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On the informational content of dividends, and dividend policy, under conditions of differential information

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City University of New York, 1990

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On The Informational Content Of Dividends, And Dividend Policy, Under Conditions Of Differential Information

by

Nikolaos Papavlassopulos

A dissertation submitted to the Graduate Faculty in Economics in partial fulfillment of the requirements for the degree of Doctor of Philosophy, The City University of New York.

1990

This manuscript has been read and accepted for the Graduate Faculty in Economics of The City University Of New York in satisfaction of the dissertation requirement for the degree of Doctor of Philosophy.

April 30, 1990

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ACKNOWLEDGMENTS:

I wish to express my gratitude to professor Salih Neftci and professor Michael Grossman for their support. Also, I want to thank professor Ronald W.Anderson; for his comments and criticisms contributed to the preparation of this work.

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PART A

DIVIDEND POLICY & THE DIVIDEND CONTROVERSY FROM A HISTORICAL PERSPECTIVE

1A. INTRODUCTION

It is well known that management is continually faced with the two crucial and interelated problems of capital investment and long-run financing. However, along with the firm's investment and financing policies, it is also well known that management must decide on its dividend policy; that is, the proportion of earnings which should be distributed to its shareholders in the form of cash dividends.

John Lintner's[1] 1956 classic article shows that dividends are smoothed to conform to long-run rather than short-run earning power and was one of the first to suggest that current dividends depended on expected as well as current and past earnings. Moreover, it has been suggested that payout ratios (dividends as proportion of earnings) fluctuate because dividends are more stable than earnings, but the firm's target payout ratio is normally stable over time.[2]

The most important theoretical work on dividend policy is a 1962 article by Franco Modigliani and Merton Miller[3]. They showed, that dividend policy is totally irrelevant to investors, provided that capital markets are perfect, that each investor is rational and

[1] John Lintner, "Distribution of incomes of Corporations among Dividends, Retained Earnings and Taxes," American Economic Review 46 May 1956: :p.97–113

[2] This characterization of firm's dividend behavior is based on Lintner's work. Also see: J.A.Brittain, "Corporate Dividend Policy" (Washington, D.C: Brookings Institution, 1966), E.Fama and H.Babiak, "Dividend Policy: An Empirical Analysis" Journal of the American Statistical Association 63(Dec 1968):p.1132–61

[3] F.Modigliani & M.Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment," Ameriacan Economic Review 48 June 1958:p.261–97

expects other investors to be rational, and that cash dividends and capital gains are taxed at the same rate. This M&M proposition has been supported with extensive tests of the relationship between dividend policy and stock prices indicating evidence that investors pay a premium for stocks with either high or low dividend yields[4]. Does dividend policy matter? The Financial theory at its current state cannot say for sure. Theory and present tax laws indicate that low payout should benefit shareholders: If good investment opportunities are scarce, the firm should repurchase its own stock rather than pay cash dividends. Nevertheless, most analysts are unwilling to assert that dividends are irrelevant. Almost all successful firms pay dividends, and dividend policy is a major concern of financial managers. In general, financial experts are not able to prove that dividend policy matters, but unwilling to assert that it does not! This is best described in the " Dividend Puzzle" by Fischer Black.[5] Many security analysts have maintained

[4] see:
Black & Scholes,"The effects of dividend yield and dividend policy on common stock prices and returns" Journal of Financial Economics, Vol 1 (1974):p.1-22
R.C.Higgins,"Growth, Dividend Policy and Capital Costs in the Electric Utility Industry" Journal of Finance 29 (September 74):p.1189-1201
Friend & Puckett. "Dividends and Stock Prices" American Economic Review 54 (September 1964):p. 656-682

[5]
Fischer Black, "The Dividend Puzzle" Journal of Portfolio Management, Vol 2 (Winter 1976).:p. 72-77
Excerpts from the above article:
" This, in essence, is the M&M theorem. It says that the dividends a corporation pays do not affect the value of its shares or the returns to investors, because the higher the dividend, the less the investor receives in capital appreciation,..."

"It is difficult or impossible to tell whether investors demand dividends or not. So it is hard for a corporation to decide whether to eliminate dividends or not."

that a high payout policy enhances share price. The most well-known proponents of this view are Graham and Dodd [6], who proposed that a dollar of dividends contributes three times as much to share price as a dollar of retained earnings," growth stocks" excepted. In addition to that, some empirical studies have indicated strong cross-sectional correlations of share price with dividends and preference of dividends over retained earnings[7]. The Modigliani & Miller reply on these findings was that these studies are subject to many possible biases, and they emphasized one[8]. Modigliani & Miller suggested that the firm's market value depends on its expected future earnings and not on current earnings. Thus, if earnings consist of permanent and transitory components and if dividends depend on the former, dividends would serve as a surrogate for expected future earnings, and such a surrogate relationship might explain the results of the cross-

---

[6] Graham B,& D.L.Dodd, Security analysis (McGraw-Hill, New York, 1962)

[7] In order to examine the impact of dividends on share prices, the following regression has been applied to cross-sections of common stock:

$$Pi = a + b1Di + b2(Ei-Di) + ui$$

where, Pi = the price of the ith firm's share
Di = the dividend per share
Ei = earnings per share
ui = an error term

Most empirical studies using the above type of regression have found that $b1 > b2$, and have concluded, that cash dividends are systematically preferred to retained earnings; that is in real-life situations dividend policy seems to count. {From Levy and Sarnat, "Capital Investment & Financial Decisions" , ch.19}

[8] see F.Modigliani & M.Miller, "The Cost of Capital,Corporation Finance and the Theory of investment: A Reply," American Economic Review 49 p. 655-69 , (Sept.1959)

sectional studies. This hypothesized relationship was labeled by Modigliani & Miller "the informational content of dividends" .

Actually, when Modigliani and Miller raised the issue of the so called "informational content of dividends", they raised implicitly the issue of differential information between management and stockholders. Hence, several authors followed by examining dividend policy under conditions of differential information[9]. That is, in the real world the relevant information regarding a firm's future prospects is neither readily available nor costless. In such a world dividends can be important purveyors of information to investors. Thus shifts in dividend policy may affect an investor's expectations regarding the future prospects of the firm, thereby affecting the value of its current stock as well. Most of these studies have provided views and arguments of great importance to the theory of finance, but the controversy has been neither resolved nor abated. Despite the fact that there is an extensive literature on the issue, it seems that the thesis of the so called " informational content of dividends" has not been fully elaborated to provide answers to questions such as: a) How and under what conditions dividends alter expectations regarding the firm's future prospects? b) how <u>current</u> dividends could be incorporated in the valuation of a firm's common stock by investors? c) If dividends affect expectations, is there an a optimum rule to choose a dividend policy?

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[9] see R.Watts, "The information content of dividends", Journal of Business, April 1973. Sudipto Bhattacharya, "Imperfect Information,Dividend Policy, and The Bird in the Hand Fallacy", Bell Journal of Economics, Spring 1979:p. 191–211
Stephen Ross, "The Incentive Signalling Approach", Bell Journal of Economics, Spring 1977:p.23–40

2A. ON THE HISTORY OF DIVIDEND POLICY

The historical pattern of dividends and earnings has fascinated economists and specialists in business finance for many years. This is illustrated in Table 1c which presents data on total dividends and earnings of private US corporations for selected years during the period 1929 - 82 . In several of the years , earnings per share actually fell below dividends per share, which means that even in years of losses firms attempt to avoid a parallel drastic cut in cash dividends.

In the years of great depression earnings for some corporation were even negative; however corporations in the aggregate declared dividends in excess of earnings. For example, in 1932 although the firms lost 2.7 billion dollars, cash dividends amounting to 2.5 billion dollars were paid to shareholders.

But no matter how strong the desire to maintain dividends, firms cannot continue to distribute dividends at the same pace in the face of losses during a number of consecutive years. And as Table 1c shows , US firms, taken in the aggregate, cut their dividends drastically, albeit not by the same amount as the decline in earnings, during the first half of the 193Os.

Table 1c

Profits after taxes and Dividends , all Private U.S Corporations Selected Years 1929 - 1982 (Billions of Current Dollars)

Year	Corporate Profits(after taxes)	Dividends
1930	2.9	5.5
1931	-0.9	4.1
1932	-2.7	2.5
1933	0.4	2.0
1934	1.6	2.6
1935	2.6	2.8
1940	7.2	4.0
1945	9.0	4.6
1950	24.9	8.8
1955	27.0	10.5
1960	26.7	13.4
1965	46.5	19.8
1970	39.3	24.7
1975	81.5	30.8
1980	149.8	58.6

Source: Statistical Abstract of the United States, 1984

3.GENERAL COMMENTS AND THE AIM OF THIS WORK

The question," Why do firms almost universally pay out a substantial portion of their earnings as cash dividends" still lingers unanswered. Several financial experts agree that the key to this problem could possibly be found to two additional, albeit related, questions: a). What impact (if any) do dividends have on the market price of a firm's common stock? b). If dividends affect shareholders' wealth, what constitutes the firm's optimal dividend policy?

This work is mainly theoretical, followed by an empirical study. It does not attempt to give either the "answer" on why firm's pay dividends or to define optimum long run dividend target payout ratios. However, it attempts to demonstrate the importance of dividends and the target payout ratio on the firm's market value under the specific environment of differential information . In essence, it is a further elaboration of the "informational content of dividends" hypothesis. Moreover, it attempts to answer what could constitute an optimum dividend rule once the long run dividend policy has been established and provide explanations on several empirical and theoretical findings.

Several of the assumptions made in this work, are based on the theoretical arguments of Modigliani and Miller, and the empirical findings of John Lintner. Hence, it is assumed that there is a stable target pay-out ratio and that earnings consist of permanent and transitory components. However, we assume that the same may be true of dividends; that is, dividends may depend on permanent and transitory components as well. Since the economic environment under which a firm operates may change, it is assumed that traders may face different degrees of uncertainty period after period regarding the "permanent" component of earnings.This uncertainty can be best described by the following two questions. What is the "permanent" component of earnings now? Is there anything to believe that it is going to change? Although it is true that a great deal of information is provided with the disclosure of financial statements and the public announcement of earnings, it is also true that reported earnings can not reveal the firm's average profitability. As it is well known, earnings may deviate substantially from the firm's average profitability(or permanent component of earnings), either due to random events, varying methods of accounting reporting, or even due to management's ability to influence reported earnings. For example, the allowance for bad debts and the reserve for outstanding claims which are important components of the earnings statement of banks and insurance companies are highly subjective estimates made by management.

Similarly the reported earnings of higly diversified conglomerate firms has been a cause of much concern to the Securuties and Exchange Commission.[10]

Furthermore, the fact that special items in income statements require special disclosure such as, "cumulative effects of changes in accounting principles", "discontinued operations" , "extraordinary items" and others, is revealing of the attempt that has been made by accountants and financial analysts to filter some of the transitory components of earnings and get an accurate or objective picture of average profitability .

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see Haim Levy & Marshal Sarnat, "Capital Investment and Financial Decisions" third edition, 1986 Prentice-Hall International, UK, LTD.

For traders, knowledge of the firm's profitability may be important for several reasons, such as :

a).Due to the separation of control and ownership, the possibility of agency costs to occur may be directly related to the degree of existing uncertainty around the firm's profitability. b).Although the value of common stock depends on expectations about future profits, knowledge of the firm's current average profitability may be of great significance to the formation of expectations and as a consequence to valuation.

We have only to think how difficult it is to form accurate estimates about a firm's future prospects if there is no knowledge of its history and its present business affairs.

According to Modigliani and Miller, and the empirical findings of Lintner, dividends may carry usefull information regarding the firm's average profitability. However, because dividend payments depend on decisions made by management, they may carry ambiguous signals to traders. Actually , in this paper it is shown that their informational content will be influenced by several factors such as the firm's target pay-out ratio , the degree of the overall uncertainty regarding a firm's average profitability just prior to the announcement of dividends and others.

The term "differential information", in this paper, referes only to differences of information between management and traders. It is assumed that management possesses some information, relevant to the firm's average profitability, which is superior to the information possessed by the market. Of course, in reality, neither management, nor traders may know exactly the real profitability of the firm. Hence, it is assumed that traders are interested to learn the perceived by management profitability. It is assumed that in order to get an efficient estimate and minimize uncertainty, traders shall have to rely not only on current or past earnings but also on any piece of information which they perceive to be relevant to their learning process. Therefore, if dividends depend on the permanent component of earnings,their announcement will carry usefull information to traders and help them form a better estimate.

Throughout this paper it is assumed that traders share the same publicly available information, they agree on the first, second and cross moments of some probability distributions, and this allows them the information needed to form linear least square projections of a random variable they do not know on the random variables they do know. The hypothesis of rational expectations is made by assuming that the traders estimate of an uknown random variable equals the linear least square projection on certain information sets to be specified.

The purpose of this study is to show, under a set of assumptions, how dividends affect expectations, how management may use dividends as an instrument to influence the relative importance of other information sets (like current reported earnings , past earnings and past dividends), how current dividends could be incorporated in the valuation of a firm's common stock, and the existence of a dividend rule. It is shown why empirical findings which claim dividends to have systematically a greater significant impact than retained earnings on share prices, could be consistent with the "informational content of dividends" hypothesis. However, in this paper we show that the target payout ratio is very important to the minimization of differential information , and that it influences the contribution of the information variables which traders rely on to derive an estimate of the permanent component of earnings. Hence, the target payout ratio may affect the degree and direction (size and sign) of their contribution. In that respect dividends may become a useful instrument in the hands of management to affect market expectations and perhaps the market value of the common stock. Moreover, we show that their impact is conditional on uncertainty, which implies that dividend policy has a great effect during periods of high volatility. This theoretical finding may explain findings of related empirical research.

This paper proceeds by discussing first the significance of information to rational traders in forming expectations, given that their objective function is to learn the firm's average profitability, we define the relevant information sets and we assume specific relations between current and future estimates .(PART B)

Then (in PART C) we examine the contribution of income statements or reported earnings to expectations, and we show the inability of management to alter expectations (if needed).

In PART D, dividends are introduced and their impact on expectations and the minimization of differential information is shown. In PART E a price generating process is derived, and in PART F given the management's objective the appropriate dividend rule. Finally in PART G the results of the price generating process empirical testing are provided, and analyzed.

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PART B. PUBLIC INFORMATION, THE TRADERS OBJECTIVE FUNCTION , AND RELATIONS OF ESTIMATES.

1B. INFORMATION SETS AND THE TRADER6S' OBJECTIVE FUNCTION

It is difficult to form accurate estimates about a firm's future prospects if there is no knowledge of its history and its present business affairs. In that respect, knowledge of the firm's current profitability could be of great importance to traders. A great deal of this work depends on the assumption that even in the most stable[11] environment, traders at time t have no knowledge of the firm's current profitability and that they use any useful and relevant piece of information to derive an estimate . That is, their estimate will depend on the information set they possess.

However, an estimate is an estimate and may deviate substantially from the firm's actual profitability.

If one of the traders' objective is to derive an estimate as close as possible to the firm's average profitability, then it is reasonable to assume that their objective is equivalent to the minimization of the Mean Square Error .

