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**Article**

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## FINANCIAL ECONOMICS | RESEARCH ARTICLE

# The dividend puzzle misspecification – Why the role of dividends is not what people think

Shreyansh Goyal\*

**Abstract:** The dividend payout problem in literature has largely been misspecified. The roles of dividends as signals, agency cost reducers, fixed income providers or even the invariance of dividend payouts are all phenomenon that, based on market conditions, follow from the role of dividends as equalizers of firm value, discounted from a given point in time, across firm's life. In this study, I discuss few problems with prevalent approaches towards solving dividend puzzle in academia, provide justification for the aforementioned hypothesis based on few assumptions, derive a model applicable under ideal conditions and then measure the deviations from the ideal model in two market indices—Nifty 500 (India) and S&P 500 (USA). The results obtained are then compared with the studies already done on these market and the reasons for deviation are discussed. Once the dividend model is derived, all roles of dividend flow automatically from the primary role of dividends and the extent of efficacy of each of the secondary role is based on numerous factors which vary, giving different results across different studies. The empirical investigation gives a view of these different factors at work in the markets.

**Subjects:** Corporate Finance

**Keywords:** dividend puzzle; agency costs; invariance; dividend preference; market efficiency; market cycles; harmonise; role of dividends; US; India

### 1. Introduction

Dividend payout decisions have been a subject of debate for a long time in academia. Both, the effects of dividend payout on value of the firm, and the factors which affect the payout ratio, have been extensively studied in order to solve the puzzle, though no uniform consensus has been

### ABOUT THE AUTHOR

Shreyansh Goyal has a Master of Business Administration degree in Financial Management from University of Delhi, India. The main areas of research for the author are in fields of Corporate Finance and how it relates to the world economy. This study is part of a larger ongoing research about opportunity costs arising in economy and how they affect the nature of financial transactions in the markets.

### PUBLIC INTEREST STATEMENT

The dividend payout and its relation to firm value has an impact on how investors make decisions about their financial corpus. In this article, it is proposed that the payment of dividends performs the primary function of affecting a firm's value (discounted appropriately) in such a way the value of the firm remains same across time. A model derived from the assumption is then tested on two different types of economies—India (Nifty 500) and USA (S&P 500) and the results are discussed. The findings show that generally assumed roles of dividend payouts are a reflection of market conditions and are not the primary factors in affecting the dividend payout decisions and its effects. The implications of the theory are discussed subsequently.

reached. While there have been few theoretical models that do outline the effects of dividends on firm value trying to hypothesize how investors and firms behave or how they should behave, Black (1976) argued that such models were inadequate. Even after several decades, it is still not clear which of these models best describes the reality in the world of corporate finance, because of mixed evidence, an emotion best captured by Allen, Bernardo, and Welch (2000) who stated that “dividends remain one of the thorniest puzzles in corporate finance”. Baker, Powell, and Veit (2002) also echoed similar sentiments, stating that it was still unclear why managers prefer one way of cash distribution over another. For example, Miller and Modigliani's (1961) dividend irrelevance model (henceforth M&M model) that argues that dividend policy is irrelevant to the value of the firm, under certain assumptions, has been supported by Fama (1978), Hakansson (1982), Berlingeri (2006a) and empirical findings of Naceur and Goaid (2002) but has been critiqued by Ross (1977) and DeAngelo and DeAngelo (2006). Similarly, Gordon's hypothesis (1959) that investors prefer a high dividend payout policy has also been a subject of critique, for example, by Miller and Modigliani (1961), Bhattacharya (1979) and Easterbrook (1984), though it has been defended by Gordon (1963) and to some extent by Shefrin and Statman (1984), who argue that regret aversion would result in preference of cash dividends over capital earnings. Other hypotheses like Signalling Hypothesis and Tax Effect Hypothesis have met similar fate. While the empirical studies by Pettit (1972), Woolridge (1983) and Asquith and Mullins (1986) support the idea that dividend decisions generate positive signals, in a study by DeAngelo and DeAngelo and Skinner (1996), such was not found to be the case. The effect of taxes on dividend decisions is likewise unclear. Despite Brennan (1970) arguing for stocks with higher dividend yield to have higher before-tax returns (due to lower prices), a study by Black and Scholes (1974) found the evidence of the impact of taxes on stocks with different yields to be insignificant. Thus, it can be safely assumed that a verdict on the impact of dividend policy on value of the firm is not out due to contradicting pieces of evidence and arguments.

Few reasons for this discrepancy have been pointed out. McCabe (1979) points out how choice of variables used in the model may have an effect on the results obtained. Similar has been pointed out by Watts (1976). Morgan (1982) mentions how results can be conflicting because of use of dissimilar methods. Watts (1973) mentioned how even choosing a different definition of dividends distributed in a particular year could affect the results and “fiscal definition of dividends” and “overlap definition of dividends” could not be assumed to yield similar results. Lease, John, Kalay, Loewenstein and Sarig (2000) argue that discrepancies arise in empirical testing because the quantitative methods used in studies are unable to measure both market- and firm-specific imperfections and that optimal dividend policy for each firm can be different than the other, owing to situation the firm uniquely finds itself in. Another reason for this discrepancy to be persistent in literature could be that the nature of the markets, managers and investors might not be a constant, over sectors, geographies, cultures and time and may have a significant contribution to the primacy of one dividend policy over another. The more recent studies point towards the same. The study by Zheng and Ashraf (2014) show significant relationship between cultural dimensions proposed by Hofstede, Hofstede, and Minkov (2010) and dividend payment. Similarly, a study by Shao, Kwok and Guedhami (2010) found out that Schwartz' (1994) national culture dimensions have a significant relationship to dividend payouts. Thus, the cultural factors cannot be distanced from the payout decisions and their implications.

Recent studies on the issue of dividend payouts affecting share prices also offer contradictory results. An earlier study by Allen and Rachim (1996) found that contrary to indication of Baskin (1989), causal relations between dividend yields and stock price volatility are not clear. This is in contrast to the study by Qudah and Yusuf (2015) which suggests that higher payout ratios lead to low stock price volatility. A study by Zainudin, Mahdzan, and Yet (2018) found out that in case of industrial product firms in Malaysia, in pre and post crisis periods, the dividend payout ratio affects stock price volatility. Hussainey, Mgbame, and Mgbame (2011) found that for UK-based firms, a positive relationship exists between dividend yield and stock price volatility while a negative relationship exists between dividend payout ratio and stock price volatility. Profflet and Bacon

(2013) found an exactly opposite relationship for US-based firms though it is worth pointing out that the observed positive relationship between dividend payout ratio and stock price volatility was not significant. The existence of negative relationship between dividend payouts and stock price volatility, is important factor for many dividend preference hypotheses to be correct. One may think of approaching the issue in a different manner and instead of studying the effects of dividend payouts, might study the factors that affect the dividend payout. However, the literature is not definite even on that aspect. In a recent study by Kumar and Sujit (2018), partial least square structural modelling (PLS SEM) was used to determine the determinants of dividend policy. PLS SEM is a technique wherein it is possible to study the effect of variables that cannot be observed directly (referred to as “latent variables”) on a dependent variable or the observable effects arising out of the particular value(s) of the dependent variable. The factors like liquidity, leverage and profitability were found to have an effect on the dividend payout. Considering these latent factors were themselves made up of several sub-factors, and significant combined loadings and cross loadings were present, the dividend payout decisions appears to be a lot more complex that their effects be captured by simple hypothesis that look at few variables.

Frankfurter and Wood (2002) argue that current models of dividend policy do not incorporate behavioural factors and that models based solely on economic justification are inadequate in explaining dividend decisions. As pointed out by Black (1976), because firms lack knowledge of how many irrational investors there are, they cannot choose an optimum dividend policy. Similarly, investors, without a knowledge of how other investors would behave, are left at best to guess the movement of stock prices using proxy indicators. While study on the nature and responses of market participants forms an aspect of behavioural finance, the proxies for such behaviour may be used to form some idea about the market, investor and manager behaviour. The proxies, themselves would be inter-dependent on each other and not strictly independent and thus have to be studied collectively, in way that can be called a “paired analysis”, an aspect which has been missing in most of the previous studies, which assume only a few relatively independent factors at work in the dynamics of the market expectations. The proxy indicators that ultimately affect the value of the firm may be obtained from dividend discount model. One such proxy indicator is the expected rate of return. The aggregate of all investors favouring different amounts of risk-adjusted returns, can be assumed to be an aggregate measure of individual expectations and behaviours. The other proxy indicator is the rate of growth in net income, which can be assume to be the aggregate of firm’s payout and investment decisions.

The aim of this study is to present a way to connect the proxies to the dividend payout using a suitable theory, and create a model that can be useful for testing applicability and efficacy of different dividend policy mechanisms. For this, the study proposes a theory, linking firm and investor expectations with dividend payouts, provides justification for it and then tests the model and hypotheses arising out of it on the Indian firms listed on the Nifty 500 Index, to see whether they are in line with the other dividend studies done on Indian markets. Then, the model is used on S&P 500 Index and the results are tabulated and contrasted with results obtained for Nifty 500 Index. A short commentary contrasting US markets with Indian markets follows next and subsequently the model’s efficacy is discussed.

The rest of the paper is organized as follows. Section 2 contains a review of literature on the dividend policy of the firms, Section 3 sets the background for the hypotheses, Section 4 presents initial assumptions required for the hypothesis and a defence of them, Section 5 contains the construction of hypotheses, Section 6 discusses the significance of hypothesis, Section 7 discusses how the empirical test is constructed, Section 8 mentions how data are collected for the empirical test on Indian market and discusses research methodology, Section 9 presents the results and the analysis of the test, Section 10 contains application of the model on US market and Section 11 contains a discussion of the theory while Section 12 concludes.

## 2. Literature review

The factors influencing share prices have been interest to academia for quite a long time, and the history up to the irrelevance hypotheses and history succeeding it are intricately linked. One of the very early papers on dividend policy by Tinbergen (1933) argued that in case of absolute certainty that dividends would stay constant, the price of the stock would be equal to dividends paid divided by yield of state bonds, which could be put in equation form as follows:

$$P = \frac{D_c}{Y} \quad (2.1)$$

Where

$P$  = Price of stock (per share)

$D_c$  = Constant dividend paid (per share)

$Y$  = Yield of state bonds

However, when dividends change, the static theory is no longer applicable. The changes in dividends paid, Tinbergen (1933) found only produced about half as intensive change in worth of the stocks (given by price of stock multiplied by yield of state bonds). The expectance of abnormal dividend in the future was only half of the abnormal dividend paid in the last year. The importance of the expectations, thus, played a part in determination of stock prices, even in as basic model as used by Tinbergen (1933). The model was as follows:

$$W = P \times Y = c + \alpha D \quad (2.2)$$

Where

$W$  = Worth of stock (per share)

$D$  = Dividends paid (per share)

The paper could be said one of the earlier attempts to implicitly demonstrate how effects of distribution of dividends may only produce a partial value increment to the value of the shares. Tinbergen (1939) added another factor to the equation aside from yield of state bonds and dividends paid. In the new model, called “the dynamic law of share price formation”, Tinbergen (1939) included rate of change in stock prices as another factor on which stock prices depend to account for speculation in the market. The stock prices were thus, dependent on dividends, interest rates and previous growth in stock prices, as follows:

$$P = \alpha_1 D + \alpha_2 Y + \alpha_3 \dot{P} \quad (2.3)$$

Where

$\dot{P}$  = Rate of change in stock prices

As such, the effect of speculation and herd instinct was included in the dynamics of share price formation. The price of a share was affected by the speculative interest in the share in the model, giving rise to yet another instance of value being dependent on investor expectations and not just raw yields received off the shares.

The most direct affirmation of such expectations among these was arguably by Lintner (1956) who after studying corporate dividend policy suggested that corporations smoothed the dividend payout according to the following equation:

$$\Delta D_{i,t} = c_i + \alpha_i (D_{i,t}^* - D_{i,t-1}) \quad (2.4)$$

Where

$\Delta D_{i,t}$  = Change in dividends paid for firm 'i' in year 't'

$D_{i,t}^*$  = Target dividend =  $DPR_{T,j} \times E_{i,t}$  = Target dividend payout  $\times$  Earnings in 't'

$D_{i,t-1}$  = Dividend paid in year 't - 1' by firm 'i'

As such a view necessary entailed that dividend payouts moulded investor expectations, it is not surprising, thus, that one of the early views about impact of dividends was that companies that pay higher dividends would have higher stock prices. Graham and Dodd (1951) and Gordon (1959) argued for this view. Gordon (1959) also performed an empirical test on four types of industries and for two years, using data of prices, dividends and earnings and found that dividends had higher contribution to value of stocks than retained earnings.

The equation Gordon used in his analysis was following:

$$P = \alpha_1 D + \alpha_2 RE \quad (2.5)$$

Where

$P$  = Year – end equity value of the firm

$D$  = Dividend paid in last year

$E$  = Earnings retained in last year

For only the earnings to be relevant in valuation of shares, Gordon (1959) argued that the expected rate of profit must be independent of the fraction of the income retained, which, according to him, was not the case.

Gordon (1959) also proposed a refined model for the price of a stock which was as follows:

$$\frac{P}{B} = \beta_0 + \beta_1 \frac{\bar{D}}{B} + \beta_2 \frac{(D - \bar{D})}{B} + \beta_3 \frac{\overline{RE}}{B} + \beta_4 \frac{(RE - \overline{RE})}{B} \quad (2.6)$$

Where

$B$  = Book value of the firm

$\bar{D}$  = Average dividend paid

$\overline{RE}$  = Average retained earnings

The simple discount model when dividend payout ratio, expected rate of return and rate of growth in revenue is assumed to be constant could be put as follows:

$$P_0 = \frac{k}{\rho - g} E_0 \quad (2.7)$$

Where

$P_0$  = Current total value of the firm

$E_0$  = Expected net earnings of the firm

$k = \text{Dividend Payout Ratio}$

$\rho = \text{Expected rate of return}$

$g = \text{Rate of growth in net income}$

The present value of a stock could be represented thus by adding all incoming streams of dividends discounted appropriately, if the investors capitalized dividends over earnings and in such a case the retained earnings mattered only indirectly, as in a way they affected future dividends. Such a view however came under criticism by Miller and Modigliani (1961) who argued that under certain assumptions, dividend policy would have no impact on value of the firm. The decreased retained earnings' effect on future dividends would, according to them, cause an equal but opposite change in value of the firm's stock, under such assumptions, as caused by a present increase in dividend payout thus, in effect neutralizing the dividend policy effect on value of shares.

$$V(t) = \frac{1}{(\rho(t) + 1)} [E(t) - I(t) + V(t + 1)] \quad (2.8)$$

Where

$V(t) = \text{Total value of the firm at time 't'}$

$\rho(t) = \text{Expected rate of return over the interval 't' to 't + 1'}$

$E(t) = \text{Firm's total profit for period from 't' to 't + 1'}$

$I(t) = \text{Firm's total investment in period from 't' to 't + 1'}$

$V(t + 1) = \text{Total value of the firm at time 't + 1'}$

That was because, Miller and Modigliani argued that in a "perfect market", the company could raise money by selling its shares, if it pays the money required for investment in the next period as dividends and the cost of either of the option would be same. While the above equation by Miller and Modigliani (1961) was based on the assumptions of a perfect market, rational behaviour of investors and perfect certainty, even in case of uncertainty, granted assumptions of "imputed rationality" and "symmetric market rationality", they argued, that dividend decisions would be irrelevant. Such a view was based on the idea that decisions like that of dividend payouts, or even corporate structuring decisions (Modigliani & Miller, 1958) were not by themselves value generating decisions mathematically and in a balanced equation, the effect on value of these decisions is impossible to factor in an ideal environment.

Gordon (1963) critiqued Miller and Modigliani's (1961) position and argued that such value generating proceeds from dividend payouts because delayed payments have higher uncertainty and investors are generally risk averse, thus making dividends preferable over retained earnings. It was an increase in the expected rate of return, he argued, that would increase if dividends were delayed, making share price go down and thus the dividend relevance was also a mathematical outcome and not just an empirical observation. Gordon argued that expected rate of return could be reasonably believed to be an increasing function of the rate of return from investment multiplied by fraction of earnings retained and the price equation thus could be restated as following:

$$P_0 = A_0[(k)E_0][1 + (1 - k)r]^{\alpha} \quad (2.9)$$

Where-

$A_0 = \text{Factor depicting influence of all other variables except current dividend}$



$r =$  The rate of return from investment

Brennan (1971) argued against Gordon's (1963) criticism of Miller and Modigliani's position by pointing that change in dividend payout does cause a change in firm value but only because such changes in payouts result in changes in investment levels. If the investment levels remain the same, as Miller and Modigliani (1961) assume, then dividend decisions would be irrelevant to the value of the firm. Yet, in such a case, Gordon's main assumption of expected rate of return changing with the change in dividend payout would be violated. A change in investment amount,  $\Delta I_t$  at time "t", assuming the dividend payout ratio changes at time "t" equal to 0, would be given by following:

$$\Delta I_t = (1 - k_0)E_0 \prod_{\tau=1}^{\infty} (1 + g) - (1 - k'_0)E_0 \prod_{\tau=1}^{\infty} (1 + g') \quad (2.10)$$

For the total effect of all change in investments, when appropriately discounted, on value of the firm, to be equal to zero, sum of appropriately discounted change in investment levels must equal to the appropriately discounted return accrued by them, from the point in time such changes are made, leading to the following:

$$\sum_{t=1}^{\infty} \frac{\Delta I_t}{(1 + \rho_t)^t} = r \sum_{t=1}^{\infty} \frac{\Delta I_t}{(1 + \rho_t)^t} \sum_{\tau=1}^{\infty} \frac{1}{(1 + \rho_{t+\tau})^\tau} \quad (2.11)$$

Brennan argued that a general solution of the equation when  $r = \rho$  where  $\rho$  is average discount rate is when  $\rho_t$  is constant. So, in general,  $\rho_t$  will have to be invariant with respect to time, and dividend payout policy. And thus Gordon's explanation for his relevance hypothesis was inconsistent with his hypothesis.

Rubinstein (1976) mentioned two ways of proving dividend irrelevance, granted assumptions of Miller and Modigliani hold in the market in consideration. The first way, Rubinstein pointed, is to keep the investment levels constant. Then, a fair value transaction of shares for money would be used to compensate for dividends paid. This is the way used by Miller and Modigliani (1961), Rubinstein argues, evident in the use of following equation:

$$P(t + 1)N_s(t + 1) = I(t) - [X(t) - D(t)] \quad (2.12)$$

Where

$P(t + 1) =$  Ex dividend price of shares at the start of time period 't + 1'

$N_s(t + 1) =$  Number of shares sold at price  $P(t + 1)$

The increase in dividends of the firm by addition of investment will be matched by an equal increase in equity of the investors, thus, keeping the level of investment constant. This policy of "substitute financing", Rubinstein points out, allows one to separate effects of dividend decisions from the effects of investment decisions. The second way is to allow investments to vary, but in such a way that the effect of any change in investment level on value of the firm is zero. Such will be the case, if the net present value of any change in investment level is zero, and could be called "neutral reinvestment" approach and was used by Brennan (1971) in his proof. Rubenstein then proceeded in his paper to generalize the neutral investment approach for conditions with uncertainty. These mathematical proofs by Brennan (1971) and Rubinstein (1976) seemed to have turned the discussion at least partially away from the mathematical validity of the irrelevance hypothesis, for then the debate largely centred around empirical validity of the irrelevance hypothesis.

