TRV	Insurance
United Technologies Corporations	UTX	Aerospace, heating/cooling, elevators
Verizon Communications	VZ	Telecommunication
Wal-mart	WMT	Broadline retailers
Walt Disney	DIS	Broadcasting & entertainment

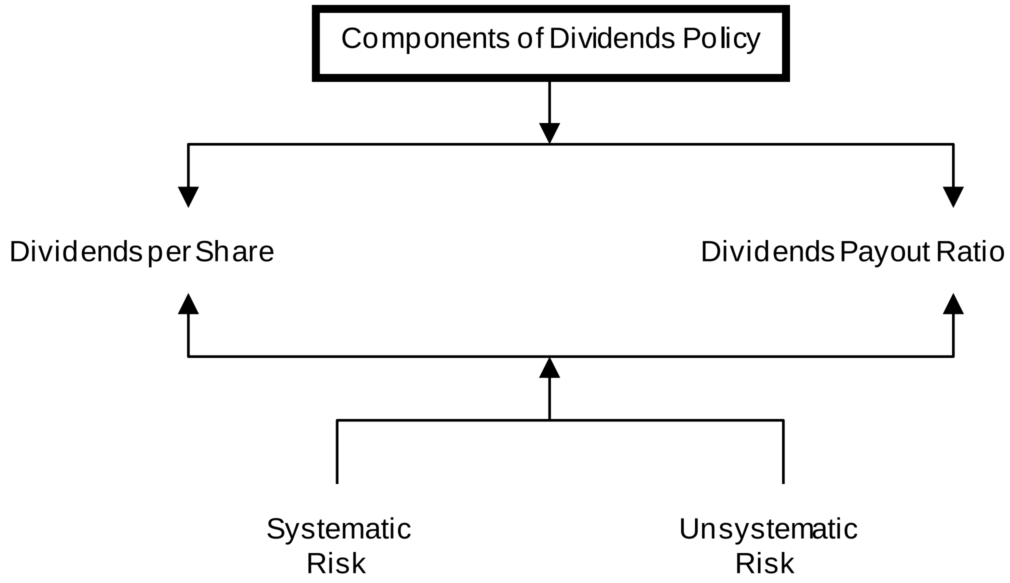

Figure 1: Components of Risk-Adjusted Dividend Policy

Table (1): Definition and Measurement of the variables

Abbreviation	Definition
DY_{t+1}	Expected Dividend Yield $\frac{D_{t+1}}{P_{t+1}}$
DY_t	Current Dividend Yield $\frac{D_t}{P_t}$
D_t	Current Dividends per Share
D_{t+1}	Expected Dividends per Share $D_t(1+g)$
$D_{PR,t}$	Current Dividends Payout Ratio $\frac{D_t}{EPS_t}$
$D_{PR,t+1}$	Expected Dividends Payout Ratio $\frac{D_{t+1}}{EPS_{t+1}}$
P_t	Current Stock Price (Stock price at the end of a quarter)
CV	Coefficient of Variation $CV = \left(\frac{\sigma_j}{\overline{R}_i}\right)$
B_{t+1}	Expected Book Value per Share = Book value per share × (1+Average Geometric Growth)
σ	Standard Deviation
ψ_{DPS}	Average dividends per share (Geometric mean)
ψ_{DPR}	Average dividend payout ratio (Geometric mean)
ψ_{SR}	Average stock returns (Geometric mean)
β	Systematic component of stock's risk
β'	Unsystematic component of stock's risk
S	Small-size firms (Dummy); 1st Quartile (based on market value)
M	Medium-size firms (Dummy); 25th and 50th Quartiles (based on market value)
L	Large-size firms (Dummy); 75th Quartile (based on market value)
T	Time (Dummy)

Table 2: Regression results for the determinants of free cash flow and dividends per share[4]

Predictors	Free Cash Flow $F^3_{CF,t}$ (Equation 12)	Dividends Per Share $\hat{D}^3_t$ (Equation 14)
Constant	-0.08057	-0.0013930
Price-to-Book ratio PB^3_t	0.00001 (2.181)**	-0.0000001 (-2.190)**
Free Cash Flow per share $F^3_{CF,t}$		-0.0000002 (-0.188)
Dividends per share D^3_t	5.97160 (1416.37)***	
Retained Earnings per share RE^3_t	6.85893 (108801.7)***	-0.0000562 (-40.187)***
Net Interest per share INT^3_t		-0.0000157 (-4.666)***
Depreciation per share DEP^3_t	0.49914 (950.03)***	0.0005212 (56.462)***
Change in Fixed Assets per share ΔF^3_t		-0.0000004 (-20.096)***
Change in Net Working Capital per share ΔNWC^3_t	0.00009 (31498.2)***	
Medium Size	0.03288 (2.812)***	0.0001632 (0.650)
Time	-0.00259 (-10.24)***	0.0001129 (21.383)***
$\bar{R}^2$	0.9999	0.9434
N	1185	1434
F-statistic	8761.41***	797.457***
Durbin-Watson	1.572	0.2755
Theil Inequality Coefficient	0.1580	0.1641

*** Significant at 1% significance level.

** Significant at 5% significance level.

* Significant at 10% significance level.