That is, if we denote by M_t the average profitability of the firm at time t and by ${}_eM_t$ an estimate, then the Mean Square Error (MSE)

$$MSE = E\{ (M_t - {}_eM_t)_2 \}$$

is minimum, if the estimate ${}_eM_t$ is the conditional expectation of M_t on the information

[11] The term "stable" is referred to the case where the firm's average profitability remains constant through time.

set which traders possess at time t. And if, the r.v's are Gaussian then, this is equivalent to the linear projection of M_t on the their information set. That is, $eM_t = P[M_t/I_t]$ where, $P[./.]$ =the linear projection operator ,

/ = the symbol of conditional on,

I_t =the information set which traders have at time t

Under these conditions the larger the relevant information set the smaller will be the MSE or the degree of uncertainty about M_t. The information set I_t is of great importance to traders because they depend entirely on it to provide answers to two fundamentals questions: What is the firm's current average profitability? And is there any reason to believe that the average profitability will be different in the future? Since traders will form their estimates about the firm's current and future prospects relying on the set I_t, we have to define it. Just prior to time t, management has some knowledge about the firm's profitability, which traders do not have, and must decide on its dividend policy. At time t, dividend payments to equity holders "D_t" and reported earnings "RE_t" are announced; so that, if prior to time t, traders had an information set I_{t-1}, with the announcement of dividends and earnings, their information set will expand to $\{I_{t-1},D_t,RE_t\}$. Furthermore , it will be assumed that the information set I_t will not only include I_{t-1}, D_t, RE_t, but also information "W_t" which arrives in the market just after the managements' decision on dividends. Information "W_t" is assumed for simplicity and convenience to be irrelevant to the profitability of the firm as of time t, but perceived by traders to carry usefull information concerning its future prospects. That is, while I_{t-1}, D_t, RE_t may be useful for the estimation of the firm's current average profitabilty, the information "W_t" could represent "news" concerning possible changes of the firm's average profitability in the future. For example, "news" that the industry which the firm is a member may be subsidized by the Government. To be more specific, let's assume that the information "W_t" reveals an increase in the firm's future average profitability by 'X' dollars. However, the future profitability of the firm can not be predicted if there is no knowledge of its current one. Therefore, the information set $\{I_t\}$ will be defined as:

$$It = \{W_t, D_t, RE_t, I_{t-1}\}$$

Where, the set $\{D_t, RE_t, I_{t-1}\}$ is useful for estimating the current profitability, and the information $\{W_t\}$ may reveal a change in the regime.

2B.RELATIONS OF ESTIMATES & THE IMPACT OF THE "CURRENT"PROFITABILITY ON EXPECTATIONS

The traders' objective to get an estimate as close as possible to the firm's current profitability has been enhanced with the additional information on D_t and RE_t (prior to the information of D_t, RE_t traders had to rely only on I_{t-1}). That is, their new estimate will be,

$$P[\, M_t / D_t, RE_t, I_{t-1} \,]$$

Since the unknown to traders' M_t is assumed to be uncorrelated with the information set W_t, the following relation between estimates should exist;

$$P[\, M_t / W_t, D_t, RE_t, I_{t-1} \,] = P[\, M_t / D_t, RE_t, I_{t-1} \,] \qquad [1]$$

The linear projection of M_t conditional on the information set $I_t = \{ W_t, D_t, RE_t, I_{t-1} \}$ is equal to the linear projection of M_t, conditional on the set $\{ D_t, RE_t, I_{t-1} \}$. This is due to the irrelevancy of the information set W_t for estimating M_t. The information set "W_t" has been assumed to carry information regarding a possible change between current and future profitability.

Next, we assume that the one period ahead forecast, is equal to the i period ahead forecasts , when conditioned on the same information set I_t. That is,

$$P[\, M_{t+}i \,/W_t,D_t,RE_t,I_{t-1} \,] = P[\, M_{t+1} \,/W_t,D_t,RE_t,I_{t-1} \,] \quad [2]$$

for i=1,2...n

This equation implies that, the linear projection of M_{t+i} conditional on I_t, is the same as the linear projection of M_{t+1} conditional on I_t. In other words, the one period ahead forecast is equal to the i=2,3,...,n ahead forecasts.

As a matter of fact, the above relation could be less restrictive by assuming a known growth factor. However, the assumption of a known growth factor at present is not that significant, while its omission helps to simplify the notation on specific relations.

Furthermore, under the assumption that the information W_t carries useful information only about the future prospects of the firm, the following relation should be true:

$$P[\, M_{t+1} \,/\, D_t,RE_t,It_{-1} \,] = P[\, M_t \,/\, D_t,RE_t,I_{t-1} \,] \quad [3]$$

That is, traders have no reason to assume that next year the profitability of the firm will differ from the current one given that there is no growth factor and information W_t.

This assumption is described by equation [3] which states that the one period ahead forecast conditioned on D_t, RE_t, and I_{t-1}, shall be equal to the estimate of M_t conditioned on the same set. The above relations are sufficient to provide us with a particular relation between estimates of current and future profitability.

Given that the information set at time t is $I_t = \{W_t, D_t, RE_t, I_{t-1}\}$, from the rule of iterated projections , the estimate of M_{t+1} is decomposed to:

$$P[M_{t+1}/I_t] = P[M_{t+1}/ D_t, RE_t, I_{t-1}] + b\{[W_t - P[W_t/D_t, RE_t, I_{t-1}]\} \quad [4]$$

and given that $P[M_{t+1}/D_t, RE_t, I_{t-1}] = P[M_t/D_t, RE_t, I_{t-1}]$, relation [4], can be expressed as;

$$\mathbf{P[M_{t+1}/I_t] = P[M_t/D_t, RE_t, I_{t-1}] + b\{W_t - P[W_t/D_t, RE_t, I_{t-1}]\}} \quad \mathbf{[5]}$$

The above equation says that traders, at any time t, have reasons to believe that the future profitability of the firm will differ from the estimated <u>current</u> one, only by the term $b\{[W_t - P[W_t/D_t, RE_t, I_{t-1}]\}$. Therefore, if $W_t = P[W_t/D_t, RE_t, I_{t-1}]$ then, the expected future profitability shall be equal to the estimate of the current profitability.

Consequently, the estimate of M_t is significant to the traders' expectations regarding the firm's future profitability, and this estimate depends on dividends D_t, reported earnings RE_t, and all past information I_{t-1}.

Next, it is appropriate to proceed by showing how reported earnings RE_t could indeed carry usefull information for the minimization of uncertainty about M_t, andexamine any influence on expectations. That is, we shall examine a hypothetical case where traders derive an estimate of the firm's current profitability by relying only on the information set { RE_t, I_{t-1} }. Then, in subsequent sections dividends shall be introduced, and it will be shown that traders are able to get a better estimate about the firm's current profitability by relying on the set { D_t, RE_t, I_{t-1}) .

PART C. THE INFORMATIONAL CONTENT AND CONTRIBUTION OF REPORTED EARNINGS ON EXPECTATIONS

1C. REPORTED EARNINGS AND AVERAGE PROFITABILITY

If the traders' estimate of the firm's profitability M_t, as of time t-1, is the linear projection of M_t on the information set I_{t-1}, then I can state the following relationship :

$$M_t = P[\, M_t/I_{t-1} \,] + n_t \qquad [6]$$

where, M_t= the average profitability as of time t,

P= the linear projection operator

$P[M_t/I_{t-1}]$ = the linear projection of M_t, conditional on the set I_{t-1}, and the traders' estimate of M_t

n_t = an error term-

The term n_t is a random variable (a least square residual) that by the orthogonality principle obeys $E(n_t\, P[M_t/I_{t-1}]) = O$ and $E(n_t) = O$.

Let the variance of n_t be denoted by $E(n_t)^2 = \sigma^2 n_t$. The disturbance n_t is that part of M_t, which cannot be predicted from information I_{t-1}. Next, suppose that earnings RE_t, at any time t, deviate from the average profitability by an error term u_t; That is,

$$RE_t = M_t + u_t \qquad [7]$$

where, $E(u_t M_t) = O$, $E(u_t n_t) = O$, and $E(u_t\, u_s) = O$ for t different to s.

It is assumed that u_t is orthogonal to all variables in I_{t-1}. Equation [7] expresses earnings

RE_t as the sum of the firm's average profitability M_t and a random term u_t , where neither M_t nor u_t are observable. It is assumed that $E(u_t) = O$, $E(u_t)_2 = \sigma^2 u_t$.

Since reported earnings RE_t are related to M_t as in equation [7], their public announcement will provide valuable information to traders for the revision of the estimate $P[M_t/I_{t-1}]$.

Actually, the new estimate shall be conditional not only on I_{t-1}, but on RE_t as well. That is, it will be the linear projection of M_t on the set $\{RE_t, I_{t-1}\}$, or $P[M_t/RE_t, I_{t-1}]$.

Substituting [6] into [7] gives,

$$RE_t = P[\, M_t/I_{t-1}] + u_t + n_t \quad [8]$$

where again $E(n_t u_t)=O$, so that $E\{(n_t+u_t)^2\} = \sigma^2 n_t + \sigma^2 u_t$. Since by construction n_t is orthogonal to I_{t-1} and since by assumption u_t is
orthogonal to I_{t-1}, equation [8] is a projection equation with disturbance u_t+n_t, so that

$$P[RE_t/I_{t-1}] = P[M_t/I_{t-1}] \qquad [9]$$

and this is easily seen if we take the linear projection of equation [8],
conditional on I_{t-1}. That is,

$$P[RE_t/I_{t-1}] = P[M_t/I_{t-1}] + P[n_t/I_{t-1}] + P[u_t/I_{t-1}]$$

where, $\qquad P[n_t/I_{t-1}] = P[u_t/I_{t-1}] = O$

It should be pointed out, that from the above equations we are able to see that the variability of earnings around their projected value will depend not only from their variance around the firm's average profitability ($\sigma^2 u_t$), but also from the degree of uncertainty around M_t ($\sigma^2 n_t$). That is,

$$RE_t = P[\, RE_t/I_{t-1}] + u_t + n_t.$$

2C. DERIVING THE NEW ESTIMATE

To find the contribution of reported earnings RE_t to the revision of the market's estimate, we have to derive a relationship between the revised estimate and the estimate prior to the announcement of RE_t.

From the law of linear projections, we know that the new estimate $P[M_t/RE_t,I_{t-1}]$ can be expressed as follows:

$$P[\, M_t/RE_t,I_{t-1}\,] = P[M_t/I_{t-1}\,] + g_t \{\, RE_t-P[RE_t/I_{t-1}] \,\} \qquad [10]$$

where the parameter g_t is equal to,

$$g_t = \frac{E\{(RE_t-P[RE_t/I_{t-1}) \, (M_t-P[M_t/I_{t-1}])\}}{E\{(RE_t - P[RE_t/I_{t-1}]\,)^2\,\}}$$

The estimate $P[M_t/RE_t,I_{t-1}\,]$ can be simplified as follows. From equations [6] and [8] we know that

$$RE_t - P[\, RE_t/I_{t-1}\,] = n_t + u_t$$

$$M_t - P[\, M_t/\, I_{t-1}] = n_t$$

and also that $E(n_t u_t) = 0$. Then the parameter g_t, can be expressed as

$$g_t = \frac{E\{(n_t + u_t)(n_t)\}}{E\{(n_t + u_t)^2\}}$$

which reduces to,

$$g_t = \frac{\sigma^2 n_t}{\sigma^2 n_t + \sigma^2 u_t}$$

Hence, the new or revised estimate $P[M_t/RE_t, I_{t-1}]$ will be equal to :

$$P[M_t/RE_t, I_{t-1}] = P[M_t/I_{t-1}] + [\sigma^2 n_t \div (\sigma^2 n_t + \sigma^2 u_t)] \{RE_t - P[RE_t/I_{t-1}]\} \quad [11]$$

The above equation says that the revised estimate $P[M_t/RE_t, I_{t-1}]$, is equal to the estimate prior to the announcement of RE_t, $P[M_t/I_{t-1}]$, plus the "surprise factor" of reported earnings [$RE_t - P(RE_t/I_{t-1})$], multiplied by the parameter 'g_t' which represents the significance of the surprise to the revision .

Since the parameter "g_t" depends on the variance of n_t, which could be thought as an index of uncertainty about M_t prior to the announcement of earnings, and the variance of u_t, which could be thought as the perceived by the market variability of earnings around M_t , then it becomes apparent that the contribution of RE_t to the revision of the estimate will be less significant the smaller the degree of uncertainty prior to the announcement of RE_t, and the greater the $\sigma^2 u_t$. That is, if traders believe that they know the firm's profitability, $\sigma^2 n_t = O$, they have no need to look up to RE_t and they will rely only on $P[M_t/I_{t-1}]$. In other words the marginal contribution of RE_t to the revision of the estimate is zero. While, if they are very uncertain about the firm's profitability prior to the announcement of RE_t (large $\sigma^2 n_t$), the marginal contribution of RE_t will approach the value of one (1.O). Moreover , we know that $P[M_t/I_{t-1}] = P[RE_t/I_{t-1}]$, so that we can rewrite the new estimate as :

$$P[M_t/RE_t,I_{t-1}] = (1-g_t)\ P[M_t/I_{t-1}] + g_t\ RE_t \quad [12]$$

That is, as g_t decreases , $(1-g_t)$ increases. Since the parameter g_t depends on the market's perception about the variances of the terms u_t, n_t, in periods of great uncertainty , that is large variance of n_t, traders may have to rely heavily on reported earnings; and if earnings happen to be small or even negative the impact on future expectations (see relation [5]) will be great. If for the moment we ignore dividends, an equivalent relation to relation [5] could be expressed as;

$$P[M_{t+i}/I_t] = P[M_t/RE_t,I_{t-1}] + b\{W_t-P[W_t/RE_t,I_{t-1}]\}$$

And the lower the estimate $P[M_t/RE_t,I_{t-1}]$ the lower will be the $P[M_{t+i}/I_t]$. This possible market reaction may lead to a drastic decrease in the value of the firm, where management may believe to be either unfounded or not representitive of the firm's intrinsic value. Consequently, if traders form their expectations as in equation

$$P[M_t/RE_t,I_{t-1}] = P[M_t/I_{t-1}] + [\sigma^2 n_t \div (\sigma^2 n_t+\sigma^2 u_t)]\ \{RE_t-P[RE_t/I_{t-1}]\}\ [11]$$

then, in periods of great uncertainty (large $\sigma^2 n_t$), unanticipated reported earnings will exert great influence on expectations and possibly on valuation. Moreover, equation [11] shows that management has no control in any of the variables (RE_t is not a control variable), and is unable to influence expectations. Hence, given that management has superior information about the firm's current and future prospects, it might be in the best interest of its stockholders (assumed to be risk averse), if management somehow had the ability to intervine actively and influence value. In reality management may have several ways to intervine, but the issue of interest here is to show how dividend policy can accomplish this.

Finally, concluding on the informational impact of earnings, I should mention that , as long as the variance of n_t is greater than zero, and the variance of u_t is less than infinite, the arrival of RE_t, shall always minimize uncertainty, and this is true irrespective of the stability or instability of the environment.

If we examine the mean square error of the estimate $P[M_t/RE_t, I_{t-1}]$ around the real mean M_t, then the degree of uncertainty prior to the announcement of earnings , which is represented by the $\sigma^2 n_t$, is indeed greater than the MSE. That is, [see appendix 1]

$$\sigma^2_{nt} \quad > \quad \sigma^2 n_t \quad \frac{\sigma^2 u_t}{\sigma^2 n_t + \sigma^2 u_t}$$

where,

$$\text{MSE} \quad = \quad \sigma^2 n_t \quad \frac{\sigma^2 u_t}{\sigma^2 n_t + \sigma^2 u_t}$$

Therefore, the announcement of earnings will minimize uncertainty regarding the firm's current average profitability.