Black (1976), for example, in an attempt to reconcile the theory with empirical observations, wondered why, in presence of taxes on dividend payout, firms continued to pay substantial amount of dividends, calling this seeming contradiction, a "dividend puzzle". The proofs presented by the academia also seemed to be, in many studies, in contrast to intuitions of managers, and the empirical

evidence for the Miller and Modigliani's dividend irrelevance hypothesis has been, since Brennan's (1971) proof, inconclusive. For example, studies by Baker, Farrelly, and Edelman (1985), Partington (1985), Baker and Powell (1999) and relatively recently by Al-Deehani (2003), found that managers of firms do think that dividends have an impact on value of the firm. Ball, Brown, Finn, and Officer (1979) studied Australian market for a period from 1960 to 1969 and found a positive relationship between dividend yields and excess stock market returns, thus providing evidence against both Miller and Modigliani's dividend irrelevance hypothesis and Gordon's "bird in hand" hypothesis. Ball et al. argued that the tax differential effects present in the market at the time were not large enough to explain the positive relationship completely. A study by Litzenberger and Ramaswamy (1982) found that common stock returns had a positive non-linear relationship with expected dividend yield, which suggested that there was another mechanism at play aside from Signalling Hypothesis. Bar-Yosef and Kolodny (1976) conducted an empirical study and found that for 87% of the firms, payout policies had an effect on return and for 62% of the firms, payout policies had an effect on beta. Their paper also presented "security market line model" based on Capital Asset Pricing Model developed by Sharpe (1964). Bar-Yosef and Kolodny argued that if dividend decisions were relevant to the price of the firm, then once risk, in form of beta is adjusted for, the expected returns on securities will exhibit a significant relationship with dividend payouts. The following model, among others, was used in determining validity of such dividend relevance hypothesis:

$$R_i = \alpha_0 + \alpha_1\beta_i + \alpha_2P_i + \epsilon_i \quad (2.13)$$

The study found that there was an inverse relationship between payout and risk adjusted return. Thus, for a given amount of risk, the investors seem to accept a lower return if such firms gave higher payouts, in contrast with the assumption of Capital Risk Asset Pricing Model. Similarly, Blume (1980) found that from 1947 to 1976, for securities listed on New York Stock Exchange, for a given beta, the quarterly before tax returns on stocks that paid no dividends exceeded the stocks with low dividend yield while for the stocks with high dividend yield, the equation predicted the opposite. This finding stood in contrast with the tax explanation put forward by Miller and Modigliani (1961) as a higher tax on dividends would entail that the expected rate of return (before taxes) increase with an increase in dividend yield. Similarly, Lee and Forbes (1980) found that using "share price determination model" as used by Gordon (1959), for 1955–1968, dividends were found to have a significant effect on value of the non-life insurance firms. Similar results for the period were found when "security market line model" developed by Bar-Yosef and Koldony (1976), was used by Lee and Forbes. However, some empirical studies have found evidence in favour of Miller and Modigliani's dividend irrelevance hypothesis. Black and Scholes (1974), for example, studied stocks listed on New York Stock Exchange for a period from 1931 to 1936 and Miller and Scholes (1982) studied a period from 1940 to 1978. Both studies found that the relationship between dividend yield after tax and stock returns was insignificant, which is consistent with MM II hypothesis. Naceur and Goaid (2002) conducted a study on companies listed on Tunisian stock exchange for a period from 1990 to 1997 and found that the dividend irrelevance hypothesis of Miller and Modigliani was consistent with Tunisian markets.

One of the relatively recent criticisms of it was by DeAngelo and DeAngelo (2006), who argued that if a partial retention is allowed, then the theorem does not work even if all the assumptions of the theorem are granted. While the most optimal decisions by managers would entail irrelevance, because managers may choose a sub-optimal investment decision, this would mean that dividend payouts would not be relevant in the whole context. In DeAngelo and DeAngelo's view, the equity raised externally would entail a value of the firm that could be potentially less than the discounted value of the dividends paid, thus allowing for a possibility of net loss in value.

$$\sum_{t=0}^{\infty} \frac{D_{t+1}}{\prod_{i=0}^{t+1} (1 + r_{i,i+1})} \geq \frac{I_0}{n_s} \quad (2.14)$$

Where

$$D_{t+1} = \text{Dividend paid at time } t = t + 1$$

$r_{i,i+1}$  = Rate of return for a period from  $t = i$  to  $t = i + 1$

$I_0$  = Equity raised externally at  $t = 0$

$n_s$  = Number of shares sold for raising equity at  $t = 0$

Handley (2008) argued that Miller and Modigliani (1961) assumptions allowed partial free cash flow retention as the cash retained by a partial distribution of free cash flow could be used to repurchase stock, allowing the investment level to remain constant, prompting a criticism by DeAngelo and DeAngelo (2008) that a retention that is distributed by means of stock repurchase on the same date, is not actually a retention because in discrete time models like that of Miller and Modigliani, time delay between actions occurring at a particular point in time of the discrete model are assumed to occur simultaneously. A critique of DeAngelo and DeAngelo's (2006) position was presented by Berlingeri (2006a) who critiqued the DeAngelo and DeAngelo's paper by using an argument (resembling proof by contradiction) from risk-free arbitrage. Berlingeri (2006b) also defended the idea that if Modigliani and Miller's (1958) assumptions were true, then the cost of equity function would be an increasing function for all values of leverage, arguing again from the concept of arbitrage.

An interesting thing to note is that in all proofs of Miller and Modigliani's dividend irrelevance hypothesis, all transactions caused by change in dividend decisions occur at fair value necessitating that dividend policy decisions have no effect on value of the firm. Any objection to the irrelevance hypothesis generally entails creation of a situation in such a fair value transaction cannot take place, for example in case of Gordon (1959), Gordon (1963), Black (1976) and DeAngelo and DeAngelo (2006) and the response generally involves creation of a specific situation that presents arbitrage opportunities culminating in a supposed fair value transaction in that specific respect, for example in case of Miller and Modigliani (1961), Brennan (1971), Rubinstein (1976) and Berlingeri (2006a).

Recent studies on the effect of dividend payouts on value of the firm have yielded interesting results. Farrukh et al. (2017) studied the impact dividend payout policy on share prices in Pakistan and found a positive relation between a change in share prices and a change in dividend paid per share. The model which also included dividend yield as an independent variable, had a very low explanatory power which is understandable as share prices volatility is dependent on a number of factors aside from dividend payout. However, what is interesting is that even earnings per share and change in return on equity were dependent on change in dividend paid per share and dividend yield. The fact that change in return on equity was positively related to change in dividend per share suggests Signalling Hypothesis might be working in the Pakistani markets. This is in line with the study by Bernheim and Wantz (1995) which supports Signalling Hypothesis. However, as the study by Amihud and Maurizio (1997) suggests, the signalling effect may not be just due to tax differential between dividends and capital gains. A study by Attig, Boubakri, Ghoul, and Guedhami (2015) conducted on firms in nine East Asian economies suggests that firms with family ownership pay less dividends and are also more likely to decrease or omit dividends. The study bases its hypotheses on agency theories. The "negative view" of family firms which implies that firms having higher family representation have more agency problems is supported by the study. Overall, the study shows how the partial but significantly concentrated ownership may result in more conservative decisions due to a greater say in management of the firm. While the results of the study are consistent with the study by Rajverma, Arrawatia, Misra, Chandra, and McMillan (2019) on firms listed on National Stock Exchange (India), this is not completely in line with the study by Al-Najjar and Kilincarslan (2016) on firms in Turkey in which it was found that the family ownership has insignificant effect on affecting dividend payouts. A study by Duqi, Jaafar, and Warsame (2019) found that Islamic banks with family ownership pay more dividends than conventional banks, though even in their study, the effect of family ownership on dividend payout was negative. A study by Jabbouri (2016) that firms with higher free cash flow in in Middle East and North

Africa (MENA) emerging markets pay less dividends, especially in markets where investor protection is low and an information gap exists between the managers (“insiders”) and investors. The dividends are also used as signals by the managers, it appears, during economic slumps as tools for signalling. The study points out how agency theory and signalling hypothesis are related to an extent. Hunjra, (2018) found that uncertainty, corporate social responsibility activities and stakeholders’ interest are important in determination of dividend policy by the management. Hoang and Hoxha (2016) used variance decomposition and found that the firms try to maintain their dividend payout as constant or smooth as possible and are not shy of using debt instruments to do that. Larger firms smooth out the dividend payout more. This is understandable as not only larger firms can afford to pay more attention to their payout decisions and generally have higher free cash flows to do that but because investors often invest in larger firms as they have less risks associated to them.

It is important to note that the current extant literature on the issue of optimal dividend payout policy, while suffers from twin problems of inconsistency of results and contradictory theories, also has a redeeming factor that our basic intuitions about the dividend payout decisions seems to hold in many cases.

### 3. Hypothesis development and statement

One of the important observations about the most often used models for studying payout policies of firms is that the models are based on study of how dividend payouts or yields or stock prices change with respect to change in few specific variables (for example, Rozeff, 1982). The models, thus often do not incorporate an equation signifying how value is actually created by dividend payouts but how dividend payouts themselves are affected by particular factors present in the firm, sector or economy and need an outside explanation for the observed behaviour. As the empirical testing yields different results in different situations, and the models are not derived from a direct theory of value creation, no consensus on mechanisms of dividend payout mechanisms is reached. However, there are few models that are more directly based on particular theories. For example, Equation (2.13) points to such a model by Bar-Yosef and Kolodny (1976), which is based on Capital Asset Pricing Model. Similar models incorporating after tax effects in a CAPM model were developed by Brennan (1970) and Litzenberger and Ramaswamy (1979). However, even those models do not capture the value creation process in the firms. The return expected by investors is represented as the sum of excess return expected from the market and excess return expected on dividends. The idea behind such models is that in equilibrium condition, if any firm fails to deliver a premium on extra risk it poses to investors’ investment, such return would be realized by change in stock prices and thus capitals gains realized by investors. However, an assumption of equilibrium already assumes within itself that all firms are in equal position with any difference solely arising from factors like beta and dividend yield. While some equilibrium condition is necessary to get any meaningful result, there is no way to allow deviations from the equilibrium condition to be measured easily.

M&M model (1961) however describes impact of dividend payout on value of the firm in a way that captures the value creation process. The value of the firm is the discounted value of the future value of the firm and the free cash flow (earnings minus investment) that the firm possesses. The value of the firm thus could be stated as the sum of present value of all dividends paid by the firm. It would appear thus that the value of the firm is based on the amount of dividend paid, but because Miller and Modigliani assume that the expected rate of return at a particular time would remain same for all the firms (no matter whether they pay the dividend or not), the payment of any amount of dividend won’t affect the level of investment and future earnings because the management of the firm may just choose to raise the amount of money required for a particular amount of investment through shares. As long as the firm can raise the money from the market at fair value and there are no transaction costs, payment of dividend, Miller and Modigliani argue, does not matter.

Deriving Equation (2.7) for value of the firm by discounting the stream of dividend payouts, it is possible to measure whether dividend payouts affect firm value. However, without the knowledge

of long-term rate of expected return and long-term rate of growth in earnings, it is possible to alter the value of these variables such that in each case the value of the firm is exactly equal to the discounted stream of dividends. Miller and Modigliani's specific approach solves this problem by employing two constraints—the first one is that the rate of expected return at a particular point in time should be same for all the firms (otherwise arbitrage would occur). It is no surprise thus that this assumption leads to dividend irrelevance. The second constraint, though not mentioned explicitly, is that the rate of growth for all firms would be same for a given level of investment, and thus, dividend payout. Equation (2.7) can be written as follows:

$$P_0 = \frac{k}{\rho - (1 - k)roe} E_0 \quad (3.1)$$

Where

*roe* = Return on Equity

Long-term return on equity for a company must be equal to long-term expected rate of return as the rate of return in equity is what will be earned on the total equity investment by the firm and if all those earnings are distributed among shareholders, that will the expected rate of return, provided that the firm continues till perpetuity (see Appendix 2).

Hence, Equation (3.1) can be written as follows:

$$P_0 = \frac{k}{\rho - (1 - k)\rho} E_0 \quad (3.2)$$

Simplifying the above equation, we get the following:

$$P_0 = \frac{1}{\rho} E_0 \quad (3.3)$$

Thus, the value of the firm will be independent of the dividend payout decision.

However, value of  $\rho$  may not be independent of dividend payout decision (refer Ball et al., 1979; Bar-Yosef & Kolodny, 1976; Blume, 1980; Lee & Forbes, 1980). Hence, constraints of M&M model need to be relaxed.

As discussed, one of the important observations that can be derived from the review of literature on dividend decisions and their impact is that factors that affect dividend decisions and consequently firm valuation can be either analysed in terms of themselves or based on impact they have on a few basic parameters.

One of such parameters is the expected rate of return. If for example, differential taxation indeed has an effect on value of shares, then such effect could be seen in returns which the investors investing in stocks with a specific amount of yield, would expect, which would be translated in value of shares. This is not much different from the idea outlined by Brennan (1970). Similarly, if dividends do contain information about the future prospects of the company, such information would also reflect in change in expected rate of return. The signals generated by dividends would lower risk and thus, lower the rate of return required, on an assumption that investors do take risk adjusted returns into account. In this way, higher dividend payouts, if perceived by investors as precursors of an increase growth in future earnings, could make dividend relevant to the value of the company by providing signals to the investors.

One of the other interesting variable, thus, that seems to be related to value of the firm, and expected rate of return, is growth in earnings. Earnings growth is also an important reflector of company's investment choices, and also a proxy for the value addition effects of past earnings retained by the company. On an assumption of a constant "return on assets", a higher portion of

retained earnings might result in a higher earnings growth in subsequent periods. While M&M model argues that similar effect could be achieved by selling shares and using that money for investment, the external financing option may not be as good as using the retained earnings from past years due to transaction costs involved in using external financing or even because of dilution of control of existing shareholders. In any case, the value of the growth rate is an important factor in determination of applicability of any theory of dividend policy, because it is intricately related to money available in subsequent periods for investment, which in turn, form component of present value of the firm.

An analysis of several theories in terms of these two variables seems to be of value, considering their significance. The primary ways in which the unique aspects of these theories affect either of the two variables are tabulated in Table 1.

One of the interesting things to observe is that an interpretation of Signalling Hypothesis and Lintner Model suggests that the managers would only increase dividend payout ratio if they feel they can maintain payments of such higher amount of dividends in future, which would require a higher growth rate in earnings, yet Transaction Cost Theories (e.g. Dempsey & Laber, 1992) suggest that less retained earnings may lead to firm’s dependency on costlier external financing which could cause a decrease in growth rate in future earnings. However, while higher payout in Signalling Hypothesis is based primarily on managerial expectation, lower payout in Transaction Cost Theories is based primarily on managerial decision. So, managers on expectance of a higher earnings growth rate in future may choose to distribute higher dividends without significantly decreasing investment potential, if the expectation holds true. From this analysis, we see two different mechanisms emerge. The epistemic mechanism of the expectation and the ontic mechanism of the actualization of expectance in varied forms. Under complete certainty, both would be same, yet complete certainty is not a phenomenon of the real world, and thus we are led to accept the clash of these two mechanisms. By removing all the conscious factors affecting the relationship, the analysis, more or less, would support Miller and Modigliani’s dividend irrelevance hypotheses. If a firm gives away something whose value is “X”, the firm’s value would decrease by “X”, just like if the firm would acquire something whose value is “X”, the firm’s value would increase by “X”. In that scenario, the firm’s equity would be no different than a bank account, in which cash inflow and from which cash outflow takes place.

However, things change when the concept of risk is introduced, leading to an introduction of an expected rate of return that varies with the risk class. Tax Effect Theories, or Bird in Hand Theory or

**Table 1. The categorization of dividend policy hypotheses by investor factor and managerial factor**

<b>On an increase in DPR</b>	<b>Expected Rate of Return (Investor Factor)</b>	<b>Expected Earnings Growth Rate (Managerial Factor)</b>
Bird in Hand Theory	Decrease (due to cash dividends in hand)	-
Signalling Hypothesis	-	Increase (expectance of stable higher earnings growth)
Irrelevance Theory	-	-
Tax Effect (assuming higher taxes on dividends)	Increase	-
Transaction Cost Theories	-	Decrease (due to less retained earnings for investment leading to dependency on costlier external financing)
Agency Theories	Decrease (due to lesser agency costs)	-



Agency Theory (Jensen & Meckling, 1976), if correct and significant, can be said to have an effect on associated risks and thus, expected rate of return. If these theories work, then their effect will be subsumed in investor expectation to a degree that may allow any analysis to limit the study to the effect on and of these variables and still get significant results.

However, the approach of studying the effects of a theory by just studying the variables at play according to its theoretical framework, may fail to consider the effect of mechanism outlined by other theories and any feedback arising from the change in question around which the significance of a particular theory is analysed. Hence, for example, the signalling by payment of dividends may actually have an effect of share price by an effect of expected rate of growth, but may cause a change in expected rate of return, thus, in turn reducing the effect of signalling hypothesis to insignificance, in presence of other unaccounted variables. The studies that often look at the effect of one theory on some variables fails to account for the fact that there might be more than one mechanism at work and the final result of the study might be indicative of not validity of one theory, but cumulative effects of all mechanisms in action. One of the ways out of this problem is to focus on the factors that affect value of the firm, in a way that they make the value of the firm, instead of models where the value of the firm is regressed onto different variables that are assumed to be independent and thus, no interaction between such variables is taken into account.

The models that are used often in understanding the impact of dividend payout policy on prices of stocks, capture only part of the whole value creation and discovery process, because they are either created to test a specific aspect of the overall hypothesis or they study the effects of different variables on dividend payout or dividend yield or value of the firm in a way that in which the effects of these variables are captured in form an equation where they form independent variables and the respective coefficients give us the rough relation they share with the dependent variable.

For example, Gordon (1959) proposed the two models to study the contribution of retained earnings and dividend payouts to value of the firm, as discussed earlier (Equations (2.5) and (2.6)). However, the equation in itself is not an equation, which hints at any kind of value creation by any theoretically sound procedure. Similarly, Rozeff (1982) studied relation of dividend payout ratio to variables like number of shareholders, beta, average growth rate of revenues, forecasted average growth rate of revenues and percentage of common stock owned by insiders. While these different variables do point out how different factors affect dividend payout ratio, it is not certain by what final measure do these factors work. So, while firm management may decide on a lower payout when a firm is experiencing higher revenue growth, it might be also true that few firms may opt for a higher payout in such a scenario because of a larger revenue may lead to a larger free cash flow which managers may choose to distribute among shareholders to prevent agency costs (Jensen, 1986). While the model by Bar-Yosef and Kolodny (1976) as presented in Equation (2.13) is based on Capital Asset Pricing Model, the relationship of returns with beta and dividend payout may not be as straightforward. While the traditional form of capital asset pricing model requires that excess returns for a security are linearly dependent on beta and the value of intercept is zero, Black, Jensen, and Scholes (1972) in their study found out that high-beta securities had significantly negative intercepts and low-beta securities had significantly positive intercepts, contrary to the predictions of the traditional form of the model.