[4] These are the results of the regression runs for equations (12) and (14). The table shows the regression estimated coefficients for two regression equations. The dependent variables are free cash flow and dividends per share respectively. The t-statistics are shown between brackets. The multicollinearity is examined using the Variance Inflation Factor (VIF) and the variables associated with VIF > 5 are excluded. The outliers are detected and excluded as well. The heteroskedastic effects are corrected using the White's HCSEC which improves the significance of the estimates.

Table 3: Regression results for the determinants of expected dividends per share[5]

Predictors	Expected Dividends per share $\hat{D}^3_{t+1}$ (equation 16)
Constant	-0.00160
Price-to-Book ratio PB^3_{t+1}	-0.00003 (-.784)
Free Cash Flow per share $F^3_{CF,t+1}$	-0.00005 (-43.754)***
Retained Earnings per share RE^3_{t+1}	-0.00001 (-24.865)***
Net Interest per share INT^3_{t+1}	0.00010 (30.944)***
Depreciation per share DEP^3_{t+1}	0.00002 (2.005)**
Change in Fixed Assets per share ΔF^3_{t+1}	-0.00007 (-1.574)
Change in Net Working Capital per share ΔNWC^3_{t+1}	0.000081 (1.194)
Medium	0.00047 (1.863)*
Time	0.00012 (21.769)***
$\bar{R}^2$	0.94371
N	1433
F-statistic	775.470***
Durbin-Watson	0.32281
Theil Inequality Coefficient	0.1637

*** Significant at 1% significance level.

** Significant at 5% significance level.

* Significant at 10% significance level.

[5] These are the results of the regression run for equation (16). The table shows the regression estimated coefficients for the expected dividends regression equation. The dependent variable is the expected dividends per share. The t-statistics are shown between brackets. The multicollinearity is examined using the Variance Inflation Factor (VIF) and the variables associated with VIF > 5 are excluded. The Outliers are detected and excluded as well. The heteroskedastic effects are corrected using the White's HCSEC which improves the significance of the estimates.

Table 4: Systematic and Unsystematic Risk-adjusted Dividend per Share and Price-to-Book Ratio[6]

Predictors	Systematic Dividends per Share	Unsystematic Dividends per Share
Constant	-2.312	0.67194
PB_t^3 Price-to-book ratio	0.93226 (1124.62)***	0.90081 (324.16)***
$\hat{D}_{t+1}^3$ Predicted Dividends	17.22404 (0.367)	-6.45376 (-0.137)
$\hat{D}_{\beta,t+1}^3$ Systematic risk-adjusted predicted dividend per share	0.00034 (0.095)	
$\hat{D}_{\beta',t+1}^3$ Unsystematic risk-adjusted predicted dividend per share		-0.00052 (-0.078)
$\hat{F}_{CF,t}^3$ Predicted Free Cash Flow	0.00036 (0.302)	0.00050 (0.428)
mid	1.00941 (0.809)	0.10527 (0.083)
time	0.07066 (2.7028)***	0.06494 (2.489)**
$\overline{R}^2$	0.9989	0.9882
N	1320	1326
F-statistic	214849.2***	18628.2***
Durbin-Watson	2.051	1.9893
Theil Inequality Coefficient	0.1842	0.1881

*** Significant at 1% significance level.

** Significant at 5% significance level.

* Significant at 10% significance level.

[6] The table shows the regression coefficients for the systematic and unsystematic risk-adjusted dividend per share. The dependent variable is the expected price-to-book ratio. The t-statistics are shown between brackets. The multicollinearity is examined using the Variance Inflation Factor (VIF). All variables are associated with VIF > 5. The Outliers are detected and excluded. The heteroskedastic effects are corrected using the White's HCSEC which improves the significance of the estimates.

Table 5: The Regression results for the determinants of price-Earnings ratio $P^3_{E,t}$, Return on Equity $R^3_{OE,t+1}$, Current and Expected Dividend Payout Ratio $D^3_{PR,t}, D^3_{PR,t+1}$ and Free Cash flow/Net Income ratio $\frac{F^3_{CF,t}}{NI^3_t}$ [7]

Predictors	$P^3_{E,t}$	$R^3_{OE,t+1}$	$D^3_{PR,t+1}$	$D^3_{PR,t}$	$\frac{F^3_{CF,t}}{NI^3_t}$
Constant	347388.97	0.00013	0.06487	0.7102	2.201
PB^3_t	536.9 (32.61)***			-0.00003 (-3.45)***	-0.00006 (-1.81)*
$(MV/FCF)^3_t$	-0.00006 (-0.415)				
$(MV/INT)^3_t$	0.0007 (5.91)***				
$(MV/DEP)^3_t$	-0.0001 (-2.511)***				
$(MV/\Delta F)^3_t$	-0.00003 (-1.18)				
$(MV/\Delta NWC)^3_t$	-0.00008 (-1.02)				
PB^3_{t+1}		0.00003 (33.98)***	0.00002 (1.25)		
$(INT/E)^3_{t+1}$		-0.02743 (-5.03)***			
$(DEP/E)^3_{t+1}$		0.00749 (5.82)***			
$(\Delta F/E)^3_{t+1}$		-0.00004 (-2.12)**			
$(\Delta NWC/E)^3_{t+1}$		0.00007 (0.04)			
$(FCF/NI)^3_{t+1}$			-0.00002		