APPENDIX 1

The MSE of the estimate $P[M_t/RE_t,I_{t-1}]$ is, $MSE = E\{(M_t-P[M_t/RE_t,I_{t-1}])^2\}$ If we substitute for $P[M_t/RE_t,I_{t-1}]$, the right hand side of equation [5] then we have;

$$MSE = E\{ (M_t-P[M_t/I_{t-1}] - \frac{\sigma^2 n_t}{\sigma^2 n_t+\sigma^2 u_t} [RE_t-P[RE_t/I_{t-1}]])^2 \}$$

And by using the fact that, $M_t-P[M_t/I_{t-1}] = n_t$, and $RE_t-P[RE_t/I_{t-1}] = n_t+u_t$,the MSE reduces to:

$$MSE = E \{(n_t - \frac{\sigma^2 n_t}{\sigma^2 n_t+\sigma^2 u_t} [n_t+u_t])^2 \}$$

Moreover, for an expression of MSE in terms of the $\sigma^2 n_t$, $\sigma^2 u_t$ we have;

$$MSE = E \{[n_t(1-g_t) - g_t(u_t)]_2 \} = \sigma^2 n_t(1- g_t)^2 + \sigma^2 u_t\, g_t^2$$

or,

$$MSE = \sigma^2 n_t \frac{\sigma^2 u_t}{\sigma^2 n_t+\sigma^2 u_t}$$

If we compare the MSE prior and after the announcement of reported earnings RE_t, we see that uncertainty has been reduced.

$$E\{ (M_t-P[M_t / I_{t-1}])^2 \} > E\{ (M_t -P[M_t /RE_t,I_{t-1}])^2 \}$$

or,

$$\sigma^2 n_t > \sigma^2 n_t \frac{\sigma^2 u_t}{\sigma^2 n_t+\sigma^2 u_t}$$

PART D. THE INFORMATIONAL CONTENT AND CONTRIBUTION OF DIVIDENDS ON EXPECTATIONS

1D. THE DIVIDEND GENERATING PROCESS

The impact of dividends to the estimation of the sequence M_{t+i}, for i = O,1,2,....n, will depend on the assumed dividend generating process. Let's assume that in a world where external financing is possible, traders believe that dividends are not residuals but they depend on the firm's average profitability (as it is perceived by management). That is, dividends are governed by the following process.

$$D_t = r\, M_t + e_t \qquad [13]$$

where, D_t = dividend payments at time t

M_t = management's perceived profitability as of time t

r = a known target payout ratio

e_t = an error term which affects dividend payments and

represents factors other than M_t

According to [13] dividend payments to equity holders are expressed as the sum of a known or perceived fraction of M_t, and a random term e_t. Agents are assumed to know neither M_t nor e_t but they know r.

The term e_t is a random variable with variance $E(e_t)^2 = \sigma^2 e_t$ and expected value $E(e_t)=O$. It is assumed orthogonal to all the variables in the set I_{t-1} and that $E(e_t M_t)$ =

$E(e_t n_t) = 0$.

However, since the factors which cause earnings to deviate from the firm's average profitability may also affect dividend payments, we shall assume that the error terms u_t and e_t are correlated so that their covariance may not necessarily be equal to zero, that is $E(u_t e_t) = cov(u_t, e_t) = \alpha_t$. Where α_t is assumed known and equal to $\alpha_t = p\, \sigma e_t\, \sigma u_t$, with 'p' been the correlation coefficient of e_t , u_t and σe_t , σu_t their respective standard deviations.

Given the firm's target pay-out ratio "r" , equation [13] states that, any increase in dividend payments can be explained by traders as an increase in the average profitability of the firm M_t' or due to some other factors "e_t" (or any combination of the two). Therefore a relation such as the one described above establishes some informational value for dividends. The announcement of D_t will expand the traders' relevant information set about M_t, and the firm's perceived profitability will be the linear projection of M_t, on D_t, RE_t, and I_{t-1}. That is,

$$P[M_t/D_t, RE_t, I_{t-1}]$$

Moreover, from the law of linear projections , we know that the estimate $P[M_t/D_t, RE_t, I_{t-1}]$, is equal to:

$$[14] \quad P[M_t/D_t, RE_t, I_{t-1}] = P[M_t/RE_t, I_{t-1}] + kt\,\{D_t - P[D_t/RE_t, I_{t-1}]\}$$

Equation [14] states that the new estimate of M_t is equal to the estimate of M_t conditional on the information set $\{RE_t, I_{t-1}\}$, plus the surprise factor of dividends multiplied by the factor k_t. So if actual dividend payments D_t are greater than projected dividends, that is $P[D_t/RE_t,I_{t-1}]$, the estimate of the average profitability will be revised upwards or downwards depended on the value of the parameter k_t. Where, the parameter k_t can be expressed as:

$$k_t = \frac{E\{ (M_t-P[M_t/RE_t,I_{t-1}]) (D_t-P[D_t/RE_t,I_{t-1}]) \}}{E\{ (D_t-P[D_t/RE_t,I_{t-1}])^2 \}}$$

In order to get a more informative expression of the new estimate $P[M_t/D_t, RE_t, I_{t-1}]$, and see the relative significance of every piece of information used by traders to estimate profitability, the expansion of equation [14] is necessary. Such expansion is possible if we simplify;

a). The linear projection of M_t, on reported earnings RE_t, and the information set I_{t-1}. Actually, this has been done in PART C , equation [11] .

b).The corroborative relation of cash payments with reported earnings, which is represented with the linear projection of D_t on RE_t, and I_{t-1}. That is, $P[D_t/RE_t,I_{t-1}]$.

c). The parameter K_t, by expressing it in terms of the known or perceived variances and covariances of the terms u_t, e_t and n_t.

By doing so, we shall see how dividends could affect expectations.

2D. EXPANSION OF THE NEW ESTIMATE AND THE PARAMETER k_t.

To analyze k_t, we have to derive simplified and useful expressions for the terms $E\{(D_t-P[D_t/RE_t,I_{t-1}]) (M_t-P[M_t/RE_t,I_{t-1}])\}$ and $E\{(D_t-P[D_t/RE_t,I_{t-1}])^2\}$.

i. The Term $(M_t\text{-}P[M_t/RE_t,I_{t-1}])\}$

The term $P[M_t/RE_t,I_{t-1}]$ which is the traders' estimate of the firm's average profitability, conditional on reported earnings and past information, has already been expressed as:

$$P[M_t/RE_t,I_{t-1}] = P[M_t/I_{t-1}] + g_t \{RE_t\text{-}P[RE_t/I_{t-1}]\}$$

where $g_t = \sigma^2 n_t \div [\sigma^2 n_t + \sigma^2 u_t]$

Then, $M_t\text{-}P[M_t/RE_t,I_{t-1}] = M_t\text{-}P[M_t/I_{t-1}] - g_t\{RE_t\text{-}P[RE_t/I_{t-1}]\}$

Since we know that, $M_t\text{-}P[M_t/I_{t-1}] = n_t$, and $RE_t\text{-}P[RE_t/I_{t-1}] = n_t+u_t$,

we rewrite the above expression as follows:

[15] $$M_t - P[M_t/RE_t,I_{t-1}] = n_t - g_t(n_t + u_t)$$

ii. The Term $(D_t\text{-}P[D_t/RE_t,I_{t-1}])$

The projected dividend payment conditional on reported earnings and past information is expressed as the linear projection of dividends D_t on RE_t and I_{t-1}, which is decomposed as follows:

$$P[D_t/RE_t,I_{t-1}] = P[D_t/I_{t-1}] + j_t \{RE_t\text{-}P[RE_t/I_{t-1}]\}$$

where, the parameter j_t is defined as,

$$j_t = \frac{E\{(D_t - P[D_t/I_{t-1}])\ (RE_t - P[RE_t/I_{t-1}])\}}{E\{(RE_t - P[RE_t/I_{t-1}])^2\}}$$

Given equations [6] and [13], $M_t = P[M_t/I_{t-1}] + n_t$ [6]

$$D_t = r\ M_t + e_t \qquad [13]$$

and by substituting equation [6], into [13] we get,

$$D_t = r\ P[M_t/I_{t-1}] + r\ n_t + e_t \quad [16]$$

Furthermore, by assuming orthogonality of e_t on the information set I_{t-1}, (the terms u_t, n_t have already been assumed orthogonal to I_{t-1}) , and that $E(n_t u_t) = E(n_t e_t) = O$ and $E(e_t u_t) = \alpha_t$ then, the linear projection of D_t on I_{t-1} is ,

$$P[Dt/I_{t-1}] = r\ P[M_t/I_{t-1}] \quad [17]$$

and

$$D_t - P[D_t/I_{t-1}] = rn_t + e_t$$

Therefore, the parameter j_t becomes,

$$j_t = \frac{E\{(r\ n_t + e_t)\ (n_t + u_t)\}}{E\{(n_t + u_t)^2\}}$$

or, $j_t = [r\ \sigma^2 n_t + \alpha^t] \div [\ \sigma^2 n_t + \sigma^2 u_t]$

and $D_t - P[D_t/RE_t, I_{t-1}] = D_t - P[D_t/I_{t-1}] - j_t\{RE_t - P[RE_t/I_{t-1}]\} = (\ rn_t + e_t) - j_t(n_t + u_t)$

iii. The Parameter k_t

By deriving, the terms M_t-P[M_t/RE_t,I_{t-1}] and D_t-P[D_t/RE_t,I_{t-1}] as relations between the terms u_t, n_t, e_t and their known variances and covariances , we are able to get a more informative expression of the parameter k_t. That is,

$$k_t = \frac{E\{(M_t-P[M_t/RE_t,I_{t-1}])\ (D_t-P[D_t/RE_t,I_{t-1}])\}}{E\{(D_t-P[D_t/RE_t,I_{t-1}])^2\}}$$

and

$$k_t = \frac{E\{[n_t\ -g_t(n_t+u_t)]\ [(m_t+e_t)-j_t(n_t+u_t)]\}}{E\{[(m_t+e_t)-j_t(n_t+u_t)]^2\}}$$

which reduces to $k_t = \sigma^2 n_t\ [r\sigma^2 u_t-\alpha_t] \div F_t$

or,

$$k_t = \frac{r\ \sigma^2 n_t\ \sigma^2 u_t\ [1-p\sigma e_t/r\sigma ut]}{F_t}$$

where,

$$F_t = r_2\ \sigma^2 n_t\ \sigma^2 u_t - r\alpha_t\ \sigma^2 n_t + \sigma^2 e_t\ \sigma^2 n_t - r\alpha_t\ \sigma^2 n_t + \sigma^2 u_t\ \sigma^2 e_t - \alpha^2$$

or

$$F_t = r^2\ \sigma^2 n_t\ \sigma^2 u_t[1-p\sigma e_t/r\sigma ut]\ +\sigma^2 n_t\ \sigma^2 e_t[1-p\ r\sigma u_t/\sigma e_t]+\sigma^2 u_t\sigma^2 e_t[1-p^2]$$

However, since $E\ \{\ [(m_t+e_t)-j_t(n_t+u_t)]^2\ \} > O$, then it is also known that $F_t > O$. Consequently, after the announcement of earnings RE_t, unanticipated or unpredicted dividend payments will have no effect on expectations only ifthe parameter K_t is zero.

And this is true if the target payout ratio r has a very specific value[12]. That is, if

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$$r = p\ \sigma e_t / \sigma ut$$

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then we say that the informational content of dividends is redundant and equation [14] is reduced to equation [1O]. That is,

$$P[M_t/RE_t,I_{t-1}] = P[M_t/D_t,RE_t,I_{t-1}]$$

However, a value of $r = p\ \sigma e_t / \sigma ut$ to be sustained from time period to time period seems unlikely, since the variances of the error terms e_t and u_t may be time depended and the same could be true for the correlation coefficient p .

Moreover, even if the sequences of $\{e_t\}$ and $\{u_t\}$ are white noises and the correlation coefficient p is constant, we are going to show that the above value for "r" might not be in the best interest of management and stockholders .

iv. About The New Estimate

Given that the parameter K_t is different than zero, equation [14], $P[M_t/D_t,RE_t,I_{t-1}]=P[M_t/RE_t,I_{t-1}]+k_t\{D_t-P[D_t/RE_t,I_{t-1}]\}$ can be simplified further by

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[12] This is very unlikely, since r is a constant, while the standard deviations of the terms u_t and e_t could be time varying.

expanding its terms as follows:

Given that, $P[M_t/RE_t,I_{t-1}]=P[M_t/I_{t-1}]+g_t\{RE_t-P[RE_t/I_{t-1}]\}$ then, we can rewrite it as,

$$P[M_t/D_t,RE_t,I_{t-1}]= P[M_t/I_{t-1}]+g_t\{RE_t-P[RE_t/I_{t-1}]\}+k_t\{D_t-P[D_t/RE_t,I_{t-1}]\}$$

In addition to that, since

$$D_t-P[D_t/RE_t,I_{t-1}]=\{D_t-P[D_t/I_{t-1}]-j_t[RE_t-P[RE_t/I_{t-1}]\}$$

Then,

$$P[M_t/D_t,RE_t,I_{t-1}]=P[M_t/I_{t-1}]+g_t\{RE_t-P[RE_t/I_{t-1}]\}+k_t\{D_t-P[D_t/I_{t-1}]-j_t[RE_t-P[RE_t/I_{t-1}]\}=$$

$$=P[M_t/I_{t-1}] + (g_t-j_tk_t)\ \{RE_t-P[RE_t/I_{t-1}]\}+ k_t\{D_t-P[D_t/I_{t-1}]\}$$

Furthermore, by using the fact, that $P[Dt/I_{t-1}] = r\ P[M_t/I_{t-1}]$ and $P[M_t/I_{t-1}]=P[RE_t/I_{t-1}]$, we get:

$$P[M_t/D_t,RE_t,I_{t-1}] = (1-[g_t-j_tk_t]-rk_t)\ P[M_t/I_{t-1}] + [g_t-j_tk_t]\ RE_t + k_t\ D_t$$

If we denote by μ_t and Φ_t the coefficients of RE_t and $P[M_t/I_{t-1}]$, that is,

$$(1-[g_t-j_tk_t]-rk_t) = \Phi_t$$

$$[g_t-j_tk_t] = \mu_t$$

then we derive the simplified expression,

$$[18] \qquad P[M_t/D_t,RE_t,I_{t-1}] = \Phi_t\ P[M_t/I_{t-1}] + \mu_t\ RE_t + k_t\ D_t$$

Which says that the new estimate is a linear function of a past estimate, earnings and dividends.