One of the models, as discussed before, where value creation is understood from the model itself is the M&M model (1961). The value of a firm at a time “ $t$ ” is a discounted sum of value of the firm at time “ $t$ ” and the amount of free cash flow (difference of earnings and investments) generated from time “ $t$ ” to ‘ $t + 1$ ’. Now, Miller and Modigliani (1961) arrived at dividend irrelevance hypothesis because they assumed that the expected rate of return from all firms would be same. However, one can include different theories of dividend payout in the M&M model by removing the restriction. The tax effects, for example would affect expected rate of return from the firms, so can the payment of a different amount of dividend. The agency costs can be either included in terms of

their monetary value or they can also be subsumed in expected rate of return. M&M model can be converted into Equation (2.7) under certain assumptions. The equation consists of all the value creators that are derived from the theoretical assessment of present value of cash flows to investors in form of dividends. Hence, the equation is of great value in solving the dividend puzzle.

A simple dividend discount model defines value of a firm to be equal to the product of a constant dividend payout ratio in the next period multiplied by the net earnings accrued in the next year, divided by difference of a constant expected rate of return and a constant rate of growth in earnings. Hence, the value of the firm may be defined by only four variables, if assumptions behind the model hold. The price to earnings ratio of the firm, which indicates the premium at which the shares of a firm are selling, with respect to its earnings, is measurement of all relevant expectations about the firm. The expectations about the firm thus, is associated with three variables—dividend payout ratio, which is based on firm decision, rate of expected return, which is primarily based on investors perception of the surrounding economy and thus, the opportunity cost, and rate of growth in earnings, which is arguably, dependent on both firm decision and investors' perception of the surrounding economy.

The three variables are related and to some extent, can act to counter effects of each other. When a firm raises payout, the value of the firm would increase (if growth and investors' expectation remain constant). However, on a higher payout, the retained earnings would be less. For a constant return on assets, the rate of growth in earnings would decrease. Which would offset the increase in value of the firm by a little amount. Also, if a higher payout exists within the whole economy, the expected rate of return would also increase as the opportunity costs increase.

Similarly, the payouts may be decided by the current expected rate of return and growth rate in earnings of the firm. In fact, in order to decide the value of the cash that is retained and not paid out to investors in form of dividends, one must know the value at which to discount such cash (be it at the current or marginal opportunity cost) and the growth in earnings that such cash on investment in the firm itself, would produce.

Without an analysis understanding cumulative and singular effects of each of the factor, in presence of complex workings of economy, the results of a study may lead to an observation of different results in different countries or at different time periods, or on different sets of companies, giving appearance of dominance of one dividend theory over another. To form a valuation hypothesis, few assumptions about the nature of the ecosystem for which the hypothesis is to be crafted need to be made.

Firstly, the very basic assumption of “perfect capital markets” as used in Miller and Modigliani (1961) and a slightly modified assumption of “rational behaviour”, that is, the investors prefer more risk-adjusted returns to less, are taken. Hence, unlike as Miller and Modigliani assumed, the indifference of the investor towards cash payments or a corresponding increase in value of the firm is not assumed for this paper, because the risk factor of the two alternatives is not necessarily the same, as outlined by Gordon (1963). The assumption of “perfect certainty” is not necessary, however, assumptions of “imputed rationality” and “symmetric market rationality” are taken, in the similar vein as taken by Miller and Modigliani.

It is also assumed, that the firm cannot raise any money from the market, in any form. This assumption is only required for an easier analysis and is not required for the applicability of the theory, as long as the firm raises money at fair value. In fact, if any such raising of money takes place, the same analysis can be done by just assuming the money raised as part of another corporation with a proportionate division of financial attributes.

The equation derived from dividend discount model is not enough to test the presence or absence of dividend policy mechanisms because if for some reason for given values of payout ratio, expected rate of return and growth rate in earnings, the value of the firm does not match, one can easily argue that



there is a difference in, for example actual long-term growth rate and growth rate taken in the model or actual long-term expected rate of return and expected rate of return taken in the model. This is because there is no way to reliably estimate the long-term values of these variables. Hence, two further constraints are required that are theoretically sound to get a reliable result. In M&M model, the constraint applied is that under certain assumptions, the expected rate of return for all firms in the market has to be equal (otherwise arbitrage would take place). However, that constraint is problematic because there is some evidence that dividend payout does impact expected rate of return or value of the firm. Another hypothesis that is consistent with Gordon's (1959) view is proposed.

The hypothesis that the paper proposes is that from any point in time “ $t$ ”, the value of the firm at all points in time subsequent to “ $t$ ”, should ideally be expected to be same as value of the firm at time “ $t$ ”, appropriately discounted. This can be called the “Equal Value Equilibrium” hypothesis.

Such a statement appears to be tautologically true. If discounted by the actual growth factor, it is expected that the value of the firm would appear to be the same. However, while being circular, the statement is informative because it allows one to form an epistemic criterion for figuring out active dividend policy workings in a market.

In context of the hypothesis statement, the term “ideally” is of great importance. There are three assumptions inherent in this term.

- (1) No Response Friction/Delay—There is no delay in change of any variable in response to any change in other variable, that is there are no frictions in market which slow down the rate of change of any variable to anything less than immediate.
- (2) No Efficiency Change—There is no change in efficiency of firm, in any capacity.
- (3) Epistemic Perpetual Existence—The firm(s) under consideration is(are) expected by investors and respective managers to last until perpetuity.

None of these three assumptions is expected to be true. Their role is to merely allow for a possibility to derive an “ideal” value of the firm.

#### 4. Analysis of assumptions

##### (1) No Response Friction/Delay

The first assumption is important to make any meaningful assertion. If there was any delay in change of variables and instead of immediately achieving their final value, the variables moved towards the value in accordance with a function dependent on time, then the lowest unit of period taken would be relevant as each change would have to be measured in terms of that small unit of time and the deviations from the required trend in that duration may produce over-arching effects even in the long-term data.

However, in context to the perpetual existence of firm, any such aggregation of function response in case of a delay, if finite, can be reasonably assumed to amount to nothing significant.

Assume for example that a payment, appropriately discounted, to investors by the firm was a function of time along with several other factors from  $a_1$  to  $a_n$ .

Hence,

$$Pay_{f,t} = f(t, a_1, a_2, \dots, a_n)$$

The value of the firm for each unit of time “ $t_u$ ” under assumption of delay, using the function and the value of the firm for each unit of time under the “ideal” condition would be, in both the cases, just the sum of respective appropriately discounted payments, which the investors in the firm receive.

Consider that before “t”, the actual value of firm and the value of the firm under ideal conditions are same. Further assume that a change takes place at time “t” causing a difference in the two values subsequently. The algebraic error in value of the firm at time “t” would simply be the sum of all deviations from the ideal value  $V_{f,t}^{ideal}$ .

$$error[V_{f,t}] = \Delta V_{f,t+i} = V_{f,t}^{ideal} - V_{f,t} = \sum_{i=1}^{\infty} \Delta Pay_{f,t+i}$$

Considering all deviations due to the change at time “t” settle to (approximately) zero, via some function, so as to become almost meaningless, in time “d”,

$$error[V_{f,t}] = \Delta V_{f,t} = \sum_{i=1}^d \Delta P_{f,t+i}$$

The relative error in estimating the value of the firm would be

$$\frac{\Delta V_{f,t}}{V_{f,t}^{ideal}} = \frac{\sum_{i=1}^d \Delta P_{f,t+i}}{\sum_{i=1}^{\infty} P_{f,t+i}^{ideal}}$$

The relative error is what would be significantly worth of interest practically to the investors in the market as that would be responsible for wrongful estimation in returns that investors would receive. Considering, we have assumed that any deviation in valuing payments would decrease with time, the numerator is a finite and overall decreasing with time, and thus would have a finite value. The only way for relative error value to be not (close to) zero would be if the denominator itself converges to a finite value.

Now, one could argue that it is to be expected that the denominator would converge, this is what enables us to derive finite value of a company’s stock and this is why a company’s shares have finite value, but such has little ground to stand on, granted a belief in firm’s perpetual existence. It is impossible to hold that a firm would have perpetual existence in any meaningful terms and simultaneously hold that its value converges. To understand the scenario, it would be appropriate to construct a simple thought experiment.

Imagine an industry that produces a resource “X”. By owning a membership pass costing “W” of that industry, one could have a specific amount of that resource, let’s say “A”, delivered to his home, on the last day of every year.

The worth “W” of the pass may be calculated as:

$$W = \frac{P_1 A}{(1 + \rho)^1} + \frac{P_2 A}{(1 + \rho)^2} + \frac{P_3 A}{(1 + \rho)^3} + \dots$$

Or, alternatively as:

$$W = \sum_{i=0}^{\infty} \frac{P_i A}{(1 + \rho)^i}$$

The total quantity, “Q”, acquired would be

$$Q = \sum_{i=0}^{\infty} A$$

So, technically, if “W” would converge, it would be possible to get an infinite amount of the resource, even if not at the same time, for a finite cost. This would mean that effective price of a unit of resource would be zero.

However, such would not be the case if one buys the same quantity of resource in a - single day, and uses “A” amount of it, every year. In this case, the price of any unit of resource

could be construed as either finite or infinite (depending on how price varies with quantity available, and whether the resource is available in finite quantity or has an infinite stock) but not zero.

But should there be a difference as significant as this, between the two alternates of buying infinite amount of “X” at a given time and then consuming a specific amount of it, equal to “A” every year, and one buying and consuming quantity “A” at different times to a total amount of “X”?

There seems to be no reason in support of such difference.

One could similarly argue it for any other good, or any basket of products or for whole economy. But could one argue that for money?

Money is merely a means of exchange of resources. If no resource singly, or jointly with any group of resources is free from the analysis, then inflation adjusted value of money would not be either, because its value will be in terms of a specific amount of basket of goods it can buy.

However, one, in theory, could construct a security, whose payments extend till perpetuity yet its value is convergent. A perpetual bond would be an example of that. The value “ $V_{b,t}$ ” of the bond would be equal to

$$V_{b,t} = \sum_{i=t+1}^{\infty} \frac{C_{b,i}}{(1 + \rho)^i}$$

However, after elapse of some specific amount of time, let’s say “ $T$ ”, it would be the case, in case the series converges, that the total value of the bond at time “ $t + T$ ”, would be several orders magnitude less than the smallest unit of currency possible in the system. So, the bond, after “ $t + T$ ” could be assumed to be worth practically nothing. This notion may be termed as “quantized nature of money”.

One can see how this understanding applies to the firm’s equity, which is the main scope of discussion. Let us assume that someone buys  $x\%$  of a company’s equity and receives dividend payments on it. The present value of any dividend payment received could be written as:

$$D_{f,i} = \frac{k_i E_{f,i}}{(1 + \rho)^i}$$

For the series involving addition of infinite payments of such dividends to converge, the payments received from the company should become smaller with time, tending to zero at infinity.

Yet, as discussed in case of perpetual bonds, the value of all future dividends after a point in time would become insignificant in comparison to the lowest unit of currency available in system.

Now, one may argue here that the receding value of the company’s discounted payments of dividends is because a receding share of the total initial value used to buy stock is behind these payments. Of course, the value of the firm could be summed up as mere summation of discounted payment values receding with time. If the investor would reinvest the dividend amount from the previous period back into the company, he could get similar value from each payment.

However, doing that would increase the number of shares he has in the company. This would not increase the value that his existing shares provide him every year.

If an investor really believes in the growth of the company he is investing in, why would he accept a receding payment from the company, provided that he knows the company’s future situation accurately and the company’s growth rate and his expected rate of return stays the same?

If every investor of the firm chooses reinvestment, the firm would have to raise new shares every year so that the investors could buy them. But it can be known by mere casual observation that such is not the case. So, what is happening? A suggested answer to the question would be looked into later.

Now, the first assumption put forward here is not fully justified. That is why it is an assumption but not an assertion. That is because information does not travel to all stakeholders instantaneously. There is always a delay in spread of information. Investors also need not be rational, and there may be no credibly estimated long-term expected rate of return or rate of growth of the company. The dividend payout ratio may change every year.

The assumption, while justified under certain conditions, which are necessary to produce any useful model, is not true. Yet it is required to get the “ideal” value of the firm, deviations from which could be measured. One of the techniques employed to account for and reduce deviations from the assumption in empirical observation has been to use a five-year gap in analysis, rather than a gap of a single year, which will allow a time for the deviations originating from the previous event to settle to some extent.

### (2) No Efficiency Change

The second assumption is merely an affirmation of the fact that this paper and the model described within do not account for differential managerial inefficiencies which can be mitigated or any growth in returns that could be realized by better investment made possible by higher or limited corpus of retained earnings. Such a model would be highly specialized to account for unique situation and operation of each firm, which is not required to support the hypothesis in its practical form. Yet a separate treatment, assuming there is such a change that is reflected in the return on equity of the firm is performed in the end.

In accordance with the assumption, the return on equity or the return on investment of the firm is assumed to be constant in all respects.

### (3) Epistemic Perpetual Existence

The third assumption is a rather simple assumption to prevent taking in account each investor's beliefs about the longevity of the company they are investing in. The firm may or may not exist till perpetuity. The assumption is only about the belief of investors, and not about the actual life of the company. If the investors already believe that the company has some finite life expectancy, then they would already believe the value of the firm to be confined to some range independently, which makes theorization of any model irrelevant, for any such expectation might necessarily require that investors expect firm to cease any economic activity and liquidate (assuming opportunity to speculate does not exist), as that would ensure that they at least get the book value of equity back.

Or, if the investors really have a reason to believe that the value of the firm will rise and then fall to zero, and thus, liquidating it later is a better option, the question is why would anyone invest in the company for long term? The only way to make short-term profits would be to either get it from other investors whom would make long-term investment decisions or from operations of the firm. Yet the latter cannot be the case, if return on equity remains a constant. And the former would not be an option for rational investors who believe that the firm would eventually liquidate and they would get only the nominal/book value of the capital invested.

## **5. The construction of hypothesis**

Aside from assumptions mentioned, there are two assertions, which form the core of the theory, to be made in regards to the role of management and behaviour of the market and investors that relate to the value of the firm.

The management of a stable firm, under the assumptions taken, would always try to institute dividends in such a way so as the value of the firm before paying the dividend remains equal to the value of the firm after paying the dividend, appropriately discounted for the period passed. The value of the firm, obviously, after payment of dividend, cannot be greater than the value of the firm before paying of the dividend if the return on investment remains constant, as assumed, because of any increase in efficiency of the firm, because any such change in efficiency of the firm in cutting down costs, or increasing profits would reflect in the change in return on investment. There could be a possible increase in value of the firm for a short time, because of perceptions about the firm, which may change in case of change in amount of dividends received or any news about the company, that may not have an effect on return on investment. However, as none of these changes would be backed by any change in financial aspects that matter, but are merely reflective of ungrounded perceptions, in a longer period of time, the effects of such change would vanish. For example, even if an increase in prices is caused by an increase in dividends which by some form of signalling hypothesis in action, may give a false perception about an increase in future earnings, in subsequent periods, as the earnings are not revised to match investor expectation, the price of share will fall. Without any transaction costs in the market, as assumed, the rotation of money invested in the firm by primary or secondary transactions in capital markets, would not be non-recoverable.

However, the value of the firm after payment of dividend, cannot be lesser than the value of the firm before paying of the dividend because then the managers would be literally giving a part of value of the corporate entity to the shareholders, thus, treating the firm as a bond. The management thus, would be left with a firm of lower value than what they possessed earlier and would be, in effect, destroying value of the firm. It should be noted that this assumes the corporate veil. Firms are separate entities than the shareholders. The earnings retained in the firm are not the same as earnings retained by its shareholders or vice versa, even if a transaction from one to other can take place at no transaction costs, because even if the value of the two options is assumed to be the same, the state the money is in is different. Having money invested in firms, grants special privileges, that are not possible if the shareholder keeps the money with himself and does not invest. However, it should be noted that as we move from the limited liability public companies to proprietorship, the effect of the assumption decreases.

The firms' perpetual existence is thus, an important consideration for the firm management. Yet, in the case of public limited liability companies, while such, may definitely occur in short term, without any change in return on investment and no transaction costs to lose money, along with the fact that such, if occurred in a long term would cast doubt an assumption of perpetual existence of the firm, there is a justification to hold that such process could not be a long-term process, of course on the assumptions held.

To understand via an illustration, consider two firms "X" and "Y" which are very similar and have same initial value and initial value per share. Let us further assume that a person "P" invests an amount "A" in the firm "Y", which pays no dividend, and gets the expected rate of return "E" in one year. Thus, after a year, the assets of "P" increase by "AE". Consider, however, that firm "X" pays a dividend "D" on an investment of amount "A". The value of the invested amount "A" in firm "X" after a year, considering the same expected rate of return "E" would be equal to  $A(1 + E) - D$ . While both the firms pay the same value to their investors considering both the dividends paid and capital gains, the value per share of firm "Y" becomes more than the value per share of firm "X". If such a scenario continues for a long time, the value of firm "X", provided number of shares remain the same, will be reduced to a small fraction of the value of the firm "Y" and for the same level of debt-equity ratio, the management of the firm "X" will be left in charge of controlling a relatively decreasing share of assets in the market. Such a position, even under assumptions of a constant return on equity, would not be what firm's management could be assumed to desire, nor such a position is likely keep the rate of return on equity constant for a long time.

The second assertion is that the investors in the market would always try to price the firm in such a way, that the value of the firm, under the assumptions taken, before paying the dividend remains equal to the value of the firm after paying the dividend. This in addition to the workings of the management, producing a “double effect” on firm pricing, but for similar reasons, as investors would perceive the firm to remain a going concern till perpetuity. Thus, when a firm pays out more dividend, the investors, instead of changing the future value of the firm, as would be in the case of Miller and Modigliani’s assumptions, would change their discount rate. That makes sense, as the investors really cannot control the value or the price of the firm as easily, but they can alter their expectation rates in response to a piece of information or an event easily. This not only allows theoretical preference of expected rate of return over value of the firm as variable expected to be the more directly under control of the investors but also allows the less risky nature of cash in hand, obtained via payment of dividends, to be accommodated in the equation.

The hypothesis rests on the idea that the expected value of dividends paid by the company must be dependent on and adjust itself to the dividends actually paid. If investors find that there is any change in dividend, their expectation of rate of return changes in response to that. Thus, instead of causing a change in the value of the firm, the payment of dividend can be assumed to change the expected rate of return. That seems more reasonable because the most significant difference between equal amount of dividends and capital gains is not primarily of value, but of risk, and any change in risk adjusted value is subsequent of the change in risk and opportunity cost.

The above statement is what harmonises the central premises of Miller and Modigliani’s model with the Gordon model. Miller and Modigliani’s model attempts to show that in presence of its central assumptions, the value of both options should be same, and if it were not, it would become so by arbitrage. And the Gordon model still proposes investor’s preference of dividends over capital gains and thus such preference must come from the lowered risk posed by the dividends, if not by the value of the two options. The only way to accommodate a functioning arbitrage with differential risk adjusted value of dividends and capital gains is by the hypothesis in the paper.