[7] The table shows the regression estimated coefficients for the instrumental variables. The dependent variables are price-Earnings ratio $P^3_{E,t}$, Return on Equity $R^3_{OE,t+1}$, Current and Expected Dividend Payout Ratio $D^3_{PR,t}, D^3_{PR,t+1}$ and Free Cash flow/Net Income ratio $\frac{F^3_{CF,t}}{NI^3_t}$. The t-statistics are shown between brackets. The multicollinearity is examined using the Variance Inflation Factor (VIF). The variables associated with VIF > 5 are excluded. The Outliers are detected and excluded. The heteroskedastic effects are corrected using the White's HCSEC which improves the significance of the estimates.

			(-13.91)***		
$(INT/NI)^3_{t+1}$			0.03266 (6407.46)***		
$(DEP/NI)^3_{t+1}$			0.01053 (115132)***		
$(\Delta F/NI)^3_{t+1}$			0.00005 (6419)***		
$(\Delta NWC/NI)^3_{t+1}$			-0.00009 (-6.83)***		
$(FCF/NI)^3_{t}$				0.00004 (0.773)	
$(RE/NI)^3_{t}$				-1.51075 (-1460)***	-3.81385 (-6869)***
$(INT/NI)^3_{t}$				0.0015 (25.06)***	-2.25416 (-8830)***
$(\Delta NWC/NI)^3_{t}$				-0.00001 (-68.47)***	
$(\Delta F/NI)^3_{t}$					-0.87004 (-7516)***
mid	-83885.04 (-3.80)***	0.00001 (0.55)	-0.02162 (-4.83)***	0.01915 (0.88)	0.1395 (1.35)
time	726.39 (1.35)	0.00002 (2.50)**	-0.00017 (-1.42)	-0.00194 (-3.33)***	-0.00364 (-1.33)
$\overline{R}^2$	0.5611	0.5291	0.9999	0.9995	0.9999
N	1029	1127	1064	1029	783
F-statistic	165.27***	181.77***	1703266562***	317490***	22955313***
Durbin-Watson	1.2556	1.082	0.841	0.407	1.127
Theil Inequality Coefficient	0.1710	0.1737	0.1526	0.1541	0.1524

*** Significant at 1% significance level.

** Significant at 5% significance level.

* Significant at 10% significance level.

Table 6: Systematic and Unsystematic Risk-Adjusted Dividend Payout Ratio and Price-to-Book Ratio[8]

Predictors	Systematic Dividend Payout Ratio	Unsystematic Dividend Payout Ratio
Constant	-15.88	-16.04
PB^3_t Price-to-Book ratio	0.9850 (222.09)***	0.9844 (221.96))***
$\hat{P}^3_{E,t}$ Predicted Price-earnings ratio	0.000017 (3.83)***	0.00002 (3.91)***
$\hat{R}^3_{OE,t+1}$ Predicted Return on Equity	66216.7 (6.21)***	66465.2 (6.23***)
$\hat{D}^3_{PR,t+1}$ Predicted expected Dividend Payout Ratio	0.006 (1.823)**	0.00621 (1.82) **
$\hat{D}^3_{PR,t}$ Predicted current payout ratio	-0.357 (-6.33)***	-0.35618 (-6.31)***
$(\widehat{FCF/NI})^3_t$ Predicted Free Cash Flow/Net Income	-0.001 (-0.311)	-0.00052 (-0.313)
$\hat{D}^3_{PR,\beta,t}$ Systematic risk-adjusted predicted dividend payout ratio	-0.000003 (-0.073)	
$\hat{D}^3_{PR,\beta',t}$ Unsystematic risk-adjusted predicted dividend payout ratio		-0.00001 (-0.074)
mid	1.736 (0.942)	1.75989 (0.954)
time	-0.061 (-1.37)	-0.06073 (-1.365)
$\overline{R}^2$	0.99642	0.99640
N	1025	1027
F-statistic	31648.2***	31594.7***
Durbin-Watson	2.1277	2.124
Theil Inequality Coefficient	0.23121	0.23136

*** Significant at 1% significance level.

** Significant at 5% significance level.

* Significant at 10% significance level.

[8] The table shows the regression coefficients. The dependent variable is the expected Price-to-book ratio. The t-statistics are shown between brackets. The multicollinearity is examined using the Variance Inflation Factor (VIF). All variables are associated with VIF > 5. The Outliers are detected and excluded. The heteroskedastic effects are corrected using the White's HCSEC, which improves the significance of the estimates.