To extract more information about the parameters we analyze further the term $(g_t-j_tk_t)$ or μ_t by proceeding as follows:

Given that k_t is different than zero then,

$$(g_t-j_tk_t) = \frac{\sigma^2n_t}{\sigma^2n_t+\sigma^2u_t} - \frac{r\sigma^2n_t+\alpha_t}{\sigma^2n_t+\sigma^2u_t}\left(\frac{r\sigma^2n_t\,\sigma^2u_t\,[1-p\sigma e_t/r\sigma u_t]}{F_t}\right)$$

or,

$$(g_t-j_tk_t)= \frac{\sigma^2n_t}{\sigma^2n_t+\sigma^2u_t}\left\{\frac{(F_t - [r\sigma^2n_t+\alpha_t]\,[r\sigma^2u_t-\alpha_t])}{F_t}\right\}$$

and by further simplification we get,

$$(g_t-j_tk_t)= \mu_t = \frac{\sigma^2n_t\,\sigma^2e_t\,[1 - p\ r\sigma u_t/\sigma e_t]}{F_t}$$

By doing the same for the parameter $(1-[g_t-j_tk_t]-rk_t)$, then

$$1-[g_t-j_tk_t]-rk_t) = 1 - \mu_t -rk_t = \Phi_t \qquad \text{and}$$

$$\Phi_t = \{ F_t - \sigma^2n_t\,[\sigma^2e_t - r\alpha_t]-r\sigma^2n_t\,[r\sigma^2u_t-\alpha_t] \}\div F_t$$

or,
$$\Phi_t = \frac{\sigma^2u_t\,\sigma^2e_t\,[1 - p^2\,]}{F_t}$$

By deriving the parameters k_t, μ_t, Φ_t as functions of known variances and covariances, and under the assumption that k_t is different than zero,[13] we proceed by examining their dependence and their respective influence on the estimate of the firm's current profitability.

3D. RELATIONS & INTERDEPENDENCE OF THE PARAMETERS k_t, μ_t, Φ_t.

When, we analyzed the impact of earnings on the market's expectations in part C, I claimed that management seemed unable to influence any of the variables which appeared in the equation

$$P[M_t/RE_t, I_t\text{-}1] = (1\text{-}g_t)P[M_t/I_{t\text{-}1}] + g_t RE_t$$

and the fact that traders have to rely only on reported earnings and some prior estimate, may sometimes result in differences between management and market valuation. However, given relation [14 or 18] it seems that management can influence expectations. Actually , the inclusion of dividends D_t, in the formation of the market's expectations, provides leeway for active intervention. That is, given the parameter k_t (see equation 14) it is easy to see that management can affect expectations upwards or downwards by paying cash dividends D_t different than the projected ones $P[D_t/RE_t, I_{t\text{-}1}]$. Moreover, the impact of dividend policy to the newly derived estimate $P[M_t/D_t, RE_t, I_{t\text{-}1}]$, is significant not only because management now can use dividends as an <u>instrument</u> to affect indirectly the market's expectations [see equation 14 or 18], but also because the significance and contribution of the prior estimate $P[M_t/I_{t\text{-}1}]$ and reported earnings RE_t can

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[13] If Kt=O, then $\mu t = gt$ and $\Phi t = 1\text{-}g$

be affected as well. Actually, the inclusion of dividends to the formation of expectations has altered the weights assigned to reported earnings and the prior estimate. That is, after the announcement of dividends , traders will assign a smaller weight on the estimate $P[M_t/I_{t-1}]$, while the weight for RE_t will depend on the specific value of the target payout ratio.

To show this, we have to compare the partial contribution of reported earnings when there are no dividend payments, with the partial contribution of earnings when dividends are paid (the same will be done for the estimate $P[M_t/I_{t-1}]$).

Therefore, we have to analyze the conditions under which the parameter g_t should be greater, equal or smaller than the parameter $(g_t - j_t k_t) = \mu_t$

,and the same for the parameter $(1-g_t)$ with respect to $[1 -[g_t-j_t k_t]-rk_t] = \Phi_t$. Given that the covariance of the error terms e_t and u_t is positive, then

j_t is always positive so that the inequality

$$g_t > \mu_t$$

will hold , as long as $k_t > O$ or $r > p\, \sigma_{eu}\sigma_u t$. While the opposite is true for values of $K_t < O$. While the inequality

$$1-g_t > \Phi_t$$

is always true, because $1-g_t > 1-g_t + j_t K_t - rK_t$ when $r > j_t$. While, when $r < j_t$ then $K_t < O$. Therefore, when dividends are payed the parameter or weight assigned by traders to the past estimate goes down, while the parameter assigned to earnings may increase or decrease and its specific value will depend on the value of K_t. This behavior, of the parameters, gives management the ability by setting properly the target pay-out ratio to affect the impact of the different information variables.

For example, if management desires the neutrality of reported earnings on expectations, it is possible, under certain conditions, to accomplish this.

If we assume that the sequences of $\{u_t\}$, $\{e_t\}$ are white noises and the $E(u_t e_t)=\alpha$ for all t, then by setting the target pay-out ratio equal to

$$r = \sigma e / p \sigma u$$

management can neutralize the information content of earnings , because the parameter μ_t becomes zero. It should be pointed out that this is an obtainable solution as long as the target payout ratio takes a value between zero and one. Moreover, the neutrality of earnings will change the parameters K_t and Φ_t to:

$$\Phi_t = (\sigma^2 e_t) / (r^2 \sigma^2 n_t + \sigma^2 e_t)$$

and $$K_t = (r \sigma^2 n_t) / (r^2 \sigma^2 n_t + \sigma^2 e_t)$$

In general, we see that <u>the selection of the target payout ratio has a direct impact on the relative contribution of each one of the variables on traders' expectations.</u>

Furthermore , if the correlation coefficient $p = O, (E(e_t u_t) = O)$, then the inequalities $g_t > g_t - j_t k_t$ and $1 - g_t > \Phi_t$ hold for any value of $r > O$ because k_t is always greater than zero.

Consequently, from the above findings , it seems that for two firms with the same D_t, RE_t, $P[M_t/I_{t-1}]$, $\sigma^2 e_t$, $\sigma^2 u_t$, $\sigma^2 n_t$, and p, expectations about future profits will be different if their target payout ratio is different.

The following table, provides a summary of the relative sign (positive or negative) of reported earnings and dividends for different values of the target pay out ratio:

Table 1D.

	$r<p\sigma e_t/\sigma u_t$	$r=p\sigma e_t/\sigma u_t$	$p\sigma e_t/\sigma u_t<r<\sigma e_t/p\sigma u_t$	$r=\sigma e_t/p\sigma u_t$	$\sigma e_t/p\sigma u_t<r$
μ_t	+	+	+	O	-
K_t	-	O	+	+	+

From the above table, which shows the relative significance of earnings and dividends with respect to the target pay out ratio , it is reasonable to assert that for firms who have to assign relatively small payout ratios, because they rely on retained earnings to finance investment activities, the parameter K_t may be very small or even negative. In that case traders will assign relatively higher weights on reported earnings than dividends.

A more extensive analysis on dividends will be provided in part E, where market expectations are incorporated to stock valuation.

The preceding analysis indicated that dividends will convey usefull and non-redundant information as long as the parameter K_t is different than zero. Which implies that dividend payments should minimize uncertainty concerning the firm's profitability. A detailed analysis on the minimization of uncertainty is provided in the subsequent section.

4D. Dividends and Uncertainty

Although this study is an attempt to elaborate further the informational hypothesis, a point of interest, with possible implications on risk premiumm is that the introduction of dividends contributes to the minimization of uncertainty around M_t.

This can be seen, by deriving the mean square error of the new estimate $P[M_t/D_t,RE_t,I_{t-1}]$ around M_t. That is,

$$MSE = E\{(M_t-P[M_t/D_t,RE_t,I_{t-1}])^2\}$$

and if we substitute for $P[M_t/D_t,RE_t,I_{t-1}]$ the right hand side of equation [18], then the MSE will become; [see appendix 2]

$$MSE_t = \frac{(1-p^2)\ \sigma^2 n_t\ \sigma^2 u_t\ \sigma^2 e_t}{F_t}$$

From the above equation we can see that, the degree of uncertainty that traders face about the firm's current profitability, will depend on the $\sigma^2 n_t$, $\sigma^2 u_t$, $\sigma^2 e_t$, p and r. Furthermore, in order to see the contribution of dividends to the minimization of uncertainty, in the mean square sense, we have to analyze the circumstances under which the following inequality holds.

$$E\{ (M_t - P[M_t/RE_t,I_{t-1}])^2\} > E\{ (M_t-P[M_t/D_t,RE_t,I_{t-1}])^2\}$$

or,

$$\frac{\sigma^2 n_t \, \sigma^2 u_t}{\sigma^2 n_t + \sigma^2 u_t} > \frac{(1-p^2) \;\; \sigma^2 n_t \, \sigma^2 u_t \, \sigma^2 e_t}{F_t}$$

The above inequality though reduces to:

$$F_t > (1-p^2) \, [\, \sigma^2 n_t + \sigma^2 u_t \,] \, \sigma^2 e_t$$

or, $[r \, \sigma_2 u_t - \alpha_t]^2 > O$, which is always true as long as the target pay-out ratio is different than $r = p(\sigma e_t/\sigma u_t)$, or $K_t = O$.

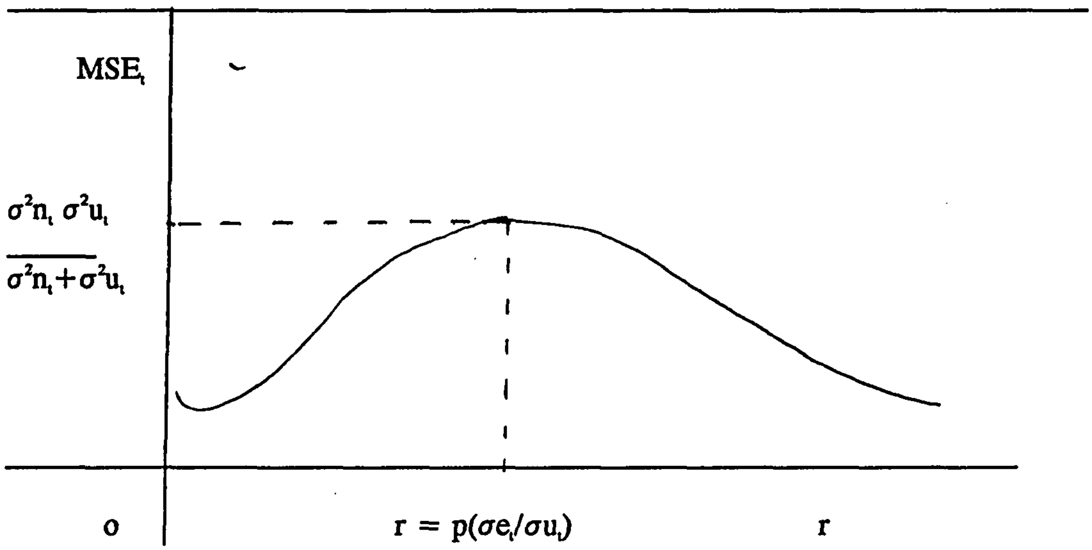
Therefore, given that k_t is different than zero, the introduction of dividends minimizes uncertainty about the firm's average profitability. It is conceivable that the degree of uncertainty around M_t may affect the required rate of return. In that case the target pay out ratio not only will affect expectations but rates of return as well. By analyzing further the MSE,we see how uncertainty is related to 'r' by taking the partial derivative of MSE_t with respect to r. Then,(see appendix 3)

$$\delta MSE_t/\delta r > O \quad \text{if} \quad O < r < p\,(\sigma e_t/\sigma u_t)$$

and $$\delta MSE_t/\delta r < O \quad \text{if} \quad r > p\,(\sigma e_t/\sigma u_t)$$

While the maximum MSE_t occurs when $r = p \, \sigma e_t/\sigma u_t$ or $K_t = O$. In general the behavior of the MSE_t with respect to r is depicted in the following graph.

Graph 1D



In order to see how uncertainty and the marginal contribution of earnings and dividends behave with respect to "r", the table 2D is provided.

Table 2D.

	$r<p\sigma e_t/\sigma u_t$	$r=p\sigma e_t/\sigma u_t$	$p\sigma e_t/\sigma u_t<r<\sigma e_t/p\sigma u_t$	$r=\sigma e_t/p\sigma u_t$	$\sigma e_t/p\sigma u_t<r$
μ_t	+	+	+	O	-
K_t	-	O	+	+	+
$\delta MSE_t/\delta r$	+	MAX	-	-	-

That is, given that the correlation coefficient p different than zero, uncertainty may be small either with high or low target pay out ratios. However relatively low target pay out ratios make traders to rely heavily on earnings while high target pay-out ratios make traders to rely heavily on dividends . Summarizing our findings we state that:

a.Dividend payments always minimize uncertainty, exept for a very special case where

$r = p\sigma e_t/\sigma u_t$.

b.The selection of the target pay-out ratio has an effect on expectations and uncertainty.

c.For a firm, given $\sigma_2 e_t$, $\sigma^2 u_t$, and p, the lower the target pay-out ratio the heavier traders would rely on earnings to form their expectations.

d.Since, earnings are not a control variable while dividends are, high target pay-out ratios provide management with the ability to have more control on market expectations. Actually management by selecting properly the target pay-out ratio (assuming this to be feasible) may neutralize the impact of earnings on expectations.

e. There is no way to tell about the impact of dividends and earnings on expectations and uncertainty for two different firms by looking just at the pay-out or target pay-out ratios. A given target pay-out ratio, may be adequate to make dividends very significant to the formation of expectations for one firm, but it might be inadequate for another. This may explain the inconclusive findings of Black and Scholes.

Concluding , part D, we must say that the above findings appear to give strong indications for a possible dual character of dividends. That is, it has been shown that dividend payments and the target payout ratio affect expectations but also minimize uncertainty . Therefore the informational content hypothesis although valid by assumption does not necessarily establish the irrelevancy of the target payout ratio.

Next, we attempt to incorporate dividends on market valuation for a more detailed analysis on the issue.

APPENDIX 2

The Mean Square Error of the estimate $P[M_t/D_t,RE_t,I_{t-1}]$ around the firm's average profitability M_t, is expressed as,

$$MSE = E\{ (M_t - P[M_t/D_t,RE_t,I_{t-1}])^2 \}$$

If we substitute equation [14] into the above expression, then we get;

$$MSE = E \{ (M_t - (1-[g_t-j_tk_t]-rk_t) P[M_t/I_{t-1}] -(g_t-j_tk_t)RE_t -k_tD_t)^2 \}$$

or, by rearanging

$$MSE = E\{(M_t-P[M_t/I_{t-1}])-[g_t-j_tk_t](RE_t -P[RE_t/I_{t-1}])-k_t(D_t-P[D_t/I_{t-1}]) \}^2$$

$$= E \{ n_t -[g_t-j_tk_t](n_t+u_t) - k_t(rn_t + e_t) \}^2$$

$$= E \{ (1-[g_t-j_tk_t]-rk_t) n_t - [g_t-j_tk_t] u_t - k_t e_t \}^2 \quad \text{and}$$

$$MSE = \frac{\sigma^2 n_t \, \sigma^2 u_t \, \sigma^2 e_t \, (1-p^2)}{F_t}$$

where,

$$F_t = r^2\,\sigma^2 n_t\,\sigma^2 u_t[1 - p\sigma e_t/r\sigma u t] + \sigma^2 n_t\,\sigma^2 e_t[1 - pr\sigma u_t/\sigma e_t] + \sigma^2 u_t\,\sigma^2 e_t[1 - p^2]$$

APPENDIX 3.