Imagine a firm “*f*” in a perfect market “*M*” (as defined by Miller & Modigliani, 1961) with a relatively stable dividend payout ratio “ $k_{f,t}$ ”, net profit at time “*t*” equalling to  $E_{f,t}$  and an annual growth in net profit “*g*”, which is expected to continue till perpetuity. Assume that investors in this firm expect a long-term annual rate of return “ $\rho$ ”. The value of the firm  $V_{f,t}$  at time “*t*”, as discounted to time “*t*”, is calculated from simple dividend discount model and would be

$$V_{f,t,t} = \frac{k_{f,t}E_{f,t}}{\rho_{f,t} - g_{f,t}} \tag{5.1}$$

Let us assume that for some reason, there is change in dividend payout ratio, at time “*t* + *T*”. Such a change might reflect and persist in growth rate, and expected rate of return from the firm. In this case, the value of the firm  $V_{f,t+T}$  at time “*t* + *T*”, would be

$$V_{f,t,t+T} = \frac{k_{f,t+T}E_{f,t+T}}{\rho'_{f,t+T} - g'_{f,t+T}} \tag{5.2}$$

Where -

$$\rho'_{f,t+T} = \text{Long term constant expected rate of return after change in payout of the firm 'f' at time 't + T'}$$

$$g'_{f,t+T} = \text{Long term constant expected growth rate in profits after change in payout of the firm 'f' at time 't + T'}$$

Let it be that the growth rate in earnings at time “*t* + *T*” from earnings a time “*t*” be equal to “ $g_{f,t,t+T}$ ” and new dividend payout ratio at “*t* + *T*” be  $k_{f,t+T}$ .

Thus the above equation can be stated as:

$$V_{f,t,t+T} = \frac{(k_{f,t+T})E_{f,t}(1 + g_{f,t,t+T})}{\rho'_{f,t+T} - g'_{f,t+T}} \quad (5.3)$$

$g_{f,t,t+T}$  = Growth rate in earnings for firm 'f' from time 't' to 't + T'

The value of the firm at time "t + T", as discounted to time "t", would be

$$V_{f,t,t+T} = \frac{k_{f,t+T}E_{f,t}(1 + g_{f,t,t+T})}{(\rho'_{f,t+T} - g'_{f,t+T})(1 + \rho_{f,t,t+T})} \quad (5.4)$$

Where

$\rho_{f,t,t+T}$  = Expected rate of return for firm 'f' from time 't' to 't + T'

The value of the firm, in both cases, should be the same, according to the hypothesis.

Hence, -

$$V_{f,t,t+T} = V_{f,t,t} \quad (5.5)$$

Putting value of  $V_{f,t,t+T}$  and  $V_{f,t,t}$  in Equation (5.5) from Equation (5.4) and (5.2) respectively, we get the following:

$$\frac{k_{f,t+T}E_{f,t}(1 + g_{f,t,t+T})}{(\rho'_{f,t+T} - g'_{f,t+T})(1 + \rho_{f,t,t+T})} = \frac{k_{f,t}E_{f,t}}{\rho_{f,t} - g_{f,t}} \quad (5.6)$$

Now, let us assume that

$$\rho_{f,t} - g_{f,t} = r \quad (5.7)$$

Where

$r$  = a rate of return

Multiplying both sides by D

$$\rho_{f,t}D - g_{f,t}D = rD \quad (5.8)$$

Where

$gD$  represents the amount lost on growth of earnings that could have been achieved had no dividend been given

$\rho D$  represents the amount gained on dividend by investor taking the dividend and investing it in the next best option

Because the two options are not exact substitutes of each other, it is possible that some rate of return be accrued by choosing one over the other. However, the difference in the two rates must be a constant across securities and time, because if such were not the case, arbitrage would take place. This arbitrage that can be called "pair arbitrage" is different than the normal arbitrage that is assumed to take place on a normal rate of return.

The difference between the two is that a normal arbitrage procedure would result in prices of same type of asset in two differing markets to be absolutely same, while a pair arbitrage would result in merely price of same type of asset in two differing markets to be relatively same, that is

that there might be a fixed difference between the two prices. Owing to more relaxed assumptions and consistency with the actual world, the pair arbitrage assumption is better to understand the price functioning of securities in the market.

The pair arbitrage, in effect, is however significant for one more reason. Instead of assuming that any rate of return of an asset could be compared to any other rate of return of a similar but not the same asset, it is better to base the analysis on the assumption that the difference in the best and the second best alternative for a particular security could be compared to such differences over different securities and over time and over different amounts of investment. That is because, a higher return for a security for a particular option may be generating at the expense of other options available with the security, while such cannot be the case in case the securities or the time (not duration) or the amount invested is different, unless by design, because there is no direct causal relationship that exists naturally over such difference. By design, one can transfer the losses and gains, to different security, by means of, for example, swaps, to different time, by means of, for example, futures, and to different amounts invested, by means of, for example, progressive taxation. Any such measures that occur thus, need separate treatment, but their effects occur by chain of wilful contractual obligations and not primarily by natural mechanisms.

A good example, for illustration of working of the above principle, wherein a higher return can be generated on a security at the expense of a lower return for the second option exercised on the same asset, is financial bubbles, wherein the short-term investors in an asset make abnormal gains off the backs of long-term investors. This situation may be completely natural and driven by sentiments and expectations, instead of a formal contract in which long-term investors may agree to give up their potential gains to provide gains to short-term investors.

Thus, in line with the above discussion, the following is held to be the case

$$\rho'_{f,t+T} - g'_{f,t+T} = r$$

However, the assumption can be relaxed and belief about value of “r” allowed to vary with time. Thus, the equation can be instead stated as the following:

$$\rho'_{f,t+T} - g'_{f,t+T} = \lambda_{t+T,t} r \tag{5.9}$$

And the equation becomes the following:

$$\frac{k_{f,t+T}(1 + g_{f,t,t+T})}{(1 + \rho_{f,t,t+T})} = \lambda_{t+T,t} k_{f,t} \tag{5.10}$$

Because

$$k_{f,t+T} = k_{f,t} + \Delta k_{f,t,t+T} \tag{5.11}$$

Where

$$\Delta k_{f,t,t+T} = \text{Change in dividend payout ratio of firm 'f' from time 't' to 't + T'}$$

Hence, the equation becomes

$$(k_{f,t} + \Delta k_{f,t,t+T})(1 + g_{f,t,t+T}) = \lambda_{t+T,t} k_{f,t} (1 + \rho_{f,t,t+T}) \tag{5.12}$$

Simplifying, we get

$$\Delta k_{f,t,t+T} = \lambda_{t+T,t} k_{f,t} \frac{(1 + \rho_{f,t,t+T})}{(1 + g_{f,t,t+T})} - k_{f,t} \tag{5.13}$$



Or, -

$$\Delta k_{f,t,t+T} = \lambda_{t+T,t} k_{f,t} \varphi_{f,t,t+T} - k_{f,t} \quad (5.14)$$

Where

$$\varphi_{f,t,t+T} = \left( \frac{1 + \rho_{f,t,t+T}}{1 + g_{f,t,t+T}} \right) = \text{Dividend Increment Factor}$$

Alternatively, the equation can be written as:

$$\lambda_{t+T,t} k_{f,t} \varphi_{f,t,t+T} = \Delta k_{f,t,t+T} + k_{f,t} \quad (5.15)$$

$\Delta k_{f,t,t+T}$  and  $k_{f,t}$  are under the control of management.  $k_{f,t} \varphi_{f,t,t+T}$  denotes a combination of all factors that emanate from a combination of investor and management decisions. The “paired analysis” of the factors such as expected rate of return and growth rate of firm’s profits, allows us to ignore any complex feedback effects going on between the variables in the equation and the financial and physical counterparts to them, because such is irrelevant to the theory being proposed in the paper.

Here, it is to be noted that  $\lambda_{t+T,t} k_{f,t} \varphi_{f,t,t+T} = \Delta k_{f,t,t+T} - k_{f,t}$  and  $\Delta k_{f,t,t+T} = k_{f,t} + \lambda_{t+T,t} k_{f,t} \varphi_{f,t,t+T}$  are different syntactically and the latter is expected to be less valid than the former generally when verified empirically, because in case of the former,  $k_{f,t} \varphi_{f,t,t+T}$  is the dependent variable, while in the latter case  $\Delta k_{f,t,t+T}$  is the dependent variable. While ideally, both could be said to equally be dependent on the other, practically, the management decisions may have less ability to capture the movement of these variables than the market, especially in cases where the market is efficient. So, in general, it is more useful to hold a view that the market adjusts to the firm’s decisions, but that does not mean that the management decisions are not taken considering the market perceptions, it is just that the latter is less efficient.

Granted all assumptions mentioned in the paper to be valid in the real world, the coefficients of  $\Delta k_{f,t,t+T}$  and  $k_{f,t}$  in the equation  $\lambda_{t+T,t} k_{f,t} \varphi_{f,t,t+T} = \Delta k_{f,t,t+T} + k_{f,t}$  must both be significant and equal to 1. Thus, an empirical test, in which such coefficients are found to be not significant or close to 1 may serve as an evidence against the theory, provided that the assumptions approximate the actual scenario, surrounding the cases used in the test.

In this paper, the hypothesis is tested on Indian markets and results are discussed subsequently.

### (1) Hypothesis significance

The hypothesis, under ideal market conditions, should fit with the data completely. However, owing to many violations of the assumptions in the real world, the hypothesis will most often, just represent a trend line. The firm value may, thus, be above the theoretical value derived from the model or below it, but is expected to stick close to the trend line, unless of course, the firm changes its efficiency. In that case, the firm value is expected to settle to another value in long term.

The significance of hypothesis, is thus, not in conveying that it is impossible to increase firm value without increasing its operational, or investment efficiency, though that appears to be the case, but in forming an epistemic empirical model through which several dividend policy mechanisms can be tested for relevancy in a particular market for a period. The factors mentioned in the model are by no means the only ones the dividend decisions by managers or investors will depend on. However, all other factors will only violate the equation as much as they violate the assumptions taken in the model. For example, a firm may decide to hold back an amount of dividend to be paid out to invest in a project it can gain a higher return on. Such an investment will surely lead to a change in return on equity and a departure from the assumptions and thus the theory will be

seen to that effect. Similarly, if a firm buys or sells shares at any price that is not equal to the fair value of shares, then it is very likely that the assumptions of “rational behaviour” or “imputed rationality” would be violated. Thus, the value of the hypothesis is in understanding the deviations from the ideal and using those deviations to understand the nature of a particular market. The first equation of the model can be stated in a way as to be tested via regression as follows—

$$\Delta k_{f,t,t+T} = a_1 k_{f,t} \varphi_{f,t,t+T} + a_2 k_{f,t} + c \quad (6.1)$$

Each of these constants has a specific significance.

$a_2$  can be called the “standardizing coefficient”. Ideally, the value of  $a_2$  should be equal to  $-1$ . If the value of  $a_2$  is not equal to  $-1$ , then to get standardized value of each term, the value of all significant coefficients and constants must be divided by magnitude of  $a_2$ . The differing value of  $a_2$  represents the cycle in which the company find itself in. For identifying a complete cycle in the market, the continuous time period for which the value of  $a_2$  becomes close to  $1$  should be identified. (see Appendix 3)

$a_1$  can be called the “signalling coefficient”. Ideally the value of  $a_1 / -a_2$  should be equal to  $1$ . If the value of standardized signalling coefficient is less than  $1$  and value of  $a_1$  is significant, it means that managers are being risk averse and underestimating the future growth rate of the firm, or overestimating the expected rate of return, while a magnitude of more than  $1$  means that managers are overestimating the future growth rate of the firm, or underestimating the expected rate of return. The managers will be expected to undercompensate, in such a case, when they expect the current earnings to not remain constant and believe that reduction in amount of dividend in future will send a negative signal to the investors. The managers will be expected to overcompensate for the dividend gap, in such a case, when they expect that the firm is not being valued correctly by investors and dividend payouts will be used to give signals to the investors they ought to value the firm more. When the value of  $a_1$  is not significant, that means either managers lay faith on measures for setting dividend policy that are not exactly aligned with growth of the firm and investor expectations or there is systematic mispricing of securities in the market. In both cases, however, the higher the departure from the ideal value of  $1$ , lower is the trust of managers in expecting efficiency of investors’ expectations in accurately pricing securities in a case where investors’ expectations themselves are not based on some constant. In such cases, the importance of dividends as signals would be more. In general, the value of  $a_1 / -a_2$  is a measure of applicability of aspects of Lintner model from the perspective of managers (see Appendix 4).

If  $c$  is significant, it means that managers are making decisions based on some sort of model, wherein the change in payout ratio is partly in line with the expectations they have for the company in the future, and not just based on meeting the gap between the actual dividend payout and the investors’ expectation. Hence, management, when for example, is targeting a particular investment routine over the years, it will make its dividend decisions based on that prior condition. The managers in such a case, may be said to be participating in active value generating decisions.

The second equation can be stated in the following way, so as to be testable via regression:

$$k_{f,t} \varphi_{f,t,t+T} = a'_1 \Delta k_{f,t,t+T} + a'_2 k_{f,t} + c' \quad (6.2)$$

Here,  $a'_2$  will be the “standardizing coefficient”. Ideally, its value should be equal to  $1$ . If the value of “standardizing coefficient” is not equal to  $1$ , the value of all significant coefficients and constants must be divided by magnitude of  $a'_2$ .

$a'_1$  can be called the “dividend preference coefficient”. While, ideally its value, after standardization, should be equal to  $1$ , if  $a'_1 / a'_2$  is more than  $1$ , then it means that there is a preference among investors for dividend, for whatever reason. A unit of dividend payout is valued more than what its

value actually is, numerically. Similarly, a value of  $a'_1/a'_2$  which is less than 1, means that investors value a unit of dividend payout less than what its value is numerically (see Appendix 5).

If  $c'$  is significant, it means that the prices in the market are being set, to some extent, based on some sort of a model. A significant presence of institutional investors and/or analysts may be the reason behind such scenario, as in such cases the prices and thus returns, will be based on a confluence of factors aside from merely dividend payout decisions. In markets that are more efficient,  $c'$  is more likely to be significant, because the fundamentals are already included in market pricing due to a market prices, largely driven by institutional investors and analysts who base their analysis on fundamentals. However, such a significance in  $c'$  must be observed for a long term to form as an evidence for market efficiency. In case, the markets have (close to) strong form of efficiency, the value of  $c'$  would be the most significant in the equation, in terms of its magnitude (see Appendix 6).

## 6. Construction of empirical test

The empirical test needs to be constructed keeping in mind that many assumptions mentioned in the paper may not hold out to be exactly true in the real world. For example, one of the issues is about stability of the variables.

The firm's dividend policy at a particular point in time might not be completely long term oriented. There can be many factors based on which firms may decide to set their dividend policy for a particular year, for example, number of investments opportunities available, corporate restructuring, change in management, effect of a newly created law and general economic effects on firms' business. While the general trend should be in line with the theory, the short to moderate term explanatory power of the theory might be very less, for there are many factors based on which firms may choose their dividend policy. Also, as the theory argues that the pricing dynamics involve both the management and the investors, the management might set the dividend payout based its own prudential concerns. Even then, it is expected that the market perceptions move towards the "Equal Value Equilibrium" even in presence of management decisions signifying contrary. Yet, in empirical test, it is important to minimise the effect of short-term conditions to see the long-term pattern more clearly.

One of the way is to get a large sample of data over many years. Moreover, the data must be taken for relatively large firms, listed on stock exchange, that are both likely to be considerate of public perception and are mature enough for to take dividend decisions into account as serious issues.

Similarly, to get stable variables, some measures must be taken to account for the situations that might affect values of variables for short term significantly. One of the ways is to take averages of the variables over years to get more stable value. That however, cannot be done here as that will create a problem of weighing different values by the discount factor. So, other measures must be taken. One of the problems faced is in calculating dividend payout ratio. The dividend payout ratio of a firm in a year can be obtained from dividends declared by the firm in the year divided by the total profit accrued by the firm in that year. However, as the dividend that is declared might not be paid in that year, therefore the better measure is to take the value of dividends that are actually paid in that year, instead of just being declared, because the effect of the payment of dividends on the firms' investment potential will be expressed fully, when the dividends are actually paid and the money moves away from the hands of management into hands of investors. However, on the other side, while for calculating the expected rate of return for a firm during a year, it will be more accurate to take into account firm specific factors that might affect rate of return expected from the firm, for simplification, expected rate of return from the whole market for the year are taken. This is not a problem because this allows one to test the validity of M&M model (as the model assumes that rate of expected rate of return for all firms in the market would be, in ideal conditions, same) and any deviation from this would show up in value of coefficients. For calculating growth in earnings,

one has an option of taking revenues, profit before taxes, cash flows, or profit after taxes. In this paper, however, profit after taxes are taken after adding back extraordinary expenses. The profit after taxes have been taken because that amount of money is what will residually increment the value of a company's equity after payment of dividend and taxes on dividend distribution. However, as extraordinary expenses in any year can significantly affect the net profits of the company and thus, the growth rate, and averaging them over the years is not an option, in the test, the growth rate is calculated by adding back extraordinary expenses back to profit after taxes. The tax liability is kept same. Also, instead of comparing change in dividend payout ratio every year, an interval of 5 years is taken to limit effects of any short-term changes.

There is also a problem that while in the study, initial and final dividend payout ratio values have been used, it might be more accurate to use a more stable value of dividend payout ratio as the management and the investors may be basing their decisions not on the dividend payout that is at a particular time, but a more stable payout for the period and deviations from such a trend of dividend payout are merely perceived as fluctuations, which are not instrumental enough for investors and management to change their perception of the stock. However, doing that will lead to complexity of defining how to arrive at that value and such is therefore, not done in the study, whose goal is more aptly defined as conducting a preliminary investigation, to arrive at what can be called a more natural conclusion and thus, limit subjectivity to as minimum as possible.

Further, the hypotheses are put forward in form of two equations. In one equation, change in dividend payout ratio is taken as the dependent variable ( $\Delta k_{f,t,t+T}$ ), allowing us to study the effect of different variables on the payout decision of the management. Ideally, the management will want to construct a perfectly optimum dividend policy, but in absence of knowledge of all conditions existent or going to be existent in future, the management might choose to adopt a more cautious approach as Lintner (1956) suggests, trying to prevent sharp changes in dividend payouts. That is consistent with the Signalling Hypothesis. So, in case the Signalling Hypothesis is correct from management perspective, it is expected that the coefficient of  $k_{f,t}\varphi_{f,t}$  will be less than 1 and instead the management may decide on changing the dividend payout ratio by a constant (relative to the independent variables in the equation) to decrease the gap that would have arisen if the dividend policy had no such change and the expected dividend payout based on Equal Value Equilibrium.

Hence, the equation as to be tested would be

$$\Delta k_{f,t,t+T} = a_1 k_{f,t}\varphi_{f,t,t+T} + a_2 k_{f,t} + c$$

In India, the signalling hypothesis seems to have some validity (Banerjee & Banerjee, 2012) and so does Lintner's Model (Gupta, Dogra, & Vashisht, 2013). The management does seem to consider signalling effect of dividends in setting up dividend policy (Anand, 2004; Baker, & Kapoor, 2015; Baker, & Weigand, 2015). The following hypotheses for test are, thus, generated:

- (1) The value of  $a_1$ ,  $a_2$  and  $c$  is significant.
- (2) The value of  $a_1 / -a_2$  is positive but less than 1.
- (3) The magnitude of  $a_2$  is close to 1 and the value of  $a_2$  is negative.