The partial derivative of the MSE with respect to r is,

$$\delta MSE_t/\delta r = \frac{-\sigma^2 n_t \sigma^2 u_t \sigma^2 e_t (1-p^2)\,(\delta F_t/\delta r)}{F_t^2}$$

or

$$\delta MSE_t/\delta r = -MSE_t \frac{(\delta F_t/\delta r)}{F_t}$$

but $\delta F_t/\delta r = 2\,\sigma^2 n_t \sigma^2 u_t\,(r - p\sigma e_t/\sigma u_t)$

Therefore, for $r > p\sigma e_t/\sigma u_t$ $\quad \delta MSE_t/\delta r < O$

for $r = p\sigma e_t/\sigma u_t$ $\quad \delta MSE_t/\delta r = O$

for $r < p\sigma e_t/\sigma u_t$ $\quad \delta MSE_t/\delta r > O$

PART E: DIVIDENDS, REPORTED EARNINGS AND MARKET VALUATION OF COMMON STOCK.

THE IMPACT OF DIVIDENDS AND EARNINGS TO THE VALUE OF COMMON STOCK

1E. The Price Generating Process

The payoff to owners of common stock comes in two forms: (1) cash dividends and (2) capital gains or losses. Then, given the required rate of return, the value of the firm's common stock, at time t, can be expressed as follows.

$$V_t = \frac{P[V_{t+1}/I_t] + P[D_{t+1}/I_t]}{(1+R)}$$

[e.1]

where, V_t = the value of the common stock at time t

R = the required rate of return

$P[./.]$ = the linear projection operator

V_{t+1} = value of common stock at time t+1

D_{t+1} = dividends at time t+1

I_t = the information set of traders at time t

However, the linear projection of V_{t+1} conditional on the information set I_t, will be equal to:

$$P[V_{t+1}/I_t] = (1/1+R)\ \{P[V_{t+2}/I_t] + P[D_{t+2}/I_t]\}$$

so that equation [e.1] can be rewritten as follows:

$$V_t = \frac{P[D_{t+1}/I_t]}{(1+R)} + \frac{P[D_{t+2}/I_t]}{(1+R)^2} + \frac{P[V_{t+2}/I_t]}{(1+R)^2}$$

By expanding sequencially the projected future value of the firm's common stock, we are able to derive a well known formula of common stock valuation. That is,

$$V_t = \frac{P[D_{t+1}/I_t]}{(1+R)} + \frac{P[D_{t+2}/I_t]}{(1+R)^2} + \ldots\ldots + \frac{P[D_{t+n}/I_t]}{(1+R)^n} + \frac{P[V_{t+n}/I_t]}{(1+R)^n}$$

[e.2]

However, since it has been assumed that the dividend generating process is governed by the process,

$$D_t = r\ M_t + e_t$$

then, it is also true that,

$$D_{t+i} = r\ M_{t+i} + e_{t+i} \quad \text{for every } i= 1,2,\ldots.,n$$

Furthermore, due to the assumed orthogonality of e_{t+i} on the information set I_t, the linear projection of future dividends on I_t, given 'r', will depend on the projected future profitability of the firm. That is,

$$P[D_{t+i}/I_t] = r\,P[M_{t+i}/I_t]$$

and equation [e.2] can be rewritten as follows:

$$V_t = \frac{rP[M_{t+1}/I_t]}{(1+R)} + \frac{rP[M_{t+2}/I_t]}{(1+R)^2} + \ldots\ldots + \frac{rP[M_{t+n}/I_t]}{(1+R)^n} + \frac{P[V_{t+n}/I_t]}{(1+R)^n}$$

Moreover , the above expression can be simplified further if we make use of the relation [2 , part B]. That is, the assumption that the one period ahead forecast of the firm's profitability conditional on information I_t ,is equal to the t+i ahead forecasts.

$$P[M_{t+i}/I_t] = P[M_{t+1}/I_t] \quad [2]$$

Then,

$$V_t = \frac{rP[M_{t+1}/I_t]}{(1+R)} + \frac{rP[M_{t+1}/I_t]}{(1+R)^2} + \ldots\ldots\ldots\ldots + \frac{rP[M_{t+1}/I_t]}{(1+R)^n} + \frac{P[V_{t+n}/I_t]}{(1+R)^n}$$

and, if the term $P[V_{t+n}/I_t]\,(1/(1+R)^n)$ becomes zero as 'n' goes to infinity, the value of the firm's common stock can be expressed as,

$$V_t = \frac{r\ P[M_{t+1}/I_t]}{R} \qquad [e.3]$$

Relation [e.3] is consistent with the hypothesis that, given the required rate of return, traders capitalize on expected dividends.

At this point, it is proper to point out that this hypothesis is also consistent with the Martingale property of stock prices.

From a carefull examination of equations [e.1] and [e.3], it is easy to see that,

$$P[V_{t+1}/I_t] = V_t\ .\ \text{(see appendix 4)}$$

Moreover, if we want to assume a known growth factor for the firm's average profitability, we can always adjust the required rate of return. However as I have mentioned before, the point of interest in this work is to show how current dividends can be incorporated in the valuation of the firm's common stock due to their informational content.

By rearanging the terms of equation [e.3], we get,

$$V_t\, R = r\ P[M_{t+1}/I_t] \qquad [e.4]$$

From equation [5 , part B], it is known that the $P[M_{t+1}/I_t]$ can be written as a function of $P[M_t/D_t,RE_t,I_{t-1}]$. That is,

$$P[M_{t+1}/W_t,D_t,RE_t,I_{t-1}] = P[M_t/D_t,RE_t,I_{t-1}] + b\ [W_t - P[W_t/D_t,RE_t,I_{t-1}]]$$

Therefore, if traders at time t receive information on W_t, which is relevant about the firm's future profitability, then the traders' forecast of future profits should be different from the perceived current profitability.

(The parameter "b" must be different than zero if the information "W_t" has to have any relevancy to future profits.)

Hence, if we define $r\, b[W_t - H(W_t/D_t, RE_t, I_{t-1})] = z_t$, where z_t is orthogonal to D_t, RE_t, and I_{t-1}, and with mean $E(z_t)=O$, and variance $E(z_t)^2=\sigma^2 z_t$; then, equation [e.4], can be written as;

$$V_t\, R = r\, P[M_t/D_t, RE_t, I_{t-1}] + z_t \quad \text{[e.5]}$$

Where the first term, of the right hand side, is a linear function of dividend payments and reported earnings , and it has been derived previously. Actually, from equation [3] (part B), we know that;

$$P[M_t/D_t, RE_t, I_{t-1}] = (1-[g_t - j_t k_t] - rk_t)\, P[M_t/I_{t-1}] + (g_t - j_t k_t)\, RE_t + k_t\, D_t$$

so that equation [e.5] becomes:

$$V_t\, R = r\Phi_t\, P[M_t/I_{t-1}] + r\mu_t\, RE_t + rk_t\, D_t + z_t \quad \text{[e.6]}$$

So, given the discount factor R, the market value of the firm will depend on current cash payments D_t, reported earnings RE_t, and an estimate of the firm's current profitability conditional on past information I_{t-1}, plus an error term z_t.

From the above equation, the only factors which appear to be unobservable is the market's estimate prior to the announcement of D_t and RE_t, that is, $P[M_t/I_{t-1}]$ and the term z_t. However, equation [e.6] can be also expressed as follows:

$$V_t R = r P[M_t/I_{t-1}] + r\mu_t (RE_t - P[RE_t/I_{t-1}]) + rk_t(D_t - P[D_t/I_{t-1}]) + z_t$$

and if we apply the linear projection operator contitional on information I_{t-1}, we get:

$$P[V_t/I_{t-1}] R = r P[M_t/I_{t-1}]$$

But , since we have shown a Martingale property of prices (see appendix 4), then it is true that,

$$\mathbf{P[V_t/I_{t-1}] = V_{t-1}}$$

and consequently

$$\mathbf{V_{t-1} R = r P[M_t/I_{t-1}]}$$

Therefore, by substituting the above equation into [e.6] , we get the price generating process;

[e.7]

$$V_t = \Phi_t \, V_{t-1} + (r\mu_t/R)\, RE_t + (rk_t/R)\, D_t + (1/R)z_t$$

2E.The Impact Of The Parameters On The Price Generating Process

Given that the parameters Φ_t, $r\mu_t$, and rK_t are

$$\Phi_t = \frac{\sigma^2 u_t\, \sigma^2 e_t\, (1-p^2)}{F_t}, \quad r\mu_t = \frac{r\, \sigma^2 n_t\, \sigma^2 e_t\, (1- pr\sigma u_t/\sigma e_t)}{F_t}$$

$$rk_t = \frac{r^2\, \sigma^2 n_t\, \sigma^2 u_t\, (1-p\sigma e_t/r\sigma u_t\,)}{F_t}, \quad \text{then, since}$$

$$F_t = r^2\, \sigma^2 n_t\, \sigma^2 u_t [1-p\sigma e_t/r\sigma ut] + \sigma^2 n_t\, \sigma^2 e_t [1-p\, r\sigma u_t/\sigma e_t] + \sigma^2 u_t\, \sigma^2 e_t [1-p^2]$$

all the parameters should be less than 1.O . However, in the price generating process [e.7] only the parameter infront of V_{t-1} will be with certainty less than one. The other two parameters are discounted by the required rate of return R, and their values could be greater than 1.O . This ofcourse will depend on the size of $r\mu_t$, rK_t and R.

Moreover, we can see that the relative weights of V_{t-1}, RE_t, D_t , may change from time to time , and in periods of great uncertainty about the

firm's average profitability, (large $\sigma^2 n_t$), traders will determine the market value of the firm's common stock V_t, by relying less on the previous price V_{t-1} and more on current earnings and dividends. This is true, because an increase in the variance $\sigma_2 n_t$ will decrease Φ_t and increase μ_t and K_t. This can be seen if we take the partial derivative of these parameters with respect to $\sigma^2 n_t$. And for firm's with relatively large target pay out ratio traders will rely more on dividends than earnings .

It should be acknowledged that as a result of the assumptions made in the model, the price generating process is consistent with the semi-strong efficiency market hypothesis.

That is, no investor can earn excess returns from trading rules based on <u>publicly</u> available information.

Furthermore, all the history of the firm, besides RE_t and D_t, is reflected on V_{t-1}.

<u>3E.On The Stability Of The Parameters And Their Respective Time Path.</u>

The three parameters have been treated till now, as time depended, for they are funtions of $\sigma^2 e_t$, $\sigma^2 u_t$, $\sigma^2 n_t$. Although the stochastic processes of $\{e_t\}$, $\{u_t\}$ can be assumed as white-noise processes with constant variance throuth time, that is $\sigma^2 e_t = \sigma^2 e$ and $\sigma^2 u_t = \sigma^2 u$ for all t, it is not reasonable to assume the same about the stochastic process of $\{n_t\}$. To demonstrate the validity of this argument, let's assume that the average profitability of the firm is governed by the following process.

$$M_{t+1} = M_t + \tau_{t+1}$$

Where the term τ_{t+1} has $E(\tau_{t+1}) = O$, $E(\tau_{t+1})^2 = var(\tau_{t+1})$ and is assumed to be uncorrelated to D_t, RE_t, I_{t-1}, but not necessarily uncorrelated to the information set W_t. If we apply in the above process, the linear projection operator conditional on information I_t, then we have;

$$P[M_{t+1}/I_t] = P[M_t/I_t] + P[\tau_{t+1}/I_t]$$

The above relation , is equivalent to equation [5 ,part B] for

$$P[\tau_{t+1}/I_t] = b\{W_t - P[W_t/D_t, RE_t, I_{t-1}]\}$$

Moreover, using the above relations, it is also true that,

$$M_{t+1} - P[M_{t+1}/I_t] = M_t - P[M_t/I_t] + \tau_{t+1} - P[\tau_{t+1}/I_t]$$

or

$$M_{t+1} - P[M_{t+1}/I_t] = M_t - P[M_t/I_t] + \theta_{t+1}$$

where $\theta_{t+1} = \tau_{t+1} - P[\tau_{t+1}/I_t]$ and it represents the unpredictable changes in the firm's future profitability, and it is assumed to have $E[\theta_{t+1}]=O$, and $E[\theta_{t+1}]^2=\sigma^2\theta_{t+1}$.

Then, since

$$E\{M_{t+1} - P[M_{t+1}/I_t]\}^2 = E\{n_{t+1}\}^2 = \sigma^2 n_{t+1}$$

and $E\{(M_t - P[M_t/I_t])^2\} = MSE_t$, we have the following relationship:

$$\sigma^2 n_{t+1} = MSE_t + \sigma^2\theta_{t+1}$$

Which reveals that the lower the MSE_t, given the $\sigma^2\theta_{t+1}$, the lower the uncertainty of future earnings ($\sigma^2 n_{t+1}$).

We can rewrite the above relationship as;

$$\sigma^2 n_{t+1} = b_t\,\sigma^2 n_t + \sigma^2\theta_{t+1}$$

where $b_t = \sigma^2 u_t\, \sigma^2 e_t / F_t < 1.O$

The above relation is very significant in discribing the time variation of the parameters. For example, if we assume white noise processes for e_t and u_t, the parameters still will be time depended, since all of them depend on $\sigma^2 n_t$.

Moreover , if we assume that the $\sigma^2\theta_t$ is the same for all t ($\sigma^2\theta_t=\sigma^2\theta$), then we should expect uncertainty to decrease or increase till it reaches an equilibrium value.

This implies a decreasing (or increasing) marginal contribution of reported earnings and dividends and an increasing (or decreasing) marginal contribution of the past price . That is, we have a learning process, where the size of the variance $\sigma^2\theta$ will determine minimum and maximum bounds for the parameters of earnings dividends and past price. In the extreme case, where $\sigma^2\theta_t=O$ for all t, then after successive earning and dividend announcements traders will eventually learn the firm's profitability and they will rely only on past price. While the speed of learning and adjustment will be faster for firms who pay divdiends, because the MSE_t is smaller when dividends are correlated with the firm's average profitability.

Management, probably should pay attention on this particular behavior of the parameters. For example, if for some time periods t+i for i=1,2,..k , the firm's average profitability remains the same, or if the market has a sufficient information "W_t+i-1" to forecast θ_{t+i}, then the variance $\sigma^2\theta_{t+i}$ may be zero till t=k . In this case uncertainty will decrease period after period and there may be a time where the parameter K_t will be very small. anagement then, from past observations may have noticed that dividend payments have no effect on the market value of the firm (K_t=O), and decides to stop payments, because there is need for funds. If this policy takes place in a period of a changing regime (increased uncertainty) the result may be a drastic decrease in price because K_t will change value due to the increased uncertainty.

4E. On The Issue Of Dividends vs Retained Earnings

For any of the above equations it is not clear, whether dividends or reported earnings carry more information. Actually, this will depend on the relative values of $\sigma^2 u_t$, $\sigma^2 e_t$ and r and p.

That is, for some firms the parameter μ_t could be greater than K_t. However, if we attempt to rewrite the above equations as a relation between price, dividends and retained earnings then by using the fact that retained earnings are defined as $RTE_t = RE_t - D_t$, equation (e.7) can be expressed as follows:

$$V_t = \Phi_t V_{t-1} + (r\mu_t/R)\, RTE_t + r(\mu_t+K_t)/R\, D_t + (1/R)\, z_t$$

From the above equation it is clear that the parameter $r(\mu_t+K_t)$ is greater than $r\mu_t$ as long as K_t is positive.

However, if $r < p\sigma e_t/\sigma u_t$, then K_t is negative and consequently $r\mu_t$ will be greater than $r(\mu_t+K_t)$.

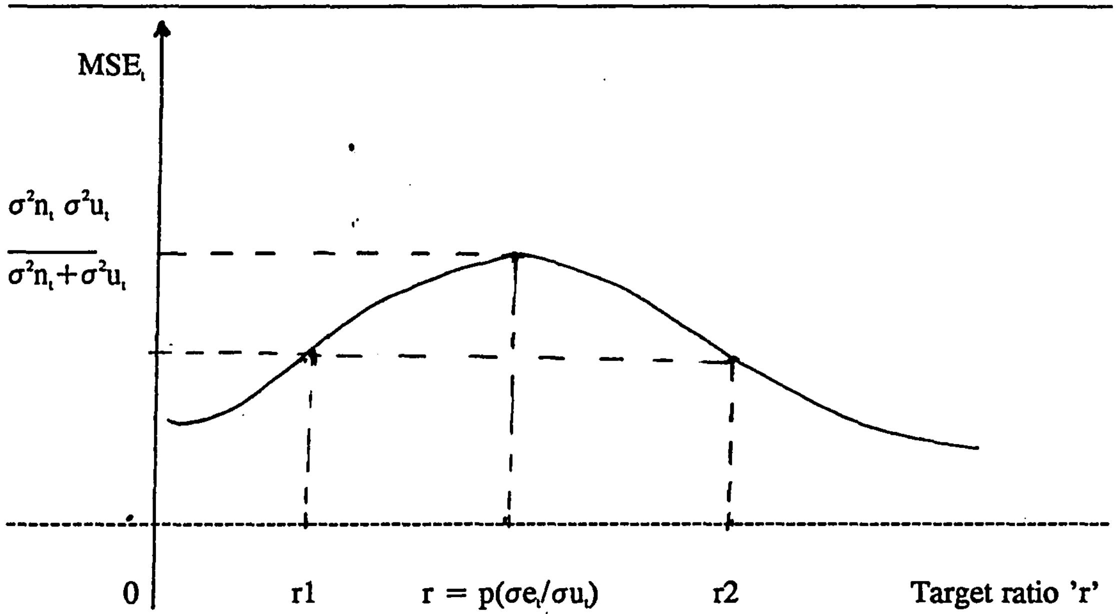
Empirical studies which attempt to detect "preference" by relying on the relative value of the parameters of retained earnings and dividends may not provide the right answers. Given that the objective of traders is to minimize uncertainty about the firm's average profitability, the preference for a low or high target payout ratio may depend on the effect of the target payout ratio on the level of uncertainty.

That is, traders could be indifferent between a target pay-out ratio r_1, where $r_1 < p\sigma e_t/\sigma u_t$, and a target pay-out ratio r_2, where $r_2 > p\sigma e_t/\sigma u_t$ if r_1 and r_2 result to the same degree of uncertainty (see graph 1D) . The difference will be only on the size of the parameters and the sign of μ_t, K_t (see table 1D).

Table 1D

	$r<p\sigma e_t/\sigma u_t$	$r=p\sigma e_t/\sigma u_t$	$p\sigma e_t/\sigma u_t<r<\sigma e_t/p\sigma u_t$	$r=\sigma e_t/p\sigma u_t$	$\sigma e_t/p\sigma u_t<r$
μ_t	+	+	+	O	-
K_t	-	O	+	+	+

Graph 1D



However, from the graph it is easy to see that there exist target pay-out ratios in the range $1.0 > r > p\sigma_{et}/\sigma_{ut}$ which minimize uncertainty in such levels where ratios in the range $0 < r < p\sigma_{et}/\sigma_{ut}$ are not able to achieve (see graph 1D). In that case, we may have preference for high pay out target ratios. <u>This is apparent in the case where the correlation coefficient "p" is equal to zero. In this case, the higher the target pay-out ratio the lower the degree of uncertainty.</u>

Moreover, preference may exist for high target pay-out ratios, even if the same level of uncertainty can be achieved with low ones. This is so,
because when the target payout ratio is relatively high the significance of dividends increases at the expense of the significance of earnings. Since, dividends are a control variable while earnings are not , it provides management whith the ability to intervine in the market through dividend payments and alter expectations.

Next, we proceed with the issue of dividend policy.

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APPENDIX 4

From equation [e.1], we know that

$$V_t = \frac{P[V_{t+1}/I_t] + P[D_{t+1}/I_t]}{(1+R)}$$

and from equation [e.3] that,

$$V_t = \frac{r\, P[M_{t+1}]}{R}$$

Moreover, since $P[D_{t+1}/I_t] = rP[M_{t+1}]$, then [see e.3]

$$P[D_{t+1}/I_t] = V_t R$$

and by substituting the above equation into equation [e.1], we get

$$V_t = \frac{P[V_{t+1}/I_t] + V_t R}{1+R}$$

and if we solve for V_t the above equation, we get the martingale property of prices.

$$P[V_{t+1}/I_t] = V_t$$

PART F. ON DIVIDEND POLICY

THE DIVIDEND RULE

In parts D and E, we discussed the impact of the target pay out ratio on uncertainty, expectations and price. However, the question of what the optimum dividend pay-out ratio should be for a firm, can not be unswered simply on terms of uncertainty . That is, the target pay-out ratio may be an issue of capital structure, liquidity (dividends are a "use" of cash), taxation as well as uncertainty.

Therefore, the selection of the right target-payout ratio is not the issue for analysis in this section. The issue in this section is the determination of the optimum dividend payment, given the target payout ratio.

1F. The Objective Function. And A Dividend Rule

Let's assume that, just prior to the announcement of dividends and reported earnings, management knows the traders' information set I_{t-1} (in general management knows more). The information 'W_t' will arrive in the market place at the same time whith the announcement of D_t and RE_t, and management is assumed not to know W_t at the decision time of D_t. Moreover, it is assumed that management knows that the price generating process is governed by the equation;

$$[e.7] \qquad V_t = \Phi_t V_{t-1} + (r\mu_t/R)\, RE_t + (rK_t/R)\, D_t + (1/R)\, z_t$$

Given that, at any time t, management has a better estimate of the firm's value than the market does, dividend payments may be instrumental for minimizing the gap between market value and intrinsic value.

It could be argued that although sometimes the market may underestimate the value of the firm and some other times will overestimate it, on the average the firm's market value would be equal to the intrinsic value.

But, the degree of overestimation and underestimation could be significant to traders, especially if they are risk averse.(Traders are assumed to be risk averse in the mean - variance sense).

Therefore , since risk averse traders would probably dislike a large variability between market and real value , it would be in their best interest if management conducted a dividend policy which aims in the reduction of large market overestimations or underestimations.

Assuming that management is to choose a policy that is in the best interest of its risk averse stockholders, then the object of concern, is to minimize the mean square error of the market value V_t , around management's better estimate of value V_t*. For management the value V_t* is known but the value V_t is random.

Hence, management by using dividends as an instrument can minimize the variability of the market value V_t around V_t^* by selecting properly the dividend payment. That is, minimize

$$\min_{D_t} \ MSE = E\{ (V_t - V_t^*)^2 \}$$

Where, the expectations operator E , is conditional on the information $\{RE_t, D_t, I_{t-1})$, because the information W_t is not known to management, when it decides on dividends D_t.

To see how management can select D_t, so that MSE is minimized, it is convenient to decompose the mean square error as follows:

$$E\{ (V_t - V_t^*)^2\} = E\{ ([V_t - EV_t] + [EV_t - V_t^*])^2 \} =$$

$$= E\{ (V_t - EV_t)^2 \} + E\{ (EV_t - V_t^*)^2 \} + 2\, E(V_t - EV_t)(EV_t - V_t^*)$$

Furthermore, given that the information piece "W_t" arrives in the market whith the announcement of dividends and reported earnings ; then if management knows the traders' price generating process, the expected value

of V_t conditional on $\{RE_t, D_t, I_{t-1}\}$, shall be:

[f.O] $\quad E(V_t) = \Phi_t\, E(V_{t-1}) + (r\mu_t/R)\, E(RE_t) + (rK_t/R)\, E(D_t) + (1/R)(z_t)$

where all expectations are conditional on $\{RE_t, D_t, I_{t-1}\}$. However, the conditional expectations of $E(V_{t-1}) = V_{t-1}$, $E(RE_t)=RE_t$, $E(D_t)=D_t$, and $E(z_t)=O$. Therefore, from the above equation we derive the following one:

[f.1]

$$E(V_t) = \Phi_t V_{t-1} + (r\mu_t/R)\, RE_t + (rK_t/R)\, D_t$$

Moreover, the term $(EV_t\text{-}V_t^*)$ from the management's point of view is not random; and since $E(V_t\text{-}EV_t) = O$, then the decomposition of the mean square error reduces to,

$$E\{(V_t\text{-}V_t^*)^2\} = E\{(V_t\text{-}EV_t)^2\} + E\{(EV_t\text{-}V_t^*)^2\}$$

and it can be minimized if management follows the rule:

$$EV_t = Vt^* \qquad [f.2]$$

From equation [f.1] and [f.2], we get

[f.3]

$$V_t^* = \Phi_t V_{t-1} + (r\mu_t/R)\, RE_t + (rK_t/R)\, D_t$$

And if we solve for D_t, then we get the optimum dividend payment;

$$D_t = (R/rK_t)\, V_t^* - (R*_t/rK_t)\, V_{t-1} - (\mu_t/K_t)RE_t \qquad [f.4]$$

where D_t, is the firm's dividend payment which minimizes uncertainty around V_t^*. Furthermore, by substituting [f.4] into [e.7], we see that the market value at any time t, shall be equal to the V_t^* plus an error term.

$$V_t = V_t^* + (1/R)z_t \qquad [f.5]$$

where z_t is equal to $b\{W_t - P[W_t/D_t, RE_t, I_{t-1}]\}$.

Consequently, the management's decision on D_t, should depend not only on the observed market price V_{t-1}, but it should take into consideration RE_t and the relative significance of each parameter. While the impact of RE_t on dividend policy shall depend on the ratio of the marginal contributions of dividends and earnings.

That is, earnings may have a very small impact on optimum dividend payments as the parameter μ_t is close to zero.

We have seen that this is possible for relatively high values of K_t or a target payout ratio which is close or equal to $r = \sigma e_t / p\sigma u_t$.

2F. Analyzing The Optimum Dividend Payment.

Since the terms K_t, Φ_t, and μ_t are functions of variances , r and p, we can rewrite equation [e.4] as follows:

Given that,

$$F_t = r^2 \sigma^2 n_t \, \sigma^2 u_t[1-p\sigma e_t/r\sigma u_t] + \sigma^2 n_t \, \sigma^2 e_t[1-pr\sigma u_t/\sigma e_t] + \sigma^2 u_t \, \sigma^2 e_t[1-p^2]$$

then,

$$\frac{F_t}{r^2\sigma^2 n_t \sigma^2 u_t[1-p\sigma e_t/r\sigma u_t]} = 1 + \frac{\sigma^2 n_t \sigma^2 e_t[1-pr\sigma u_t/\sigma e_t]}{r^2\sigma^2 n_t \sigma^2 u_t[1-p\sigma e_t/r\sigma u_t]} + \frac{\sigma^2 u_t \, \sigma^2 e_t[1-p^2]}{r^2\sigma^2 n_t \sigma^2 u_t[1-p\sigma e_t/r\sigma u_t]}$$

or $$1/rK_t = 1 + \Phi_t/rK_t + \mu_t/rK_t$$

Therefore, equation [f.4] can be rewritten as:

$$D_t/R = V_t^* + (\Phi_t/rK_t)\,[V_t^* - V_{t-1}] + (\mu_t/rK_t)\,[V_t^* - rRE_t/R]$$

[f.5]

From the above equation we see that, constant dividend payments through time can be optimum, despite the variation of earnings RE_t, if $V_t^* = V_{t-1}$

and the term μ_t is close to zero. The parameter μ_t is close to zero if the target pay-out ratio of the firm r is very close to the value $\sigma e_t/p\sigma u_t$. In this case we can say that reported earnings will exert no influence on dividend decisions. That is, the term (μ_t/rK_t) $[V_t^*-rRE_t/R]$ approaches zero. Therefore, constant dividend payments may be consistent with the informational hypothesis of dividends.

Moreover, a carefull examination of the above equation, indicates that the parameter (Φ_t/rK_t) decreases as the $\sigma^2 n_t$ increases. In other words, the higher the uncertainty, regarding the firm's average profitability prior to the announcement of dividends and earnings, the smaller the parameter (Φ_t/rK_t). This, has the following implications on dividend payments.

We have seen previously that, in an economic environment which remains relatively stable, in the sense that the average profitability of the firm does not change, uncertainty will decrease with time. In that respect the parameter (Φ_t/rK_t) will increase. Consequently, <u>if the market believes that the enviroment is relatively stable and management wants to signal a higher value ($V_t^* > V_{t-1}$), this will probably require a substantial increase in dividend payments. While, the opposite will be true if the environment is unstable.</u>

Which implies that a given change in dividends will have a greater impact in periods of high uncertainty.

3F. CONCLUSIONS

In this work, we have shown that in an environment of differential information, dividends may serve as a very important instrument to transmit information about the firm's average profitability.In an environment of risk aversion, uncertainty may demand a premium on the firm's required return, which premium can be small with the right dividend payments. That is, dividends decrease the degree of uncertainty.

It has been shown that low levels of uncertainty can be achieved with relatively "low" or "high" target pay-out ratios. However, for low target pay-out ratios the weight of reported earnings increases relative to the weight of dividends, and for some range of "r" the weight on dividends may even be negative. <u>The fact that dividends may carry a negative weight does not imply that dividend should not be paid</u>. In Part C we showed that if dividends are never payed uncertainty is maximum. Actually, in this case earnings will carry a higher weight to compensate for the negative weight on dividends. This may explain the empirical findings that for growth companies (possibly low r) dividends seem to be insignificant, while the opposite seems to hold for non-growth companies (possibly high r).[15]

Moreover, a price generating process was derived as a function of past prices, current earnings and dividends, and we showed that the relative significance of dividends on

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Irwin Friend and Marshall Pucket, "Dividends and Stock Prices", American Economic Review, September 1964.

expectations and price should be time depended. This implies that dividends will not have the same effect on price period after period.

That is, in periods of high uncertainty the relative significance of the firm's history will diminish (past price), and the significance of current information (earnings and dividends) will increase. While the relative weights will be determined from the relative variances and covariances of earnings and dividends, as well as from the selection of the target pay-out ratio.

This theoretical finding may shed more light on the empirical findings regarding the influence of current dividends on market price.

Finally, it is shown that if management wants to signal a given positive change in the firm's value the amount of dividends required will be inversly related to the degree of existing uncertainty. That is, the lower the degree of uncertainty the higher the amount of dividends required to to signal the given change, and the opposite.

Next, we proceed with the empirical testing of this price generating process described in Part E, in an attempt to see whether the parameters Φ_t , μ_t , K_t , behave according to our theoretical findings.