In second equation,  $k_{f,t}\varphi_{f,t,t+T}$  is taken as a dependent variable, which signifies a theoretical dividend payout increment. Investors and the market are expected to react to dividend decisions made by the firm in accordance to the Equal Value Equilibrium. If there will be investors' preference for dividend, then the coefficient of  $\Delta k_{f,t,t+T}$  will be greater than 1. If there is a preference for dividends that may translate into firms increasing in value by paying higher dividends, such an effect could be seen in coefficient of  $\Delta k_{f,t,t+T}$  being greater than 1 in magnitude (see Appendix 2), and hence, theories that argue for investor preference of dividends can be validated. However, no

constant is expected to be significant if it is easy to buy and sell shares as then investors' can just value the dividends on existing prices instead of setting a constant increment for every year.

Hence, the equation can be stated as:

$$k_{f,t}\varphi_{f,t,t+T} = a_1\Delta k_{f,t,t+T} + a_2k_{f,t} + c$$

In India, there seems to be rejection of irrelevance theory of Miller and Modigliani in India from perspective of management (Baker & Kapoor, 2015). Earlier studies on Indian markets have found positive impact of dividend payout on shareholders' value in, for example, chemical sector (Azhagaiah & Sabaripriya, 2008), pharmaceutical sector (Thirumagal & Vasantha, 2016) and electrical equipment manufacturing sector (Bezawada & Tati, 2017). The following hypotheses for test are, thus, generated:

- (1) The value of  $a_1$  and  $a_2$  is significant, while the value of  $c$  is not significant.
- (2) The value of  $a_1/a_2$  is slightly more than 1.
- (3) The magnitude of  $a_2$  is close to 1 and the value of  $a_2$  is positive.

To distinguish whether a variable is to be interpreted close to a value, or not, a margin of 5% is taken, in all cases. It is to be noted that in both cases the magnitude of  $a_2$  is taken to be close to 1, as over long periods of time, the effect of distortion in cycle is could be presumed to be non-significant. Yet, if such is really the case remains something to be discovered after the actual regression is performed. The time period taken covers substantial number of years both before and after the real estate crisis of 2007–2008 and the effect of such crisis on the cycle could be assumed to be neutralized over such lengths of periods *prima facie*.

### 7. Methodology

The data are collected for the companies listed on Nifty 500 Index from CMIE (Centre for Monitoring Indian Economy) Prowess for a period from FY 2002 to FY 2017 and NSE (National Stock Exchange) website for the same period. In any case, data for any particular field for an observation set was not available, the whole observation set was discarded. The observation set, here, refers to set of all values required for one particular instance of the equation. The variables used in the analysis and their definitions are given in Table 2.

If value of any variable in an observation set was undefined (because of division by zero), the whole observation set was discarded.

**Table 2. The variable definitions as used in analysis of Indian stock market**

Variable	Name	Definition
$k_{f,t}$	Dividend Payout Ratio	The amount of dividends actually paid (including taxes on dividends) by a firm during a financial year divided by profit after tax of the firm in that financial year
$\rho_{f,t,t+T}$	Expected rate of return	Growth in average of all NSE 500 Index closing values in March of a particular year
$g_{f,t,t+T}$	Growth in Earnings	Growth in profit after taxes accrued by a firm in a financial year after adding back value of extraordinary expenses incurred during that year
$\Delta k_{f,t,t+T}$	Change in Dividend Payout Ratio	Change in dividend payout ratio of a firm (final—initial)
$\varphi_{f,t,t+T}$	Dividend Increment Factor	The ratio of value the investor will receive on an amount invested, if the effective rate of interest is equal to the expected rate of return for a firm and the value of his money if it grows by the growth rate of the firm.

A cross-sectional analysis was performed using Ordinary Least Squares (OLS) regression. The independent variables were checked for multi-collinearity by checking for Variance Inflation Factor (VIF). The significance level for VIF was taken to be 5. The data was also tested for heteroscedasticity using White Test. If heteroscedasticity was present, White heteroscedasticity-consistent standard errors and covariance were used.

The significance level for coefficients was chosen as 5%. The analysis was performed separately for the two equations.

### 8. Results and analysis

The descriptive statistics for the data from the Nifty 500 Index are given in Table 3.

#### EQUATION 1

$$\Delta k_{f,t,t+T} = a_1 k_{f,t} \varphi_{f,t,t+T} + a_2 k_{f,t} + c$$

For the analysis, firstly, the data is tested for multi-collinearity by checking Variance Inflation Factor. The results are shown in Table 4.

The Uncentred VIF is much less than 5, so there are no significant problems due to any multi-collinearity that might be present.

Then the data is tested for heteroscedasticity, using White Test. The results are shown in Table 5.

There is heteroscedasticity in the model as the null hypothesis of the White Test is rejected. Hence, to get the value of unbiased coefficients, we have to run regression with White heteroscedasticity consistent standard errors and covariance. The results of the regression are shown in Table 6. The standardized coefficient values are shown in Table 7.

Coefficients of all the variables are found to be significant at 5% level. The coefficient of  $k_{f,t}$  is close to  $-1$ ; there is less than 5% difference in magnitude, and hence the test provides some evidence for the theory. The standardized coefficient of  $k_{f,t} \varphi_{f,t,t+T}$  is close to 0.5, which is way less than 1. The constant term is significant. The goodness of fit, accounting for the number of predictors, is moderate.

All hypotheses for the equation are thus, supported by the results.

Table 3. Descriptive statistics for Nifty 500 data			
	$\Delta k_{f,t,t+T}$	$k_{f,t}$	$k_{f,t} \varphi_{f,t,t+T}$
Mean	0.067	0.267	0.318
Median	0.000	0.175	0.114
Standard Deviation	1.730	0.659	2.263
Skewness	24.438	18.540	15.984
Kurtosis	946.489	494.667	580.761
Number of observations	2503	2503	2503

Table 4. VIF test results for the first equation for Indian data		
Variable	Coefficient Variance	Uncentred VIF
c	0.00062	1.181
$k_{f,t}$	0.00121	1.116
$k_{f,t} \varphi_{f,t,t+T}$	0.00010	1.020

**Table 5. White test results for the first equation for Indian data**

P-Value—F Test	0.000
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**Table 6. Regression test results for the first equation for Indian data**

Variable	Coefficient	Standard Error	P Value
<i>c</i>	0.0182	0.0249	3.19E-13
<i>k<sub>f,t</sub></i>	-1.0239	0.0348	1.52E-163
<i>k<sub>f,t</sub>φ<sub>f,t,t+T</sub></i>	0.4988	0.0101	0
R Squared		0.560	

**Table 7. Standardized coefficients for the first equation for Indian data**

Variable	Standardized Coefficient Value
<i>C</i>	0.0177
<i>k<sub>f,t</sub></i>	-1.0000
<i>k<sub>f,t</sub>φ<sub>f,t,t+T</sub></i>	0.4871

Equation (2)

$$k_{f,t}\varphi_{f,t,t+T} = \alpha_1\Delta k_{f,t,t+T} + \alpha_2k_{f,t} + c$$

For the analysis, firstly, the data is tested for multi-collinearity by checking Variance Inflation Factor. The results are shown in Table 8.

The Uncentred VIF is much less than 5, so there are no significant problems due to any multi-collinearity that might be present.

Then the data is tested for heteroscedasticity, using White Test. The results are shown in Table 9.

There is heteroscedasticity in the model as the null hypothesis of the White Test is rejected. Hence, to get the value of unbiased coefficients, we have to run regression with White heteroscedasticity consistent standard errors and covariance. The results of the regression are shown in Table 10; the standardized values are shown in Table 11.

Coefficients of all the variables (excluding the constant) are found to be significant and positive, indicating that there is a relationship between the variables as expected. The coefficient of *k<sub>f,t</sub>*, is close to 1; there is less than 5% difference. The coefficient of  $\Delta k_{f,t,t+T}$ , after standardization is more than 1. The constant term is not significant. The goodness of fit, accounting for the number of predictors, is moderate.

All hypotheses for the equation are thus, supported by the results.

### 9. Application on US market and contrast with India

The model is also applied in case of US markets. The companies listed on S&P 500 are chosen for the analysis for a period starting from 2008 to 2018. The data for the firms is collected from

**Table 8. VIF test results for the first equation for Indian data**

Variable	Coefficient Variance	Uncentred VIF
<i>c</i>	0.00125	1.2059
$\Delta k_{f,t,t+T}$	0.00276	1.3473
<i>k<sub>f,t</sub></i>	0.00049	1.1583

**Table 9. White test results for the second equation for Indian data**

P-Value—F Test	0.000
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**Table 10. Regression test results for the second equation for Indian data**

Variable	Coefficient	Standard Error	P Value
<i>c</i>	-0.0341	0.0480	0.477
$\Delta k_{f,t,t+T}$	1.0689	0.1711	5.00E-10
$k_{f,t}$	0.9863	0.1273	1.36E-14
R Squared		0.492	

**Table 11. Standardized coefficients for the first equation for Indian data**

Variable	Standardized Coefficient Value
<i>c</i>	-0.0345
$\Delta k_{f,t,t+T}$	1.0837
$k_{f,t}$	1.0000

Calcbench and the data for the index is taken from Yahoo Finance. A three-year gap is taken, instead of the five-year gap, in case of Indians markets. The rest of the procedure is same, except that the financial year is taken from January to December and not April to March.

The descriptive statistics for the data from the S&P 500 Index are shown in Table 12.

The regression results for both the equations are presented in Table 13 and Table 14. The standardized coefficient values are shown in Table 15 and Table 16.

EQUATION 1

$$\Delta k_{f,t,t+T} = a_1 k_{f,t} \varphi_{f,t,t+T} + a_2 k_{f,t} + c$$

EQUATION 2

$$k_{f,t} \varphi_{f,t} = a_1 \Delta k_{f,t,t+T} + a_2 k_{f,t} + c$$

The value of coefficients after standardization are

EQUATION 1

EQUATION 2

It is evident that in US markets, there is a strong model oriented approach. Managers do not base their decisions as much on investors' perceptions directly, unlike in case of Indian markets, as on the need of the company or their own personal decisions. Similarly, investors' base their decisions on models and thus the attitude towards appreciation of the model-oriented approach is mutual which is necessary otherwise the management would be in error of basing their policy on something which is completely foreign to attitude of the investors. The results of the study are consistent with the findings of Pruitt and Gitman (1991), Baker and Powell (2000) and Baker, Veit, and Powell (2001). Pruitt and Gitman (1991)



**Table 12. Descriptive statistics for S&P 500 data**

	$\Delta k_{f,t,t+T}$	$k_{f,t}$	$k_{f,t}\varphi_{f,t,t+T}$
Mean	-0.029	0.409	0.175
Median	0.001	0.236	0.264
Standard Deviation	4.826	4.332	12.935
Skewness	-30.979	43.212	-54.426
Kurtosis	1545.268	2280.337	3184.118
Number of observations	3752	3752	3752

**Table 13. Regression results for the first equation for US data**

Variable	Coefficient	Standard Error	P Value
$c$	0.3529	0.0351	1.82E-23
$k_{f,t}$	-0.9445	0.0324	1.88E-168
$k_{f,t}\varphi_{f,t,t+T}$	0.0241	0.0114	0.0345
R Squared		0.810	

**Table 14. Regression results for the second equation for US data**

Variable	Coefficient	Standard Error	P Value
$c$	1.0182	0.2526	0.0001
$\Delta k_{f,t,t+T}$	-2.0338	0.7458	0.0064
$k_{f,t}$	0.3353	0.1534	0.0289
R Squared		0.633	

**Table 15. Standardized coefficients for the first equation for US data**

Variable	Standardized Coefficient Value
$c$	0.3736
$k_{f,t}$	-1.0000
$k_{f,t}\varphi_{f,t,t+T}$	0.0255

**Table 16. Standardized coefficients for the second equation for US data**

Variable	Standardized Coefficient Value
$c$	3.0366
$\Delta k_{f,t,t+T}$	-6.0656
$k_{f,t}$	1.0000

conducted a survey of highest-ranking financial officers of around 1000 largest US firms in 1988 and found from the 144 responses that they received that managers believed “projected net earnings,” “recently enacted dividend changes,” “current dividend payout ratio,” and “level of cash flows,” as the four most explanatory factors in their dividend decisions, with previous earnings levels and capital investment requirements jointly ranking fifth. Baker and Powell (2000) conducted a similar study on firms listed on New York Stock Exchange and found that “level of current and expected future earnings,” “pattern or continuity of past dividends,” “concern about maintaining or increasing stock price,” and “concern that dividend change

may provide a false signal to investors,, were the four most important factors for the managers while deciding dividend policy. Baker, Veit and Powell (2001) conducted a survey of managers of firms with stocks trading on Nasdaq and which paid dividends for every quarter of 1996 and 1997. Their finding was that concern about dividend policy affecting stock price was significantly less than concerns about creation of payout policy in line with the “pattern of past dividends,, “stability of earnings,, “level of current earnings,, and “level of expected future earnings,, in managers’ decisions about dividend payouts. None of the four most important factors has anything to do with the investor perception directly. Interestingly, Baker and Kapoor (2015) found in their study of National Stock Exchange listed firms, that managers of these firms believe that investors in their firms prefer a certain dividend stream to uncertain stock price appreciation, though in even that study the concern about dividend changes affecting stock price or consideration of needs of shareholders as a reason for a particular payout decision were overshadowed by similar factors as found in Baker and Powell’s (2000) study on firms listed in the United States. However, Baker and Kapoor also found that 73.5% of the managers agreed to the proposition that a firm’s stock price usually increases when it unexpectedly increases its dividend or pays a dividend for the first time.

It also seems to be the case that dividend payouts above a fixed value are strongly disliked, which is different than what is the case in Indian market. That is not surprising considering around 80% of the constituents of S&P 500 index based on market value are owned by institutional investors (as in April 2017) and payment of dividends above the value as may seem fit to these investors may signal these investors that there is a difference between their and management’s view about future prospects of the firm. The observation also falls in line with the general idea of agency costs being reduced by presence of institutional investors and hence the role of dividends as tools in decreasing such costs has reduced importance. This is in line with Fama and French (2001) study in which it was found that firms in US markets were less likely to pay dividends in 1999 than in 1978. Also, the study shows that US markets are relatively more efficient than Indian markets.

## 10. Discussion

The main motive of the paper was to develop an equilibrium theory or an ideal case theory, and then using that theory to arrive at an equation, which can be used to identify different dividend policy mechanisms working in a market and their efficacy. Any distortion in the equilibrium creates an opportunity for specific theories of dividend policy to spring into action, as the results suggest. However, the very reason the equal value equilibrium equation is applicable in deciphering any distortion is because the equilibrium theory is correct. One of the interesting things to note is that studying results of the first equation, we find that while one coefficient is higher than 1, the other is less than 1. In the ideal case, both should have been equal to 1. There seems to be a deviation, which is expected because many of the ideal case assumptions are not completely in line with the actual mechanisms of the market, however there seems to be an accompanied balancing effect towards the ideal scenario.

In Finance, one may not just look at the empirical factors associated with a security as they exist, like risk and return, but the very nature of the security itself, something which may be called “Financial Essentialism”. While investing in a security, people also look at what the security looks like and not just how much risk adjusted return it can provide. Temporal but non-perpetual securities (like non-perpetual bonds) must be distinguished from non-temporal securities (like stocks), which may be distinguished from temporal but perpetual securities (like perpetual bonds). The very nature of the security would define any a priori considerations and perceptions about the security upon which empirical measures of the performance of the security would be built on. Deriving key postulates for a security and supplanting them with performance indicators might serve as a better measure to value a security.

The value of a share, for example, among other things is determined by management decisions and investors' perceptions. While the management and investors (excluding manipulators and speculators) may adopt different mechanisms, their goal is a lot similar, at least in an ideal case. Instead of merely value maximization, which is done by removing inefficiencies in the business and market information, they would supplant it with desire for the perpetual existence of the company. The different dividend policy mechanisms interact with each other and keep the value of the company on a nominal trend line. While it is possible that value of a fully efficient company may increase for short amount of time, because of investor perception, the principle of arbitrage, would in ideal case, keep the value growth in check. It will be impossible for any firm to generate or lose significant amount of extra inflow of money consistently without any change in its efficiency.

However, that is not the only thing that is important. Moving from realm of principles to the methodology, because of interdependent nature of variables associated with company financials, it is also better to study the effect of the variables cumulatively and divide the different contributing factors based on the dynamics affecting them, rather than their type or source. It is quite possible that multiple dividend theory mechanisms are in action simultaneously and any frame of time or segment of the market from which the data is captured may show overbearing effect of one over the other, which may not be the case for any other period of time or market segment. That is not to say that techniques for isolation of one effect over another are not important, but in presence of theoretical justifications on all sides, the issue is rather left unsolved by consideration of such effects independently of each other.

The main thesis behind the model is that dividends are not primary management selection criterion. The payment of dividends is dependent on a more fundamental aspect of equalizing firm value across time for firms expecting to last till perpetuity. That aspect forms the ground for all different roles of dividends discussed in literature like use as signals, or tools to reduce agency costs. Thus, while dividends can alter the value of the firm (contrary to what Miller and Modigliani (1961) suggest), the equalization of firm value (across time) is the goal behind payment of dividends. That is how the Gordon's (1959, 1963) view is harmonized with the view of Miller and Modigliani. It is to be noted that the claim is not that payment of any amount of dividend will lead to equalization of firm value. The equalization of firm value, as a motive, is the determinant of dividend policy and the dividends are instituted in such a way so that the firm value is equalized. The issue with the M&M model is that it assumes that value of the firm is contingent on the expected rate of return and the arbitrage affects the rate of return instead of value of the firm. This view is problematic because value is the precursor to expected rate of return and not the other way around. A rational investor will set his investment goals based on his consumption pattern, such that he is able to consume a set quantity of products every year, no matter the price of products. There will be deviations from it based on the stage of life the investor is in and the circumstances and events in his life. However, over a large population with characteristics that do not change drastically (e.g. percentage of youth, mortality rate, life expectancy), these deviations will tend to minimum. For a uniform consumption to occur, the value of the products appropriately discounted must remain constant, no matter the expected rate of return or interest rate or inflation rate. Similarly, assuming that value of all the products is in equilibrium (the values of different products may be unequal), the products are expected to show an increase in value in a constant proportion in an ideal situation where supply and demand curves do not change and the efficiency of extraction and sale of products remains also the same. The same is true for the firm value. The arbitrage is present, however it is just acting in a different way.

The results of the paper, point out interesting facts about Indian markets. Not only the management of the Indian firms seem to accept the importance of signalling power of dividends, the preference of dividends among investors' is also quite present. This makes sense, because in earlier

studies Indian markets have been found to be inefficient (Gupta & Parikshit, 2007; Harper & Jin, 2012; Mehla & Goyal, 2012). Thus, dividend payouts become an important way of predicting future prices of shares. Similarly, the comparison of US markets with India using the methodology points out interesting results that are intuitive. The magnitude of the coefficients, in both cases, seem to point out respective efficacy of the mechanisms in action, which can be compared to markets in other countries, to get an estimate of differential effects of the theoretical mechanisms in different types of markets.