PART G. EMPIRICAL TESTING OF THE PRICE GENERATING PROCESS

The Empirical Testing Of The Price Generating Process

1G. Introduction

In our previous analysis, the derived price generating process was a function of past price (which reflects all past information), current earnings and current dividend payments. Furthermore, it was argued that the parameters may change from period to period, and if the economic enviroment of the firm remains relatively stable, a very specific pattern should be observed between the parameters. To be more specific, if we run a regression on the equation;

$$V_t = \Phi_t V_{t-1} + (r\mu_t/R)\,RE_t + (rK_t/R)\,D_t + z_t/R$$

we should expect the following:

If the parameters $r\mu_t/R$ and rK_t/R are very small then the parameter Φ_t should approach the value of 1.O . This pattern should occur, because very small values of the parameters $r\mu_t$ and rK_t imply decreased uncertainty or very small $\sigma^2 n_t$. Then, the contribution of earnings and dividends is insignificant and the past price reflects all the relevant information that traders need regarding the firm's current profitability. However, the parameter Φ_t must always be positive and less than one . Regarding the parameters $r\mu_t/R$ and rK_t/r, their <u>sign</u> will depend in general on the target payout ratio. For relatively small target payout ratios, such as $r<p\sigma e_t/\sigma u_t$ the parameter $r\mu_t/R$ will be positive and the parameter rK_t/R will be negative. While, for values of $r>\sigma e_t/p\sigma u_t$ the opposite will be true. Both parameters will be possitive for target payout ratios in the range $p\sigma e_t/\sigma u_t<r<\sigma e_t/p\sigma u_t$. Moreover, since the variances $\sigma^2 e_t$ and $\sigma^2 u_t$ may not be the same period after period, their changes may not have only an impact on the absolute size of the parameters but also on their signs. For example a decrease in the $\sigma^2 u_t$ may not only decrease the absolute size of the parameter rK_t/R but it may also change its sign because the inequality $r > p\sigma e_t/\sigma u_t$ may reverse itself. In general, we summarize the impact of the variances $\sigma^2 n_t$, $\sigma^2 u_t$, and $\sigma^2 e_t$ on the parameters, in table [1G].

TABLE 1G.

	Φ_t	μ_t	K_t
increase in $\sigma^2 n_t$ constant $\sigma^2 u_t, \sigma^2 e_t$	decrease	increase	increase
increase in $\sigma^2 u_t$ constant $\sigma^2 n_t, \sigma^2 e_t$	increase	decrease	increase
increase in $\sigma^2 e_t$ constant $\sigma^2 n_t, \sigma^2 u_t$	increase	increase	decrease

2G. Methodology, Data, And Empirical Results

To detect the particular pattern of the parameters the most appropriate statistical technic seems to be a Kalman Filter. Actually the mathematical treatment in this work and the derivation of the price generating process is in essence Kalman itself.

Kalman testing needs the supply of priors and their respective distributions. Since there is no knowledge of the priors, it seems inappropriate to supply them arbitrarily.

However, if we assume that the firm's average profitability or the sequence of $\{M_{t+1}-M_t\}$ is white noise with a constant variance, then by running a simple regression, for a specified time period, we can get estimates of the parameters and their covariance matrix and use these estimates as priors for a Kalman estimation.

This is consistent with the assumption that as new and additional information is received by the market, rational traders would use it to revise their estimates, period after period, till they find the "true" parameters.

In reality, traders may never know the true parameters since profitability could change randonly; but this is something to be tested by observing the covergence or divergence of the parameters. Nevertheless, and since the aim of this empirical test is not to find the "parameters" but rather their interelations and pattern through time , the Kalman Filter technic could offer enough statistical information about the time dependence of the parameters.[16] In order to test equation [e.7] , data for twelve different

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16 The Kalman filter provides a cheap method of obtaining new estimates when a single new measurement is added. Suppose that,
a) The equation being estimated is $y_t = x_t b_t + u_t$, where the variance of u_t is $\sigma^2 u_t$. b) The coefficient vector follows the process $b_t = b_{t-1} + v_t$ where the variance of v_t been $\sigma^2 v_t$, and u_t, v_t are independent.
If we have an estimate of b_{t-1} and its covariance matrix Σ_{t-1}, then the updated estimate given y_t and x_t is computed by,

corporations traded in the New York Stock Exchange was collected. The data was extracted from the publications of Daily Report of New York Stock Exchange, from January 1 1967, till Dec 31, 1986 (for one firm the data was till Sep 3O, 1985).

For the market price V_t, the data selected was the price at the end of each quarter of a calendar year, while for dividends D_t and earnings RE_t the data collected was from reported dividend and earnings during the quarter. Data was collected, by selecting at random the following corporations :Lucky Stores , Luckens Steel Co , Martin Marietta Co., General Mills Inc.,Goodrich, B.F Co , National Fuel Gas Co , Occidental Petroleum , Ogden Corp. ,Alberto Culver Co. , Alcan Aluminum LTD , Air Products & Chemicals , Alabama Gas Corp.

In the empirical testing, the priors for the Kalman estimation procedure were supplied by runing simple regressions for some specified time periods and the estimates of the parameters and the variance covariance matrix became the priors for the Kalman estimation. Thereafter the Kalman was applied for several time periods.For every corporation more than twenty Kalman parameters were derived for each variable and in addition to that the RBAR's, and the t-statistics.The t-statistics are reported not as a measure for the stability of the parameters, but rather as a proxy for the null hypothesis.

$$b_t=b_{t-1} + \Sigma_t x_t'\sigma^2 u_t^{-1}(y_t-x_t b_{t-1})$$

with a covariance matrix $\Sigma_t= S_t-S_t x_t'(x_t S_t x_t +\sigma^2 u_t)^{-1} x_t S_t$, where $S_t=\Sigma_{t-1}+\sigma^2 v_t$.

The simplest setup been with $\sigma^2 u_t$ =constant and $\sigma^2 v_t$ zero.

That is, usually if the t-statistic of a parameter is small we can not reject the hypothesis that the value of the parameter is zero.

Another problem we tried to avoid in our estimation procedure, is the impact of splits on market price. When a split occurs earnings and dividents split as well. Therefore, if dividends, earnings and price are not adjusted it is more likely that the impact of earnings and dividends may be overestimated.

From the other side though, we can not tell what the appropriate adjustment should be for price. By multiplying the price , dividends and earnings with the split does not seem right either. Such a treatment would imply that a split has no impact on price and this is something we do not know.

Consequently, in the empirical testing we attempted to avoid the impact of splits by deriving priors with no split in the data and the same was done for the Kalman estimation procedure as well.

The empirical findings, are supportive of our theoretical arguments in the sense that the parameters follow the pattern expected. That is, for all tweleve corporations the parameter Φ_t appears to be consistently below zero while in some periods where this parameter approaches the value of one K_t and μ_t appear to be very small.

Moreover, we see that when uncertainty increases, which results to the decrease in the value of Φ_t, most of the times both of the other two parameters are increasing.

Finally, it should be pointed out that instead of RE_t (earnings) we use retained earnings in our regressions (RTE_t). Actuall the estimation procedure was done for both cases, there are no changes on the parameters exept that the parameter infront of the variable D_t is not simply rK_t/R but rather $[r[\mu_t+K_t]/R]$. That is, the equation tested was:

$$V_t = \Phi_t V_{t-1} + (r\mu_t/R)\, RTE_t + (r[\mu_t+K_t]/R)\, D_t + z_t/R$$

The reason we selected this particular testing format is because it is customary in the literature to use retained earnings and dividends in empirical testing.

Next, the parameters, from testing the price generating process for the twelve corporations, are reported.

H.THE EMPIRICAL RESULTS, AND THE KALMAN ESTIMATES OF THE PARAMETERS.

Alabama Gas Corp. TICKER SYMBOL (AGA)

Prior Estimates From 1968: 1 UNTIL 1978: 1

Price(t-1)		0.4933		0.00434	-0.359	-0.399
RTE(t)	b_{t-1} =	2.9700	Σ_{t-1} =	-0.02041	0.749	-0.688
DIV(t)		10.380		-0.12516	-2.819	22.580

Kalman Estimates 1978: 2 UNTIL 1984: 2

Year	COEF(T-stat)	PRICE(t-1)	RE(t)	D(t)
78:2	RBAR2=.432	.5081 (7.581)	2.560 (3.015)	10.890(2.321)
78:3	RBAR2=.419	.5179 (7.806)	2.378 (2.865)	11.737(2.432)
78:4	RBAR2=.391	.5281 (7.905)	2.260 (2.702)	11.568(2.367)
79:1	RBAR2=.391	.5302 (8.087)	2.260 (2.732)	11.418(2.381)
79:2	RBAR2=.388	.5328 (8.207)	2.303 (2.817)	10.946(2.332)
79:3	RBAR2=.389	.5320 (8.313)	2.278 (2.873)	11.150(2.499)
79:4	RBAR2=.383	.5355 (8.387)	2.404 (3.077)	10.147(2.341)
80:1	RBAR2=.374	.5483 (8.664)	2.378 (3.029)	9.427(2.184)
80:2	RBAR2=.364	.5641 (9.271)	2.145 (2.889)	9.708(2.258)
80:3	RBAR2=.335	.5864 (9.833)	1.744 (2.496)	10.482(2.428)
80:4	RBAR2=.325	.5943 (10.09)	1.681 (2.422)	10.286(2.390)
81:1	RBAR2=.316	.6006 (10.31)	1.660 (2.401)	9.958(2.330)
81:2	RBAR2=.293	.6122 (10.55)	1.537 (2.227)	9.849(2.288)

81:3	RBAR2=.279	.6220 (10.76)	1.553 (2.239)	9.103(2.124)
81:4	RBAR2=.278	.6255 (11.13)	1.519 (2.235)	9.069(2.135)
82:1	RBAR2=.245	.6390 (11.29)	1.312 (1.929)	9.315(2.157)
82:2	RBAR2=.234	.6505 (11.61)	1.212 (1.788)	9.145(2.110)
82:3	RBAR2=.235	.6514 (11.93)	1.199 (1.823)	9.160(2.133)
82:4	RBAR2=.237	.6541 (12.16)	1.119 (1.816)	9.409(2.227)
83:1	RBAR2=.241	.6559 (12.31)	1.085 (1.758)	9.477(2.261)
83:2	RBAR2=.280	.6502 (12.28)	1.108 (1.797)	9.747(2.331)
83:3	RBAR2=.375	.6483 (11.206)	1.224 (2.002)	9.336(2.231)
83:4	RBAR2=.410	.6457 (12.207)	1.188 (1.953)	9.557(2.294)
84:1	RBAR2=.464	.6455 (12.255)	1.220 (2.019)	9.469(2.284)
84:2	RBAR2=.527	.6467 (12.324)	1.292 (2.172)	9.093(2.216)

Comments:

The empirical findings from testing the price generating process for Alabama Gas Corporation, are consistent with the theoretical findings of this work. That is, the coefficient of V_{t-1} (Price(t-1) is always less than one. On the average increases through time and we are able to make a inferrence of what causes this behavior by examining its movement with respect to the movement of the other two coefficients. That is, given that the coefficient of V_{t-1} is defined as;

$$\Phi_t = \frac{\sigma^2 u_t \, \sigma^2 e_t \, (1-p^2)}{F_t}$$

we have seen that this coefficient will if there are changes in any of the variances σ^2_{u}, σ^2_{α} and σ^2_{n} changes.

However, since the coefficient of retained earnings seems to decrease (on the average) with time, and the same is true for the coefficient of dividends, it is reasonable to argue that uncertainty ($\sigma^2 n_t$) decreases, and this explains why we observe this particular movement. This, can be seen from the definition of the parameters of retained earnings and dividends.

Moreover, since the coefficients of retained earnings and dividends remain positive through time, and they seem to be different than zero, from table 2D, we see that the target pay-out ratio r should be in the range $p\sigma e_t/\sigma u_t < r < \sigma e_t/p\sigma u_t$.

Table 2D.

	$r<p\sigma e_t/\sigma u_t$	$r=p\sigma e_t/\sigma u_t$	$p\sigma e_t/\sigma u_t<r<\sigma e_t/p\sigma u_t$	$r=\sigma e_t/p\sigma u_t$	$\sigma e_t/p\sigma u_t<r$
μ_t	+	+	+	O	-
K_t	-	O	+	+	+
$\delta MSE_t/\delta r$	+	MAX	-	-	-

Moreover, since both μ_t and k_t are positive, the coefficient of dividends should always be greater than the coefficient of retained earnings. And we see that this is true throughout.

An interesting case is the coefficient movement from 1983,1 to 1984,2. During this period the coefficient of price has a downward trend and the same is true for the coefficient of dividends. While, the opposite is true for the coefficient of earnings. This particular coefficient movement is possible if the variability of earnings around the firm's average profitability ($\sigma^2 u_t$) decreases faster than the degree of uncertainty ($\sigma^2 n_t$).

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Goodrich, B.F , Co. TICKER SYMBOL (GR)

Prior Estimates: FROM 1969: 3 UNTIL 1980: 1

Price(t-1)		0.679		0.0110	0.435	-0.879
RTE(t)	b_{t-1} =	-0.846	Σ_{t-1} =	-0.0324	0.503	-0.800
DIV(t)		25.30		-0.8743	-5.371	89.335

Kalman Estimates: FROM 1980: 2 UNTIL 1986: 4

YEAR	COEF&(T-STAT) OF	PRICE(t-1)	RTE	DIVIDENDS
80:2	RBAR2=.793	.668(6.48)	-.825(-1.17)	25.93(2.77)
80:3	RBAR2=.813	.666(6.57)	-.836(-1.20)	26.14(2.85)
80:4	RBAR2=.813	.673(6.56)	-.733(-1.04)	24.72(2.68)
81:1	RBAR2=.829	.668(6.99)	-.771(-1.18)	25.33(3.06)
81:2	RBAR2=.812	.724(7.38)	-.027(-.044)	16.60(2.10)
81:3	RBAR2=.798	.784(8.16)	.450(.782)	9.63(1.32)
81:4	RBAR2=.800	.796(8.89)	.482(.856)	8.68(1.28)
82:1	RBAR2=.791	.831(9.52)	.545(.960)	6.01(.915)
82:2	RBAR2=.788	.857(10.3)	.605(1.07)	4.04(.652)
82:3	RBAR2=.789	.843(10.8)	.528(.983)	5.36(.963)
82:4	RBAR2=.791	.836(11.1)	.453(.898)	6.31(1.24)
83:1	RBAR2=.795	.826(11.1)	.282(.602)	8.02(1.70)
83:2	RBAR2=.804	.825(11.1)	.156(.366)	8.97(2.00)

83:3	RBAR2=.812	.824(11.28)	.186(.479)	8.79(2.03)
83:4	RBAR2=.817	.824(11.36)	.247(.693)	8.41(2.00)
84:1	RBAR2=.823	.823(11.46)	.230(.680)	8.54(2.08)
84:2	RBAR2=.828	.824(11.56)	.243(.740)	8.43(2.10)
84:3	RBAR2=.829	.825(11.61)	.294(.910)	7.97(2.00)
84:4	RBAR2=.831	.825(11.74)	.296(.942)	7.95(2.05)
85:1	RBAR2=.829	.819(11.33)	.114(.369)	9.48(3.91)
85:2	RBAR2=.838	.825(11.56)	.038(.131)	9.62(2.47)
85:3	RBAR2=.844	.819(11.65)	.904(.277)	9.63(2.48)
85:4	RBAR2=.848	.830(11.53)	-.043(-.15)	9.94(2.50)
86:1	RBAR2=.846	.886(11.37)	-.186(-.615)	8.06(1.85)
86:2	RBAR2=.859	.849(11.95)	-.140(-.465)	9.68(2.34)
86:3	RBAR2=.872	.859(12.65)	-.152(-.510)	9.27(2.30)
86:4	RBAR2=.883	.882(13.41)	-.191(-.641)	8.35(2.10)

Comments:

The empirical findings from testing the price generating process for Goodrich,B.F, Corporation, are consistent with the theoretical findings. That is, the coefficient of V_{t-1} (Price(t-1) is always less than one and on the average has increased but with some variations in its process. That is, from 8O:2 to 82:2 it seems to have an upward trend. For the same time period the coefficient of retained earnings achieves its maximum value (from -O.846 to O.6O5), while the coefficient of dividends reaches a minimum (from 25.3O to 4.O4). This particular behavior can be explained as follows: The initial vegative values of the coefficient of retain earnings implies that given 'p' the ratio $\sigma^2 u_t/\sigma^2 e_t$ is large. However, this ratio decreases through time till the coefficient of earnings becomes positive. This behavior in combination with the decrease of the coefficient of dividends and the increase in the coefficient of price implies that uncertainty decreases faster than $\sigma^2 u_t$. From 1982,3 to 1985,3 we observe exactly the opposite behavior to take place. While from 85,4 to 86,4 we observe the same behavior as in the period 8O,2 to 82,3 but with slower movements.