## 11. Conclusions

An “Equal Value Equilibrium model” for the dual benefits of testing of empirically observable effects of dividend theories in markets and also presenting general outline of the behaviour of stock markets in an idealized situation, is derived with theoretical justification. The model relies on its simplicity and potency to present effects of different theoretical mechanisms in such a manner that they can be studied easily, while attempting to harmonise different theories of dividend policy.

What investors value is neither dividends or earnings per se, but what they value is their stake in company and any abnormal gains associated with that stake. In contrast, what the management cares about is that firm remains working till perpetuity because that is related to their job security. Management does not care about abnormal gains to the extent investors do because they do not get same amount of benefits for any abnormal gains, unless they either own a stake in the company (in which case they are investors in the company) or there is some incentive structure for abnormal gains. However, considering management has better knowledge of which gains are abnormal and won't be persistently acquirable in future, the value of any such incentive is short lived. The actions of the investors thus, to squeeze out any abnormal gains by use of arbitrage from the firm and the actions of management to not go for risk-based approaches threatening their job security, mean that the value of the company, barring any efficiency change, is expected to remain constant over the years.

Unlike as previous studies on the subject and prevalent theories on the dividend payout decisions point out, it is not the case that dividends perform some rigid primary function as academic literature points out. The theories that point out a specific primary function of the dividends at the exclusion of other functions are severely deficient in explaining many empirical tests in favour of the other functions. Stressing on making better models for validation of these theories has not solved the puzzle but has complicated it even more as now few models that make use of quite a few variables have come up. It would be surprising if as these studies suggest, the management really uses an extensive modelling based on firm's financial parameters and sets the dividend payout based on extensive regression involving coefficients that alter with time and economic conditions. And if that is really the case, then the surveys seem to be a better way of figuring the dividend determinants rather than model based regressions.

The actual role of dividends is to just equalize firm value to an ideal value for a given level of efficiency and firm and market conditions, which can be assumed to be close to a stable value with similar parameters. Even if such equalization is not done by use of dividends, it is expected to happen on its own as investors will eventually price the firm to its fair value, however the inefficiencies and delay in that process is what gives rise to inconsistent instances of verification of prevalent dividend theories in empirical studies. The actual mechanism behind the applicability of prevalent theories in different markets is the process of firm value equalization.

The theory of “Equal Value Equilibrium” also leads to two pragmatic conclusions. Firstly, for the investors, the best method of investing in absence of any knowledge of future efficiency change of the firm is selecting those firms whose value in current period has changed significantly from their

expected value without any observable change in efficiency. Secondly, for the managers more importantly, the best way of setting dividend payout is to set the value of dividend equal to a value which will equalize their firm value to a past stable value, of course, in the case, when the money that is paid off as dividend cannot be used to increase operational or financial efficiency. Thus, the dividend decision is a residual decision, after meeting operational, investing and capital budgeting costs and the management needs to keep a track of expected rate of return for the market in deciding the optimal dividend payout.

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#### Limitations of the Study and Future Recommendations

The study is only as good as its assumptions. Also, it is only conducted in two markets and may show different results in markets of other countries. Yearly data prevents studying causal direction in more detail. The validity of the model derived from the proposed theory need to be studied in other countries and markets with different features than the Indian and US markets. Also, a better way of deriving more stable variables for the study needs to be discussed to get more stabilized results. A study of causality would also be beneficiary. Taking quarterly data and arranging it in a manner to study which effect precedes what would clarify how the application of theory in real world must be undertaken. One of the other interesting points of research would be to see how much the theory is actually applicable in the real world markets in terms of firm value and to which extent the value of the firms might increase or decrease in real terms, accounting for the opportunity cost. Further, the study of ways to incorporate effects of other dividend policy theories in the model and pronouncing the isolation of effects of such theories also seems to be a good future projects.

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### Appendix 1

The value of a firm, stated by Miller and Modigliani (1961) is, as follows:

$$V(t) = \frac{1}{(\rho(t) + 1)} [D(t) + V(t + 1) - m(t + 1) \times p(t + 1)]$$

Where-

$V(t)$  = Value of the firm at 't'

$\rho(t)$  = Expected rate of return

$D(t)$  = Dividends paid by the firm during the period 't'

$V(t + 1)$  = Value of the firm at 't + 1'

$m(t + 1)$  = The number of shares sold during 't' at the ex  
 – dividend closing price 'p(t + 1)'

Any change in payment of dividends, Miller and Modigliani (1961) argued would be absorbed in either future value of the firm or the value at which the new shares are sold, leaving the effect of dividends paid on the current value of the firm to be zero. If the expected rate of return remains constant, no matter the dividend payout, then the value of the firm in the next period would be dependent on the dividends paid and value of the new shares sold, in addition to the value of the firm in the current period. On a per share basis, however, the value of the firm in the next period would be dependent only on value of the firm and dividends paid in the current period. For a higher dividend paid, the future value of the firm will be lower.

The value of a corpus of shares, thus, on any payment of dividend, would increasingly become smaller (when appropriately discounted), as viewed from a particular point in time, and thus would necessarily reach a value of termination, in terms of what was earlier described as “quantized nature of money”.

$$V'(t + 1) = \{\rho(t) + 1\}[V(t) - D(t)]$$

Where-

$V'(t + 1)$  = The value of the initial corpus at time 't + 1'

As viewed from time period “t”, the value of the corpus of shares at time 't + 1' would be

$$V_t(t + 1) = \frac{V'(t + 1)}{\rho(t) + 1} = V(t) - \frac{D(t)}{\rho(t) + 1}$$

The equity stock would thus, behave exactly like a perpetual bond, wherein payment of dividends is akin to payment of coupon on dividends and the value of the stock would reduce each time, the dividend is paid, assuming the discount rate remains constant. Yet unlike, in case of a perpetual bond, it is not expected that the limiting value of the firm at infinity would be zero, for unlike bond which is basically an extended payment of a fixed value of money, the equity stock represents ownership over profits of the company, which, if the firm never ceases to exist, would not become zero, and with the growth in firm's business, might actually remain stable.

However, Gordon (1963) argued that change in payment of dividends would reduce the opportunity cost of the investor for the firm as the dividends represent cash in hand which is certain over

any changes in price of the stock, which is by nature, riskier. Let us assume that the firm decided to revise the amount of dividend it pays. Hence

$$V'_t(t+1) = \frac{V''(t+1)\{\rho(t)+1\}}{\rho'(t)+1} = \frac{V(t)\{\rho(t)+1\}}{\rho'(t)+1} - \frac{D'(t)}{\rho'(t)+1}$$

Where

$V''(t+1)$  = The value of the initial corpus at time 't + 1' after revision

$D'(t)$  = Revised amount of dividends paid

$\rho'(t)$  = Revised rate of return dependent on payment of dividends

Now, one can apply the reasoning of Miller and Modigliani, with a slight modification. The values of firm, whether the dividend is paid or not, as estimated with respect to a fixed point in time, would be equal, and hence such value of the firm would be independent of the amount of dividend paid, as pointed out in Miller and Modigliani Model.

Hence,

$$V_t(t+1) = V'_t(t+1)$$

Or,

$$V(t) - \frac{D(t)}{\rho(t)+1} = \frac{V(t)\{\rho(t)+1\}}{\rho'(t)+1} - \frac{D'(t)}{\rho'(t)+1}$$

Rearranging terms, we get

$$\frac{V(t)\{\rho(t) - \rho'(t)\}}{\rho'(t)+1} = \frac{D'(t)\{\rho(t)+1\} - D(t)\{\rho'(t)+1\}}{\{\rho'(t)+1\}\{\rho(t)+1\}}$$

Simplifying further

$$V(t)\{\rho(t) - \rho'(t)\} = \frac{D'(t)\{\rho(t)+1\} - D(t)\{\rho'(t)+1\}}{\rho(t)+1}$$

Assuming that initially, the dividend paid was zero

$$V(t) = \frac{D'(t)}{\rho(t) - \rho'(t)}$$

Now,  $\rho'(t)$  represents the expected rate of return when the dividend  $D'(t)$  is paid, while  $\rho(t)$  is the expected rate of return when no dividend is paid.

When no dividend is being paid, the opportunity cost entails both a fixed interest rate, to account for all passage of time, and inflation, and an added component for risk. However, when a stable and static amount of dividend is being paid, the opportunity cost only entails the component of risk, as the fixed rate is already being paid in form of dividends.

If  $R_f$  is fixed component of the opportunity cost and  $R_v$  is the risk-based variable component, at a time "t", then

$$V(t) = \frac{D'(t)}{R_f(t) + R_v(t) - R_v(t)}$$

$$V(t) = \frac{D'(t)}{R_f(t)}$$

This is similar to Tinbergen's (1933) equation in case of static dividends,

$$P = \frac{D_c}{Y}$$

But if the dividends are dynamic, the equation will be slightly different. Taking previous equation.

$$V(t)\{\rho(t) - \rho'(t)\} = \frac{D'(t)\{\rho(t) + 1\} - D(t)\{\rho'(t) + 1\}}{\rho(t) + 1}$$

Let's say that the both dividend payout have a stable component  $D'_s(t)$  and  $D_s(t)$  and a variable component  $D'_v(t)$  and  $D_v(t)$ . Hence,

$$V(t)\{\rho(t) - \rho'(t)\} = \frac{\{D'_s(t) + D'_v(t)\}\{\rho(t) + 1\} - \{D_s(t) + D_v(t)\}\{\rho'(t) + 1\}}{\rho(t) + 1}$$

$$V(t)\{\rho(t) - \rho'(t)\} = \frac{D'_s(t)\rho(t) - D_s(t)\rho'(t) + D'_s(t) - D_s(t) + D'_v(t)\rho(t) - D_v(t)\rho'(t) + D'_v(t) - D_v(t)}{\rho(t) + 1}$$

Let's assume that that initial dividend payout was stable, and so  $D_v(t) = 0$ .

$$V(t)\{\rho(t) - \rho'(t)\} = \frac{D'_s(t)\rho(t) - D_s(t)\rho'(t) + D'_s(t) - D_s(t) + D'_v(t)\rho(t) + D'_v(t)}{\rho(t) + 1}$$

Also, let's assume  $D'_s(t) = \gamma D'(t)$  and hence  $D'_v(t) = (1 - \gamma)D'(t)$ .

$$V(t)\{\rho(t) - \rho'(t)\} = \frac{\gamma D'(t)\rho(t) - D_s(t)\rho'(t) + \gamma D'(t) - D_s(t) + (1 - \gamma)D'(t)\rho(t) + (1 - \gamma)D'(t)}{\rho(t) + 1}$$

Simplifying,

$$V(t)\{\rho(t) - \rho'(t)\} = \frac{-D_s(t)\rho'(t) - D_s(t) + D'(t)\rho(t) + D'(t)}{\rho(t) + 1}$$

$$V(t)\{\rho(t) - \rho'(t)\} = \frac{-D_s(t)\rho'(t) - D_s(t)}{\rho(t) + 1} + D'(t)$$

The expected rate of return can also be divided into two parts, corresponding to the stable and variable part of the dividend, that is,

$$\rho'(t) = \rho'_s(t) - \rho'_v(t)$$

Hence

$$V(t)\{\rho(t) - \rho'_s(t) + \rho'_v(t)\} = \frac{-D_s(t)\rho'(t) - D_s(t)}{\rho(t) + 1} + D'(t)$$

Now,  $\rho(t) - \rho'_s(t) = R_f(t)$  for similar reasons as mentioned above. Hence

$$V(t)\{R_f(t) + \rho'_v(t)\} = \frac{-D_s(t)\rho'(t) - D_s(t)}{\rho(t) + 1} + D'(t)$$

$$\text{Let } \rho'_v(t) = \beta R_f(t)$$

$$V(t)\{(1 + \beta)R_f(t)\} = \frac{-D_s(t)\rho'(t) - D_s(t)}{\rho(t) + 1} + D'(t)$$

$$V(t)R_f(t) = \frac{-D_s(t)\rho'(t) - D_s(t)}{\{\rho(t) + 1\}(1 + \beta)} + \frac{D'(t)}{(1 + \beta)}$$

As,  $D_s(t)$  is stable value of dividend, it can be expected to remain constant, with respect to time, for at least short to moderate durations.  $D_s(t)$  and  $\rho(t)$  will be independent of  $D'(t)$ .

So,

$$V(t)R_f(t) = c + \alpha D'(t)$$

This is very similar to Tinbergen's (1939) equation when dividend payout varies.

$$W = P \times Y = c + \alpha D$$

## Appendix 2

Let us assume that the book value of equity of a firm "f" at a time "t" is given by  $BE_{f,t}$ . After "n" periods, the book value of equity of the firm could be derived as follows:

$$BE_{f,t+nT} = BE_{f,t} \prod_{i=1}^n (1 + roe_{f,t,t+iT}) \tag{A2.1}$$

Where

$T = \text{Length of one period}$

Let  $\overline{roe}_{f,t,t+T}$  be such that  $(1 + \overline{roe}_{f,t,t+T})^n = \prod_{i=1}^n (1 + roe_{f,t,t+iT})$ .

$$BE_{f,t+nT} = BE_{f,t} (1 + \overline{roe}_{f,t,t+T})^n \tag{A2.2}$$

However, the book value of equity of the firm at time "t+ Nt" needs to be discounted to get a value that can be compared to the book value at time "t" in terms of worth of money.

$$BE_{f,t+nT,t} = BE_{f,t} \frac{(1 + \overline{roe}_{f,t,t+T})^n}{\prod_{i=1}^n (1 + \rho_{f,t,t+iT})} \tag{A2.3}$$

Let  $\bar{\rho}_{f,t,t+T}$  be such that  $(1 + \bar{\rho}_{f,t,t+T})^n = \prod_{i=1}^n (1 + \rho_{f,t,t+iT})$ .

$$BE_{f,t+nT,t} = BE_{f,t} \frac{(1 + \overline{roe}_{f,t,t+T})^n}{(1 + \bar{\rho}_{f,t,t+T})^n} \tag{A2.4}$$

Assuming the firm continues to perpetuity, and putting  $n \rightarrow \infty$ , we get the following:

$$\lim_{n \rightarrow \infty} BE_{f,t+nT,t} = \lim_{n \rightarrow \infty} BE_{f,t} \left[ \frac{1 + \overline{roe}_{f,t,t+T}}{1 + \bar{\rho}_{f,t,t+T}} \right]^n \tag{A2.5}$$

Assuming  $\overline{roe}_{f,t,t+T} > 0$  and  $\bar{\rho}_{f,t,t+T} > 0$ , if  $\overline{roe}_{f,t,t+T} < \bar{\rho}_{f,t,t+T}$ , then  $\lim_{n \rightarrow \infty} BE_{f,t+nT,t}$  would be equal to zero. That would violate the assumptions of continuation till perpetuity. Hence, it follows that  $\overline{roe}_{f,t,t+T}$  cannot be lesser than  $\bar{\rho}_{f,t,t+T}$ .

Similarly, if  $\overline{roe}_{f,t,t+T} > \bar{\rho}_{f,t,t+T}$ , then  $\lim_{n \rightarrow \infty} BE_{f,t+nT,t}$  would be equal to infinity. That cannot be the case also because that would mean that market value of equity of the firm “*f*” at time “*t*” would also be infinity. Hence, it follows that  $\overline{roe}_{f,t,t+T}$  cannot be greater than  $\bar{\rho}_{f,t,t+T}$ .

Hence, it follows that  $\overline{roe}_{f,t,t+T} = \bar{\rho}_{f,t,t+T}$ .

$\overline{roe}_{f,t,t+T}$  and  $\bar{\rho}_{f,t,t+T}$  are nothing but long-term rate of return on equity and long-term expected rate of return.

### Appendix 3

As there is difference in the actual value of a stock and the investors’ perception of the value of such stock, a formation of stock market cycles is possible. Such cycles contain periods of a bull market followed by periods of bear market. The length of such periods may be anything, there may be intra-day cyclical movements in a stock’s prices, and there may be longer cyclical movements in stock market prices extending over several years. For example, Gonzalez, Powell, Shi, and Wilson (2005) identified such cycles extending over different periods of time.

One of the reasons why such cycles may persist is because of information gap between the firm management and investors. Few investors may perceive a move by management of a company as a sign of future growth in the company, prompting them to buy stock of that company at an increased price. This initial rise in prices may signal other investors wrongly about the future prospects of the company and they may contribute further to rise in prices by following the lead of investors who invested money in the firm initially. However, such an increase in prices may not be backed by any change in operational or investment efficiency of the firm and the results in future may not be as good as the investors who bought shares on premium thought they will be. This may cause few investors to take money out of the stock, causing a decline in prices, which has a potential of being followed by other investors.

While many such cycles of different periods may exist at a given time, the cumulative effect of such cycles for few periods may become quite insignificant. In such cases, the regression equation is likely to mimic the ideal equation, as in the ideal equation, only the factors which have a direct effect in changing the value of the stock are taken in account and the factors which may be merely causing a perception of higher or lower stock value are not included. In other cases, where the effect of cycles is prominent, any departure from the ideal equation could be captured by a change in the slope of the linear equation. Taking Equation (6.1), for example

$$\Delta k_{f,t,t+T} = a_1 k_{f,t} \varphi_{f,t,t+T} + a_2 k_{f,t} + c$$

It is possible to rewrite the equation as:

$$\Delta k_{f,t,t+T} = -a_2 \left( \frac{a_1}{a_2} k_{f,t} \varphi_{f,t,t+T} - k_{f,t} + \frac{c}{a_2} \right)$$

The reason why  $-a_2$  is taken as to standardize the equation is because the ideal value of the coefficient of  $k_{f,t}$  is known with the most certainty. That is due to the fact that it is known that  $k_{f,t} + \Delta k_{f,t,t+T} = k_{f,t+T}$ . The value of coefficient is thus, known by through the very method used to derive the equation.

This raises the question as to why the value of  $-a_2$  would be different than 1 in the first place during a bull or a bear cycle. One of the reasons for that might be because in such situations, dividend payout will be dependent on previous payouts.

$$k_{f,t+T} = a_1 k_{f,t} \varphi_{f,t,t+T} + (a_2 + 1) k_{f,t} + c$$

Where  $a_2 + 1 \neq 0$

This means that a part of future dividend payout will be directly some percentage of past dividend payout. And thus, irrespective of the changes in expected rate of return or rate of growth in earnings, the future dividend payout will have to move in a general trend if the value of  $(a_2 + 1)k_{f,t}$  dominates value of other terms in the equation, in order to keep the value of the firm constant. If such does not occur in way that satisfies the equation, then it would mean that the value of such stock in the market is more or less than what its theoretical value, according to the model, is and the gap between the values is widening over time.

The same is true when the equation is expressed in the second form.

$$k_{f,t} \varphi_{f,t,t+T} = a'_1 \Delta k_{f,t,t+T} + a'_2 k_{f,t} + c'$$

While investors' perceptions may be affected by any increase in dividend payout, they must not increase by any proportion of the past dividend payout except 1 for a long time period, otherwise, if value of  $a'_2 k_{f,t}$  dominates, then even without any contribution of other factors present in the equation, the investors' expectation of dividend payout will increase or decrease ad infinitum just based on presence of past dividend payouts.

In case of presence of a cycle, the observed departure can be explained in one of the two ways. For example, with reference to Equation (6.1), we know that

$$\Delta k_{f,t,t+T} = a_1 k_{f,t} \varphi_{f,t,t+T} + a_2 k_{f,t} + c$$

Now, if it is true that a change in dividend payout sends a signal to investors, as has been supported by studies such as by Pettit (1972), Aharony and Swary (1980), Asquith and Mullins (1983), Chen and Wu (1999), Stacescu (2006), Baker and Kapoor et al. (2015), then a change in price of a stock could be assumed to be a function of a change in dividend payout. If such a change in payout is also unexpected and ungrounded in any actual improvement in company's financials, it could be presumed as a speculative change. The speculative price,  $P_s$ , thus could be modelled as:

$$P_{s,f,t+T} = F_s(\Delta k_{f,t,t+T})$$

Putting value of  $\Delta k_{f,t,t+T}$  from Equation (6.1) in the above equation, we get

$$P_{s,f,t+T} = F_s(a_1 k_{f,t} \varphi_{f,t,t+T} + a_2 k_{f,t} + c)$$

Now, for there to be no speculative cycle, that is an excess increment and then decrement of value of share, speculative price would have to be independent of the actual price of share. There are only two ways in which this could be the case. Either all the different variables on the right hand side of the equation are independent of price of the share or at least few of them are function of price of share and somehow their effects are cancelled. Assuming that none of the coefficients are a function of price of share, which seems to be the case, as to obtain a static value of these coefficients with respect to differently priced of stocks on the index on which the study is performed would be almost impossible, both the cases are looked into.

#### Case-I All variables are independent of price of share

$k_{f,t}$  being independent of price of share is a generalized empirical consequence of Miller and Modigliani's hypothesis being correct insofar that amount of dividend paid does not affect stock price.  $\varphi_{f,t,t+T}$  consists of two variables:  $\rho_{f,t,t+T}$  and  $g_{f,t,t+T}$ .  $\rho_{f,t,t+T}$  being independent of price of share

is consistent with Miller and Modigliani (1961) proof of dividend irrelevance and in view of proponents of the hypothesis, a consequence of rational behaviour of investors and process of arbitrage.  $g_{f,t,t+T}$  can be stated as  $roe_{f,t,t+T}(1 - k_{f,t})$ , wherein  $roe_{f,t,t+T}$  is return on equity of a firm “P” for a period from “t” to “t + T”. Because the model already assumes return on equity to be a constant for a given firm,  $g_{f,t,t+T}$  being independent of price of the firm is also a consequence of Miller and Modigliani’s dividend irrelevance hypothesis being correct.

Hence, when Miller and Modigliani’s hypothesis holds for a given market, the speculative pricing of securities would be non-significant, which is not surprising considering that the hypothesis assumes rational behaviour of investors, imputed rationality and symmetric market rationality.

Case-II All variables are not independent of price of share but the effect of price of share is cancelled as a net consequence

There are various ways in which such could be the case, however, only a few trivially true cases will be considered in the paper. Because  $g_{f,t,t+T}$  is a function of  $k_{f,t}$  and  $k_{f,t}$  is present in two terms on the right hand side of the equation,  $k_{f,t}$  must be a function of price of share. The Equation (6.1) can be written as:

$$\Delta k_{f,t,t+T} = a_1 k_{f,t} \frac{1 + \rho_{f,t,t+T}}{1 + (1 - k_{f,t})roe_{f,t,t+T}} + a_2 k_{f,t} + c$$

Assuming, as  $roe_{f,t,t+T}$  is a constant -

$$k_{f,t}roe_{f,t,t+T} \ll 1 + roe_{f,t,t+T}$$

We get

$$\Delta k_{f,t,t+T} = a_1 k_{f,t} \frac{1 + \rho_{f,t,t+T}}{1 + roe_{f,t,t+T}} + a_2 k_{f,t} + c$$

As c is constant, for  $\Delta k_{f,t,t+T}$  to be independent of price of share, following is one possible solution

$$a_1 k_{f,t} \frac{1 + \rho_{f,t,t+T}}{1 + roe_{f,t,t+T}} = -a_2 k_{f,t}$$

This follows from the idea that a change in value of dividend payout ratio that is not grounded in any respective change in financial position is unjustified and allows potentiality of speculative appreciation and depreciation of prices. In a stable equilibrium situation, value of  $a_1 k_{f,t} \frac{1 + \rho_{f,t,t+T}}{1 + roe_{f,t,t+T}} + a_2 k_{f,t}$  would be equal to zero.

Now, putting  $a_2 = -1$ , for standardization and assuming that  $k_{f,t} \neq 0$

$$a_1 \frac{1 + \rho_{f,t,t+T}}{1 + roe_{f,t,t+T}} = 1$$

In an ideal situation, the expected rate of return on an investment, to be reasonable would be equal to return on equity on the investment. It cannot be more than that, for there is no more money accrued from investment, which can be paid to shareholders, and if it is less, it means a part of the net profits that belong to shareholders is going to someone else, which is a very peculiar situation. Normally, it is reasonable to expect that  $\rho_{f,t,t+T} = roe_{f,t,t+T}$ . However, the management may not immediately set a dividend payout that is fully reflective of a particular return on equity, as return on equity may not remain constant in reality unlike what is assumed in the paper. Hence, the management may display an aversion to setting up a dividend payout that they have to



reduce in future. The value of  $a_1$ , when  $a_2 = -1$  will display the extent of this aversion and conservatism. When  $a_2 \neq -1$ ,  $a_1 / -a_2$  can function as a coefficient that may display the extent of conservatism of management towards dividend policy among other things. Hence, use of  $a_2$  as a standardizing coefficient is of, at the very least, pragmatic importance.

The other way to analyse the cyclical aspect is by expected rate of return. We already know that Equation (6.1) can be written as—

$$\Delta k_{f,t,t+T} = a_1 k_{f,t} \frac{1 + \rho_{f,t,t+T}}{1 + (1 - k_{f,t}) \text{roe}_{f,t,t+T}} + a_2 k_{f,t} + c$$

In a speculative cycle, the expected rate of return should be different from the actual rate of return that would be grounded in a firm's financials. Investors, expecting a higher return, for example, over a longer period by observing a high return for a short period, might inflate the stock prices by buying shares at prices higher than what they would value shares for if the long-term expected rate of return was known. Similarly, investors might assume rate of return achievable of a share to be far less than what the actual rate of return would be because of false signals of company's financial health. This would cause a deflation in share price.

Hence, expected rate of return could be assumed to be sum of  $\rho_{f,t,t+T}$  and  $\rho_{s,f,t,t+T}$  where  $\rho_{s,f,t,t+T}$  is negative of difference from the actual value in expected rate of return for a firm "f", for a period from "t" to "t + T" because of speculation in market. Value of  $\rho_{s,f,t,t+T}$  can be both positive and negative. Hence, Equation (6.1) could be further transformed as follows:

$$\Delta k_{f,t,t+T} = a_1 k_{f,t} \frac{1 + \rho_{f,t,t+T} + \rho_{s,f,t,t+T}}{1 + (1 - k_{f,t}) \text{roe}_{f,t,t+T}} + a_2 k_{f,t} + c$$

Assuming,

$$k_{f,t} \text{roe}_{f,t,t+T} \ll 1 + \text{roe}_{f,t,t+T}$$

$$\Delta k_{f,t,t+T} = a_1 k_{f,t} \frac{1 + \rho_{f,t,t+T} + \rho_{s,f,t,t+T}}{1 + \text{roe}_{f,t,t+T}} + a_2 k_{f,t} + c$$

The above equation could be rewritten as follows:

$$\Delta k_{f,t,t+T} = a_1 k_{f,t} \frac{1 + \rho_{f,t,t+T}}{1 + \text{roe}_{f,t,t+T}} + a_1 k_{f,t} \frac{\rho_{s,f,t,t+T}}{1 + \text{roe}_{f,t,t+T}} + (a_2 + 1)k_{f,t} - k_{f,t} + c$$

Rearranging the terms of the equation, we get the following:

$$\Delta k_{f,t,t+T} = a_1 k_{f,t} \frac{1 + \rho_{f,t,t+T}}{1 + \text{roe}_{f,t,t+T}} - k_{f,t} + c + a_1 k_{f,t} \frac{\rho_{s,f,t,t+T}}{1 + \text{roe}_{f,t,t+T}} + (a_2 + 1)k_{f,t}$$

$a_1 k_{f,t} \frac{1 + \rho_{f,t,t+T}}{1 + \text{roe}_{f,t,t+T}} - k_{f,t} + c$  represents a situation where the effect of cycle is not present. In such a case, it could be accepted, as no speculative cycle of a significant order is involved, that  $a_1 k_{f,t} \frac{1 + \rho_{f,t,t+T}}{1 + \text{roe}_{f,t,t+T}} - k_{f,t} + c$  is independent of the price of share by any means. For  $\Delta k_{f,t,t+T}$  to still be independent of the price of share, the rest of the terms must be independent of price of share too. One trivial way is the following:

$$a_1 k_{f,t} \frac{\rho_{s,f,t,t+T}}{1 + \text{roe}_{f,t,t+T}} + (a_2 + 1)k_{f,t} = 0$$

Assuming that  $k_{f,t} \neq 0$ , we get -

$$a_1 \frac{\rho_{s,f,t,t+T}}{1 + roe_{f,t,t+T}} = -(a_2 + 1)$$

$$a_1 \rho_{s,f,t,t+T} = -a_2 roe_{f,t,t+T} - roe_{f,t,t+T} - a_2 - 1$$

Putting  $\rho_{s,f,t,t+T} = 0$ , for speculation to not exist, we get

$$a_2 = -1$$

Similarly, instead of putting  $\rho_{s,f,t,t+T} = 0$ , putting  $a_2 = -1$ , we get

$$a_1 \rho_{s,f,t,t+T} = 0$$

Hence, speculation in the market can be avoided by either there being no speculative tendencies existent among investors or coefficient of  $k_{f,t} \varphi_{f,t}$  being zero. The latter makes sense because in a market not driven by investor expectations, but by a model-oriented approach, the chances of speculation are low. For example, De Bondt and Thaler (1985) found that portfolios that lost money previously outperformed portfolios that gained money previously. This finding suggests that investors and the market might have a tendency to over react to good and bad news. The authors suggest this to be a violation of weak form of efficiency in the market. In markets that have weak form of efficiency, the only way to get abnormal returns consistently is by fundamental analysis of stocks. Hence, in such markets, it is expected that dependence on  $k_{f,t} \varphi_{f,t,t+T}$  as an indicator of value of a stock would be low.

However, the importance of standardization and how the concept relates to market cycles is the main reason for adopting the approach as main value of setting  $a_2$  to  $-1$  lies in its ability to standardize the equation.

In a regression equation when expected the dependent variable is completely explained by the equation if error term is included in the analysis.

$$\Delta k_{f,t,t+T} = a_1 k_{f,t} \varphi_{f,t,t+T} + a_2 k_{f,t} + c + \epsilon_{f,t,t+T}$$

The error term could be expected to include firm and time specific effects outside reach of the model, while the constant value reflects the effects that are same for all the firms and for the time period under consideration. We know that we can rewrite the equation as:

$$\Delta k_{f,t,t+T} = -a_2 \left( \frac{a_1}{-a_2} k_{f,t} \varphi_{f,t,t+T} - k_{f,t} + \frac{c}{-a_2} + \frac{\epsilon_{f,t,t+T}}{-a_2} \right)$$

Taking  $-a_2$  to the other side, we get

$$\frac{\Delta k_{f,t,t+T}}{-a_2} = \frac{a_1}{-a_2} k_{f,t} \varphi_{f,t,t+T} - k_{f,t} + \frac{c}{-a_2} + \frac{\epsilon_{f,t,t+T}}{-a_2}$$

As once error term is included, there can be no doubt about the value of  $\Delta k_{f,t,t+T}$  obtained,  $\Delta k_{f,t,t+T} / -a_2$  suggests a degree to which the dividend gap is matched, thus giving an indication of difference between theoretical dividend change and actual dividend change. The formation of cycles is thus, when there is a gap between dividend that should be paid and dividend that is actually paid, which could be construed as one of the cause of generation of false signals of financial health of the company.

#### Appendix 4

The signalling power of dividends is contingent mostly on two factors. Firstly, the expected rate of return, that is, the power of dividends to change the expectation of investors, which the management can potentially use to alter stock prices. Secondly, the rate of growth in earnings, which acts

as a constraint in setting up payout policy as a future decrease in dividend payout because of lower earnings can send undesired signals to investors, thus affecting the management's plans.

Taking Equation (6.1), for example

$$\Delta k_{f,t,t+T} = a_1 k_{f,t} \varphi_{f,t,t+T} + a_2 k_{f,t} + c$$

The value of the coefficient of  $k_{f,t} \varphi_{f,t,t+T}$  can inform us about the managerial and investor expectations at play in the market. If the value of  $a_1$  is significant, and so is the value of  $a_2$ , then the value of  $\frac{a_1}{-a_2}$  gives the extent of such expectations.

We can rewrite the Equation (6.1) as follows:

$$\Delta k_{f,t,t+T} = -a_2 \left( \frac{a_1}{-a_2} k_{f,t} \left[ \frac{1 + \rho_{f,t,t+T}}{1 + g_{f,t,t+T}} \right] - k_{f,t} + \frac{c}{-a_2} \right) \quad (A4.1)$$

Let the actual expected rate of return and rate of growth in earnings be  $\rho'_{f,t,t+T}$  and  $g'_{f,t,t+T}$  respectively such that

$$1 + \rho_{f,t,t+T} = \gamma_{\rho,f,t,t+T} \left( 1 + \rho'_{f,t,t+T} \right) \quad (A4.2)$$

$$1 + g_{f,t,t+T} = \gamma_{g,f,t,t+T} \left( 1 + g'_{f,t,t+T} \right) \quad (A4.3)$$

Combining A4.2 and A4.3 with A4.1, we get

$$\Delta k_{f,t,t+T} = -a_2 \left( \frac{a_1}{-a_2} \frac{\gamma_{\rho,f,t,t+T}}{\gamma_{g,f,t,t+T}} k_{f,t} \left[ \frac{1 + \rho'_{f,t,t+T}}{1 + g'_{f,t,t+T}} \right] - k_{f,t} + \frac{c}{-a_2} \right) \quad (A4.4)$$

If the equation holds, in the ideal case, the coefficient of  $k_{f,t} \left[ \frac{1 + \rho'_{f,t,t+T}}{1 + g'_{f,t,t+T}} \right]$  would be equal to 1. Hence

$$\frac{a_1}{-a_2} \frac{\gamma_{\rho,f,t,t+T}}{\gamma_{g,f,t,t+T}} = 1 \quad (A4.5)$$

Or—

$$a_1 \gamma_{\rho,f,t,t+T} + a_2 \gamma_{g,f,t,t+T} = 0 \quad (A4.6)$$

If the management is underestimating the growth rate in earnings, then  $\gamma_{g,f,t,t+T} < 1$ , and thus  $a_1 / -a_2 < 1$ , if  $\gamma_{\rho,f,t,t+T} = 1$ . Such underestimation might be due to error or due to a cautious approach adopted by the management to prevent cutting down dividend payout in times of economic downturn or whenever firm performs poorly.

If the management is overestimating the expected rate of return, then  $\gamma_{\rho,f,t,t+T} > 1$ , and thus  $a_1 / -a_2 < 1$ , if  $\gamma_{g,f,t,t+T} = 1$ . Such overestimation might be due to error or because of management being cautious and factoring in more risk and thus volatility, or more premium than what is actually required.

One of the interesting point worth mentioning here is the relation of the equation with the Capital Asset Pricing Model. Capital Asset Pricing model, as put by Sharpe (1964) could be used to write expected rate of return for a firm as follows:

$$\rho_{f,t,t+T} = \rho_{rf,t,t+T} + \beta_{f,t,t+T} \left( \rho_{mr,t,t+T} - \rho_{rf,t,t+T} \right) \quad (A4.7)$$

Where—

$\rho_{mr,t,t+T}$  = Market rate of return for aperiod from 't' to 't + T'

$\rho_{rf,t,t+T}$  = Risk free rate of return for aperiod from 't' to 't + T'

$\beta_{f,t,t+T}$  = Beta of firm 'f' with respect to the market for aperiod from 't' to 't + T'

The Capital Asset Pricing Model puts the expected rate of return from a security as a sum of risk free rate and a premium for the risk involved with the security, which is measured, most often, by volatility in price of security with respect to the volatility in the market. However, the volatility in the market price of a security is based on the information that is available to investors in the market and may not fully reflect the risk associated with the security. Assume that there is another component of risk that involves information which is with managers and not available for to investors (this assumes that the markets are not fully efficient). So, Equation (4.7) can be written as follows:

$$\rho'_{f,t,t+T} = \rho_{rf,t,t+T} + \beta_{f,t,t+T}(\rho_{mr,t,t+T} - \rho_{rf,t,t+T}) + R_{f,t,t+T}Y_{f,t,t+T} \quad (A4.8)$$

Where

$R_{f,t,t+T}$  = Added risk ratio for the firm 'f' from period 't' to 't + T'

$Y_{f,t,t+T}$  = Rate of return for risk ratio  $R_{f,t,t+T}$  for the firm 'f' from period 't' to 't + T'

The above equation can be rewritten as:

$$\rho'_{f,t,t+T} = \rho_{f,t,t+T} + R_{f,t,t+T}Y_{f,t,t+T} \quad (A4.9)$$

Or

$$\rho'_{f,t,t+T} - \rho_{f,t,t+T} = R_{f,t,t+T}Y_{f,t,t+T} \quad (A4.10)$$

The gap in the risk may be signalled to some extent by management decisions of formulating certain payouts, or the dividend payouts might actually alter risk as Gordon (1963) opined. In either case, the difference in expected rate of return can be modelled in similar terms as in case of premium in a normal Capital Asset Pricing Model equation.

$$\rho'_{f,t,t+T} = \rho_{rf,t,t+T} + \beta_{f,t,t+T}(\rho_{mr,t,t+T} - \rho_{rf,t,t+T}) + \beta_{d,f,t,t+T}(\rho_{md,f,t,t+T}) \quad (A4.11)$$

Here  $\rho_{mr,t,t+T}$  does not include dividend yield on the market.  $\rho_{md,f,t,t+T}$  can be equated to total dividend yield of the index and  $\beta_{f,t,t+T}$  and  $\beta_{d,f,t,t+T}$  could be assumed to be beta derived by factoring out dividend yields and only in dividend yields respectively. There is no risk free rate subtracted from dividend yield because cash dividends are assumed to be risk free by nature, however the treatment of cash dividends with respect to risk free rate may require a deeper analysis.

If  $\beta_{f,t,t+T} = \beta_{d,f,t,t+T}$ , then the model would resemble the Capital Asset Pricing Model. However, if  $\beta_{f,t,t+T} > \beta_{d,f,t,t+T}$  then dividend paying stocks will be associated with lower rate of expected return for the same total yield. It is crucial to note that the risk decreasing effect of dividend payout in this case will not be just the result of payment of dividends, but the effect of payment of a consistent dividend. An irregularity in other firms' payment of dividend, and yet consistency in

payment of dividends by the firm under consideration would send signals about an internal firm specific stability of the firm, in a period of systematic volatility.

From Equations (A4.10) and (A4.2), the following equation is obtained:

$$\left(1 - \gamma_{p,f,t,t+T}\right)\left(1 + \rho'_{f,t,t+T}\right) = R_{f,t,t+T}Y_{f,t,t+T} \quad (\text{A4.12})$$

The above could be written as:

$$1 - \gamma_{p,f,t,t+T} + \rho'_{f,t,t+T} - \gamma_{p,f,t,t+T}\rho'_{f,t,t+T} = R_{f,t,t+T}Y_{f,t,t+T}$$

From Equation (A4.5), assuming value of  $\gamma_{g,f,t,t+T} = 1$ , the following equation is obtained:

$$1 + \frac{a_2}{a_1} + \rho'_{f,t,t+T} + \frac{a_2}{a_1}\rho'_{f,t,t+T} = R_{f,t,t+T}Y_{f,t,t+T}$$

On simplification, we get following:

$$\frac{a_1}{-a_2} = \frac{1 + \rho'_{f,t,t+T}}{1 + \rho'_{f,t,t+T} - R_{f,t,t+T}Y_{f,t,t+T}} \quad (\text{A4.13})$$

If  $a_1 = 1$  and  $a_2 = -1$ , then

$$1 + \rho'_{f,t,t+T} = 1 + \rho'_{f,t,t+T} - R_{f,t,t+T}Y_{f,t,t+T}$$

Hence, in such a case,  $R_{f,t,t+T}Y_{f,t,t+T} = 0$ . Thus, there would be no risk perceived by management that is not being priced by the market.

If only  $a_2 = -1$ , then

$$1 + \rho'_{f,t,t+T} = a_1 + a_1\rho'_{f,t,t+T} - a_1R_{f,t,t+T}Y_{f,t,t+T}$$

On rearranging terms, we get the following:

$$\left(1 - a_1\right)\left(1 + \rho'_{f,t,t+T}\right) = -a_1R_{f,t,t+T}Y_{f,t,t+T}$$

Taking all terms involving  $a_1$  to one side, we get the following:

$$\left(1 - \frac{1}{a_1}\right)\left(1 + \rho'_{f,t,t+T}\right) = R_{f,t,t+T}Y_{f,t,t+T} \quad (\text{A4.14})$$

If  $a_1 > 0$ , which will usually be the case, more the signalling power ( $a_1$ ), more there will be risk gap in perception of management and investors. Or in other words, higher the risk gap in perception of management and investors, more the signalling power of dividends, which is expected.

It is also interesting to note that  $\lambda_{t+T,t}$  in Equation (5.14) is very similar to  $a_1 / -a_2$  in Equation (A4.1). That is because the risk aversion in Lintner model or the signalling under Signalling Hypothesis serve as a way in which management prepares for any trend in future that may turn out to be different than the current trend, for example, a higher rate of growth in earnings observed currently might not persist in the future. If investors also lower their expected rate of return in response to a lower growth rate in earnings, then there would be no need for change in dividends. However, the expected rate of return may change only partially in response to a downturn in the market or lag a little bit. Thus a part of the signalling and risk aversion, that comes from the difference of the two opportunity costs not being a constant is what is signified by

$\lambda_{t+T,t}$ . However, there may also be a firm specific effect, which is not considered here. That is because the firm specific effect might arise out of inefficiencies in the functioning of a particular firm with respect to other firms in the same industry. If such inefficiencies persist, the firm cannot be expected to last till perpetuity as it will be outcompeted by other firms in the industry, which would violate the assumption taken before. It might be the case that such inefficiencies do not persist, however knowledge of when that would happen is out of bounds of a theory like this and hence such limitation in scope of theory is pragmatically unavoidable. Hence, while the firm specific effect will show in the regression results, they are not considered in the theory. It is expected though that taking a large number of firms in the sample will decrease the extent of firm specific effect.

It is to be noted here that the effects subsumed in  $\lambda_{t+T,t}$  would be long term because the terms used to get its value are long term. One way in which the difference in expected rate of return between the option of realizing capital gains and the option of taking dividends would change permanently for perpetuity would be because of a permanent change in tax rates on the options. Of course, a lot of it is dependent on the extent of tax change, presence of tax clienteles, and whether the investors and managers believe that such tax changes would never be revoked or mitigated in future. As transaction costs are not being considered in the study, the effect of taxes is also ignored, though if such is present, it would be subsumed in  $\lambda_{t+T,t}$ .

### Appendix 5

The preference of dividend over capital gains in general could be defined in a practical sense as a greater placement of value on a particular amount of dividend over the same amount of capital gain. The preference of capital gains, on the other hand, would be defined by a lesser placement of value on a particular amount of dividend in comparison with the same amount of capital gains. Gordon (1959) proposed the following model for studying preference for dividend:

$$\frac{P}{B} = \beta_0 + \beta_1 \frac{\bar{D}}{B} + \beta_2 \frac{(D - \bar{D})}{B} + \beta_3 \frac{\overline{RE}}{B} + \beta_4 \frac{(RE - \overline{RE})}{B}$$

Multiplying both sides of the equation by book value by earnings of the firm,  $B/\bar{E}$  we get the following:

$$\frac{P}{\bar{E}} = \beta_0 \frac{B}{\bar{E}} + \beta_1 \frac{\bar{D}}{\bar{E}} + \beta_2 \frac{(D - \bar{D})}{\bar{E}} + \beta_3 \frac{\overline{RE}}{\bar{E}} + \beta_4 \frac{(RE - \overline{RE})}{\bar{E}} \quad (A5.1)$$

The above equation can be modified to be following:

$$\frac{P}{\bar{E}} = \beta_0 \frac{B}{\bar{E}} + (\beta_1 - \beta_3) \frac{\bar{D}}{\bar{E}} + (\beta_2 - \beta_4) \frac{(D - \bar{D})}{\bar{E}} + \beta_3 \frac{\bar{E}}{\bar{E}} + \beta_4 \frac{(E - \bar{E})}{\bar{E}} \quad (A5.2)$$

The average dividend paid over years can be approximately represented as  $k_{f,t}\bar{E}$ . The above equation then can be approximated as following:

$$\frac{P}{\bar{E}} = \beta_0 \frac{B}{\bar{E}} + (\beta_1 - \beta_3)k_{f,t} + (\beta_2 - \beta_4)\Delta k_{f,t,t+T} + (\beta_3 - \beta_4) + \beta_4 \frac{E}{\bar{E}} \quad (A5.3)$$

The price to average earnings ratio of the firm seems to be dependent on five factors in the model, namely, the book value to average earnings ratio, the average dividend payout ratio, change in dividend payout ratio, a constant and growth rate in earnings of the firm. If  $\beta_1 = \beta_3$  and  $\beta_2 = \beta_4$ , then dividend payout will be irrelevant as Miller and Modigliani (1961) propose, and the price of the a firm would be a function of its book value and earnings growth rate, with the latter being decided by the investment policy which is assumed to be fixed under M&M model. While the book value gives a firm's base value (i.e., value if firm is liquidated immediately and assets and liabilities are priced in the market at their value as written in books), the earnings give the subsequent additions to the value of the firm, forming the complete value of the firm's share. If  $\beta_1 > \beta_3$  and  $\beta_2 = \beta_4$ , then it must

be assumed that while investors prefer dividend over capital gains, they do not trust changes in dividend (both expected and unexpected) to base their decisions on it and their adjustment to dividend is with a lag. If both  $\beta_1 > \beta_3$  and  $\beta_2 > \beta_4$ , then it must be assumed that while investors prefer dividend over capital gains, in all forms, whether the dividend is stable or not.

If the use of dividend as only a signal is valuable, then  $\beta_1 = \beta_3$  and  $\beta_2 > \beta_4$  would be expected, because the unexpected change in dividend will be what will produce observable value in the market but only because of availability of new information in the market by proxy of a change in dividend or a confirmation of existing expectations. When this new change would be accommodated, the increased or decreased dividend would have no further contribution towards value of the firm.

Here, the paper's assertion becomes a bit clearer. If dividend is more preferable than capital gains, then there would be extensive opportunities for arbitrage and as Miller and Modigliani (1961) suggest, both the options would become equally preferable by workings of the market, assuming no differential tax effect. However, Miller and Modigliani (1961) allow signalling function of the dividend to alter value of the firm if there is information asymmetry between the managers and investors. In such a case, an unexpected change in dividend would cause a change in the value of the firm, but not the payout that is stable over a long period of time. However, that would violate Gordon's (1963) idea of dividend possessing, whether they are stable or not, a lower risk than capital gains, which also seems to be a reasonable position.

One way to harmonise the two positions is to allow a value differential because of differential dividend payout to be partially covered by arbitrage. If  $\beta_1 - \beta_3 \neq 0$ , or in other words, coefficient of  $k_{f,t}$  is not zero, then a cycle in the market could be assumed, which would be eventually fixed by arbitrage. However, if  $\beta_2 - \beta_4 \neq 0$  that might be suggestive of investors' preference for dividend or capital gains, while controlling for a cyclical effect in the market, giving us a hint of whether there is a rational preference for dividend. The extent of this preference can be known by computing the value of  $(\beta_2 - \beta_4)/(\beta_1 - \beta_3)$ , if  $\beta_1 - \beta_3 > 0$  which would generally be the case. This preference would be a result of signalling effect, however the signalling effect itself would be based on the lower risk that dividends carry.

The price to earnings ratio of a firm could be thought in the following way. If an amount of stock is sold in a period, for a particular amount of earnings, it allows one to get a specific amount of capital gain accrued in that period. If an amount of stock is not sold, it will accrue dividend for one more period, after which the investor can again make a decision whether to sell the stock or retain it. If arbitrage is possible under the market, the value realized by a capital gain for a period for a firm, must be (approximately) same as the value realized by the dividend paid for the period for the same firm. Assuming two alternate scenarios, one in which the firm decides to increase the dividend paid by  $\Delta k_{f,t,t+T}$  and in the other scenario, the firm decided to keep the dividend payout the same as the previous period. Using Equation (5.3), the change in price to average earnings ratio could be represented as the following:

$$\frac{P'}{E} - \frac{P}{E} = \beta_0 \left( \frac{B'}{E} - \frac{B}{E} \right) + (\beta_2 - \beta_4) \Delta k_{f,t,t+T} \tag{A5.4}$$

The appreciation in price of stock with respect to earnings can be assumed to be equal to decrease in amount of capital gained by the decision, which can be approximately equated to change in dividend payouts. The dividend payout at time "t" is  $k_{f,t}$ . The expected payout at time "t + T" by rational investors could be derived to be the following:

$$\text{Next Period Payout} = k_{f,t} \left[ \frac{1 + \rho'_{f,t,t+T}}{1 + g'_{f,t,t+T}} \right]$$



This is because the value of payout must increase to the same extent as the capital gains accrued by holding the firm's stock. However, as earnings in the current period grow by a rate of  $g'_{f,t,t+T}$ , the payout ratio is divided by  $1 + g'_{f,t,t+T}$  to get the value of the payout ratio that must be set to get the same gain as an increment in capital. All of this assumes no differential taxation.

Now, Equation (A5.4) can be written as following:

$$k_{f,t} \left[ \frac{1 + \rho'_{f,t,t+T}}{1 + g'_{f,t,t+T}} \right] - k_{f,t} = \beta_0 \left( \frac{B'}{E} - \frac{B}{E} \right) + (\beta_2 - \beta_4) \Delta k_{f,t,t+T} \quad (A5.5)$$

The dividend payout at time “t + T” would be based on the change in book value with respect to earnings of the firm, change in dividend payout and a change in dividend payout. If there is no change book value of the firm (which would generally be the case, as the book value used in the model refers to the book value before addition of current earnings), then that component can be discarded and the Equation (A5.6) can be written as the following:

$$k_{f,t} \left[ \frac{1 + \rho'_{f,t,t+T}}{1 + g'_{f,t,t+T}} \right] - k_{f,t} = (\beta_2 - \beta_4) \Delta k_{f,t,t+T} \quad (A5.6)$$

As the next period payout as calculated is an expected payout, the value of  $\Delta k_{f,t,t+T}$  could be assumed to approximate only the expected change in dividend and hence the coefficient of  $\Delta k_{f,t,t+T}$  does not denote comprise of signalling effect of dividend policy, and consists of only the dividend preference effect, because of other reasons.

The Equation (A5.6) is similar to the Equation (5.15), except that the coefficient of  $\Delta k_{f,t,t+T}$  is  $(\beta_2 - \beta_4)$ , instead of 1. If Miller and Modigliani's hypothesis stands true, then value of  $\beta_2 - \beta_4$  would be equal to zero. In such a case, there would be no effect of change in dividend. The expected dividend payout ratio could be assumed to be same as prior dividend payout ratio because there would be no reason to expect a different dividend payout as such is irrelevant.

One of the other things to notice is that the magnitude of the coefficient of  $k_{f,t}$  is 1 in Equation (A5.6). The coefficient will not be 1 if either  $\beta_1 - \beta_3 \neq 0$ , or in the two alternate scenarios, the way for calculating  $k_{f,t}$  would not be same. In both cases, there will be formation of cycles, and in such a case, the method to get the usable coefficient of  $\Delta k_{f,t,t+T}$  would be by division of its coefficient by the coefficient of  $k_{f,t}$  which has already been discussed previously.

It is important to note that forcing the different approximations on Gordon's (1959) equation are not a major problem because the equation is not an actual equation derived by a theory but merely an equation used in regression and the point of using it is not to derive the proposed model but to link it to the proposed model.

## Appendix 6

Fama (1970) discussed the efficient market hypothesis in detail. In weak form of efficiency tests of the market, it is studied whether prices at particular point in time fully include information about the past prices, or in other words, whether it is possible for an investor to use only the information about past share prices in the market to earn an abnormal return consistently. Fama (1970) talks about fair game model, sub-martingale model and random walk model. Fair game model is what is of most importance here and it forms the base of other models. According to the model, for the stock market investment to be a fair game with respect to an information set  $S$  available at the time, the expected price of the stock as observed should be such that gain and loss from the stock over its actual value is equalized and thus the net return is zero.

$$E(P_{f,t}) = F_w(P_{f,t-1}, P_{f,t-2}, P_{f,t-3}, \dots) \quad (A6.1)$$

Where

$E(P_{f,t}) = \text{Expected price of share for a firm 'f' at time 't'}$

$F_w = \text{Pricing function involving only historical prices of the stock being employed by the market}$

Thus, it is impossible to earn a consistent return that is abnormal in such markets using a pricing function that only includes historical prices because probability weighted value of gain over a price thus calculated is equal to the probability weighted value of loss. If the markets do not have even weak form of efficiency, then it means that the expected price of the stock would be different than the price calculated by using past prices by a value that itself is a function of past prices of the stock. This can be represented as the following:

$$E(P_{f,t}) = F_w(P_{f,t-1}, P_{f,t-2}, P_{f,t-3}, \dots) + F_u(P_{f,t-1}, P_{f,t-2}, P_{f,t-3}, \dots) \quad (\text{A6.2})$$

Where

$F_u = \text{Pricing function involving only historical prices of the stock not being employed by the market}$

In such a case, an investor who knows about the function  $F_u$  can have an edge over other investors in the market and gain a consistent abnormal rate of return, by trading with the investors in the market who do not know the exact value of the function, given the historical prices in the market.

Now if the hypothesis in the paper is correct and dividend payout changes are important in aligning the value of the firm's stock to its actual value, then it follows that when there is not even a weak form of efficiency in the market then the following would hold in case of existence of market equilibrium:

$$\Delta k_{f,t,t+T} = D_u(F_u(P_{f,t-1}, P_{f,t-2}, P_{f,t-3}, \dots)) \quad (\text{A6.3})$$

Where

$D_u = \text{Dividend function to convert pricing function output to a particular dividend output}$

$D_u$  may be a function involving many other inputs and not just historical stock prices. If there is no gap between the actual (or rather expected) pricing of the stock and the pricing as being done by the market, no dividend change would be required and Miller and Modigliani (1961) hypothesis would prevail. Note that the situation when the dividend payout change would be relevant is not exactly the same as in case of signalling hypothesis in which the investors' perceptions about a firm's value change by change in payout because they perceive the change in payout as an indication of change in management's beliefs future growth prospects of the firm. In the latter case, the investors lay more trust in management's views about the firm because of lack of some information. However, even if both the management and the investors lack information about  $F_u$ , they might not share similar views about the actual value of the firm. And thus a particular change in payout may not be enough to align the value of the firm to its true value and it becomes a long process involving a series of adjustments.

In contrast, when a market has a strong form of efficiency, it is impossible to beat the market consistently because stock prices at a particular point in time already reflect all the available information materially relevant to the price of the stock and thus it is impossible for anyone to predict the future movement of the stock with a greater accuracy than anyone else consistently. Jensen uses the Capital Asset Pricing Model to develop an equation of expected returns, and

converts the *ex ante* equation into an *ex post* equation by replacing the expected market rate of return with the realized market rate of return.

$$E(\tilde{r}_{f,t+1}|\phi_t, r_{mr,t+1}) = r_{fr,t+1} + \beta_f(\phi_t)[r_{mr,t+1} - r_{fr,t+1}] \quad (\text{A6.4})$$

Where

$\phi_t$  = All information available at time 't'

$\beta_f(\phi_t)$  = Beta of the firm 'f' estimated based on information  $\phi_t$

It can be assumed that a firm's return has no considerable effect on either the market (portfolio) return or risk free rate of return because there are many firms in the market and economy and the effect of each individual firm on the economy is marginal compared to the market or economy as a whole. Thus,  $r_{fr,t+1}$  and  $r_{mr,t+1}$  can be assumed to be constant with respect to the firm.

However,  $r_{fr,t+1}$  and  $r_{mr,t+1}$  would not necessarily be constant with time. Yet a part of the risk free rate of return and market rate of return can be assumed to be constant even with respect to time. Assume that based on current information set  $\phi_t$ , investors in the market have an expectation value for all future rate of returns till infinity (based on the assumption that firms exist until perpetuity). While the expected value of return may differ from the actual value because of availability of new information, generally it could be assumed that over a moderate time period, there won't be any significant deviations from the expected value because generally all information at a particular point in time would also contain information about the long-term capital budgeting and capital structuring decisions. The collective of these individual strategies and the overall outlook towards economy can be expected to provide a foundation for a reasonable value of expected returns from the market and government bonds. In any case, if there is still a difference in the expected and the observed value of a stock in the market, whatever the cause of the difference is, it must be constant of the firm specific effects to a considerable degree (some of the difference might also be attributable to same information but different valuing mechanism, different time horizons and so on). The change in payout ratio would then be an attempt to mitigate the difference in actual risk and expected risk and the payout thus could be written as the following:

$$\Delta k_{f,t,t+T} = c \quad (\text{A6.5})$$

Where

$c$  = a constant with respect to firm, time, and all information available at time 't'

Thus from complete inefficiency to a complete efficiency, the dividend payout is expected to range from a high dependence on firm specific factors to a high dependence on a constant value (which would depend on several factors like economic conditions).



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