Moreover, since the coefficient of retained earnings changes from negative to positive and the coefficient of dividends remain positive through time, then ,from table 2D, we see that the changes in the ratio $\sigma e_t/\sigma u_t$ forces the target pay-out ratio r to be in the ranges $p\sigma e_t/\sigma u_t < r < \sigma e_t/p\sigma u_t$, and $\sigma e_t/p\sigma u_t < r$.

Table 2D.

	$r<p\sigma e_t/\sigma u_t$	$r=p\sigma e_t/\sigma u_t$	$p\sigma e_t/\sigma u_t<r<\sigma e_t/p\sigma u_t$	$r=\sigma e_t/p\sigma u_t$	$\sigma e_t/p\sigma u_t<r$
μ_t	+	+	+	O	-
K_t	-	O	+	+	+
$\delta MSE_t/\delta r$	+	MAX	-	-	-

Moreover, if the parameter k_t is positive, the coefficient of dividends should always be greater than the coefficient of retained earnings. And we see that this is true throughout.

National Fuel Gas Co. TICKER SYMBOL (NFG)

Prior Estimates : FROM 1967: 2 UNTIL 1978: 4

Price(t-1)	0.806		0.0027	-0.325	-0.652
RTE(t)	b_{t-1} = -0.359	Σ_{t-1} =	-0.0075	0.195	-0.479
DIV(t)	11.54		-0.0098	-0.593	8.106

Kalman Estimates : FROM 1979: 1 UNTIL 1984: 1

YEAR	COEF&(T-STAT) OF	PRICE(t-1)	RTE	DIVIDENDS
79:1	RBAR2=.556	.804(15.51)	-.341(-.788)	11.56(4.103)
79:2	RBAR2=.556	.807(15.80)	-.373(-.878)	11.49(4.115)
79:3	RBAR2=.565	.802(15.97)	-.304(-.740)	11.48(4.134)
79:4	RBAR2=.578	.802(16.19)	-.311(-.773)	11.48(4.177)
80:1	RBAR2=.491	.816(15.05)	-.566(-1.30)	11.78(3.906)
80:2	RBAR2=.435	.775(13.81)	-.327(-.715)	12.87(4.009)
80:3	RBAR2=.462	.775(13.95)	-.329(-.726)	12.82(4.035)
80:4	RBAR2=.484	.776(14.09)	-.333(-.743)	12.78(4.063)
81:1	RBAR2=.522	.772(14.05)	-.243(-.552)	12.62(4.016)
81:2	RBAR2=.481	.779(13.70)	-.417(-.928)	12.94(3.977)
81:3	RBAR2=.470	.790(14.09)	-.546(-1.25)	12.97(3.977)
81:4	RBAR2=.475	.780(14.22)	-.449(-1.06)	13.04(4.006)

82:1	RBAR2=.465	.786(14.37)	-.518(-1.23)	12.98(3.976)
82:2	RBAR2=.464	.793(14.90)	-.567(-1.39)	12.87(3.973)
82:3	RBAR2=.472	.792(15.30)	-.565(-1.41)	12.88(4.019)
82:4	RBAR2=.488	.791(15.56)	-.548(-1.41)	12.89(4.054)
83:1	RBAR2=.509	.791(15.72)	-.548(-1.42)	12.89(4.093)
83:2	RBAR2=.536	.794(16.03)	-.500(-1.35)	12.42(4.157)
83:3	RBAR2=.581	.792(16.20)	-.511(-1.39)	12.60(4.306)
83:4	RBAR2=.621	.793(16.35)	-.508(-1.39)	12.53(4.333)
84:1	RBAR2=.669	.787(15.90)	-.340(-.938)	12.03(4.082)

Comments:

The empirical findings from testing the price generating process for National Fuel Gas Co, are consistent with the expected ones. That is, the coefficient of V_{t-1} (Price(t-1) is always less than one and the coefficients movement is not contradictory to our theoretical arguments.

Regarding the coefficients, it seems that the variability of earnings around the mean is very large so that its coefficient is negative throughout.

While the high variability of earnings seems to be responsible for the high positive value of the coefficient of dividends.

The movement in the coefficient of dividends and past price, indicates a small but downward trend for the significance of past price from 1979,1 to 1980,3 (from .8O4 to a minimum .775) and an upward trend for dividends for the same period (from 11.56 to 12.87). This can be interpreted as a small increase in the degree of uncertainty during this period.

From 1980,4 to 81,4 the coefficient of price and dividends increases, but the coefficient of earnings decreases furthermore. This behavior could be consistent with an increase in the variability of earnings around the mean.

Moreover, since the coefficients of retained earnings remains negative through time, and the coefficient of dividends remains positive, from table 2D, we see that the target pay-out ratio r seems to be in the range $\sigma e_t/p\sigma u_t < r$.

Table 2D.

	$r<p\sigma e_t/\sigma u_t$	$r=p\sigma e_t/\sigma u_t$	$p\sigma e_t/\sigma u_t<r<\sigma e_t/p\sigma u_t$	$r=\sigma e_t/p\sigma u_t$	$\sigma e_t/p\sigma u_t<r$
μ_t	+	+	+	O	-
K_t	-	O	+	+	+
$\delta MSE_t/\delta r$	+	MAX	-	-	-

In addition to that it seems that k_t is positive, and the coefficient of dividends should always be greater than the coefficient of retained earnings. And we see that this is true throughout.

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Luckens Steel Co. TICKER SYMBOL (LUC)

Prior Estimates : FROM 1967: 2 UNTIL 1978: 2

$$\begin{array}{l} \text{Price(t-1)} \\ \text{RTE(t)} \\ \text{DIV(t)} \end{array} \quad b_{t-1} = \begin{array}{r} 0.874 \\ 1.030 \\ 1.270 \end{array} \qquad \Sigma_{t-1} = \begin{array}{rrr} 0.0035 & -0.302 & -0.2312 \\ -0.0179 & 0.987 & -0.8341 \\ -0.1314 & -7.886 & 90.552 \end{array}$$

Kalman Estimates : FROM 1981: 4 UNTIL 1986: 4

YEAR	COEF&(T-STAT) OF	PRICE(t-1)	RTE	DIVIDENDS
81:4	RBAR2=.378	.834(12.4)	1.00(.887)	3.83(.354)
82:1	RBAR2=.415	.836(12.6)	.93(.842)	4.13(.385)
82:2	RBAR2=.450	.837(12.7)	.93(.850)	4.03(.381)
82:3	RBAR2=.483	.839(12.9)	.91(.839)	4.03(.384)
82:4	RBAR2=.511	.839(13.1)	.91(.848)	3.97(.383)
83:1	RBAR2=.545	.839(13.2)	1.02(.979)	2.83(.284)
83:2	RBAR2=.573	.839(13.4)	1.01(.991)	2.92(.301)
83:3	RBAR2=.599	.839(13.5)	1.02(1.03)	2.85(.305)
83:4	RBAR2=.615	.842(13.7)	.93(.963)	3.48(.377)
84:1	RBAR2=.634	.842(13.9)	.93(.976)	3.51(.386)
84:2	RBAR2=.633	.846(14.0)	.83(.876)	4.20(.461)
84:3	RBAR2=.642	.846(14.1)	.82(.874)	4.31(.478)
84:4	RBAR2=.654	.846(14.2)	.81(.871)	4.30(.481)

85:1	RBAR2=.667	.846(14.3)	.80(.872)	4.32(.488)
85:2	RBAR2=.679	.846(14.5)	.80(.875)	4.32(.492)
85:3	RBAR2=.694	.846(14.6)	.86(.955)	3.65(.421)
85:4	RBAR2=.708	.846(14.7)	.85(.955)	3.80(.446)
86:1	RBAR2=.715	.846(14.8)	.76(.876)	4.71(.569)
86:2	RBAR2=.721	.849(15.0)	.68(.805)	5.23(.640)
86:3	RBAR2=.722	.858(15.4)	.40(.517)	7.19(.918)
86:4	RBAR2=.727	.860(15.9)	.33(.490)	7.70(1.05)

Comments:

The empirical findings from testing the price generating process for Luckens Steel Co., are consistent with the theoretical findings. That is, the coefficient of V_{t-1} (Price(t-1) is always less than one and the coefficients' movement is not contradictory to our theoretical findings.

Regarding the coefficients, it seems that there is un upward trend for the coefficient of past price ,nd dividends and a downward trend for the coefficient of earnings.
This particular behavior is possible if the variability of earnings around the mean increases faster than uncertainty ($\sigma^2 n_t$), or decreases slower than uncertainty.

From table 1G, we see that these trends are possible if, there is a relative increase of the variance $\sigma^2 u_t$ with respect to $\sigma^2 n_t$ and $\sigma^2 e_t$. (see the second row , in table 1G)

TABLE 1G.

	Φ_t	μ_t	K_t
increase in $\sigma^2 n_t$ constant $\sigma^2 u_t, \sigma^2 e_t$	decrease	increase	increase
increase in $\sigma^2 u_t$ constant $\sigma^2 n_t, \sigma^2 e_t$	increase	decrease	increase
increase in $\sigma^2 e_t$ constant $\sigma^2 n_t, \sigma^2 u_t$	increase	increase	decrease

While the coefficient of dividends is greater than the coefficient of earnings and the parameter k_t is positive.Moreover, since the coefficients of retained earnings and dividends remain positive through time, from table 2D, we see that the target pay-out ratio r seems to be in the range $p\sigma e_t/\sigma u_t < r < \sigma e_t/p\sigma u_t$.

Table 2D.

	$r<p\sigma e_t/\sigma u_t$	$r=p\sigma e_t/\sigma u_t$	$p\sigma e_t/\sigma u_t<r<\sigma e_t/p\sigma u_t$	$r=\sigma e_t/p\sigma u_t$	$\sigma e_t/p\sigma u_t<r$
μ_t	+	+	+	O	-
K_t	-	O	+	+	+
$\delta MSE_t/\delta r$	+	MAX	-	-	-

General Mills, Inc. TICKER SYMBOL (GIS)

Prior Estimates : FROM 1967: 4 UNTIL 1975: 2

Price(t-1)		0.755		0.0155	-0.297	-0.334
RTE(t)	b_{t-1} =	-0.535	Σ_{t-1} =	-0.1383	14.101	-0.792
DIV(t)		49.940		-1.4393	-103.53	1210.6

Kalman Estimates : FROM 1980: 4 UNTIL 1986: 3

YEAR	COEF&(T-STAT) OF	PRICE(t-1)	RTE	DIVIDENDS
80:4	RBAR2=.696	.753 (6.23)	-.436(-.12)	49.43(1.45)
81:1	RBAR2=.639	.624 (5.14)	.041(.010)	66.32(1.81)
81:2	RBAR2=.654	.625 (5.23)	.103(.030)	66.40(1.85)
81:3	RBAR2=.663	.623 (5.31)	.197(.053)	65.27(1.87)
81:4	RBAR2=.672	.624 (5.42)	.108(.030)	65.75(1.92)
82:1	RBAR2=.675	.621 (5.49)	.349(.100)	64.30(1.92)
82:2	RBAR2=.679	.626 (5.53)	-.428(-.12)	70.08(2.12)
82:3	RBAR2=.688	.636 (5.82)	-.541(-.19)	70.08(2.13)
82:4	RBAR2=.694	.649 (6.11)	-.934(-.28)	69.98(2.16)
83:1	RBAR2=.698	.666 (6.54)	-1.04(-.32)	67.75(2.13)
83:2	RBAR2=.696	.695 (6.94)	-1.29(-.39)	64.32(2.01)
83:3	RBAR2=.702	.702 (7.37)	-1.40(-.44)	63.91(2.02)
83:4	RBAR2=.705	.714 (7.72)	-1.57(-.50)	63.14(2.01)
84:1	RBAR2=.703	.739 (8.31)	-1.42(-.45)	56.78(1.85)

84:2	RBAR2=.696	.775 (8.83)	-.91(-.28)	45.06(1.48)
84:3	RBAR2=.703	.796 (9.51)	-.72(-.22)	39.23(1.33)
84:4	RBAR2=.709	.806 (10.1)	-.77(-.24)	37.83(1.30)
85:1	RBAR2=.710	.833 (10.9)	-.57(-.18)	31.05(1.09)
85:2	RBAR2=.714	.856 (11.6)	-.20(-.06)	23.34(.845)
85:3	RBAR2=.719	.873 (12.4)	-.17(-.05)	23.72(.870)
85:4	RBAR2=.722	.861 (13.0)	-.33(-.10)	23.47(.868)
86:1	RBAR2=.724	.876 (13.9)	-.53(-.17)	22.80(.848)
86:2	RBAR2=.723	.866 (14.5)	-.40(-.13)	23.23(.870)
86:3	RBAR2=.723	.863 (14.8)	-.35(-.11)	23.42(.886)

Comments:

The empirical findings from testing the price generating process for General Mills, Inc. are consistent with the expected ones. That is, the coefficient of Price(t-1) is always less than one and the coefficients' movement is not contradictory to our theoretical arguments.

The estimates show un upward trend for the coefficient of the past price ,nd a downward trend for the coefficient of dividends. While earnings have small insignificant variations .From the 198O,4 to 1982,2 it seems that uncertainty was increasing, because we see a decrease in the coefficient of price and an increase in the coefficient of dividends and to a lesser extent an increase in the coefficient of earnings. However, after 1982,3 till

1986,3 there is an upward trend for the coefficient of the past price and a downward trend for the coefficient of dividends.

While the coefficient of dividends is greater than the coefficient of earnings as long as k_t is positive. Moreover, we see the coefficient of retained earnings to take positive and negative values through time while the coefficient of dividends remains positive; In this case, from table 2D, we see that the target pay-out ratio r seems to be in the ranges $p\sigma e_t/\sigma u_t < r < \sigma e_t/p\sigma u_t$ and $\sigma e_t/p\sigma u_t < r$.

Table 2D.

	$r<p\sigma e_t/\sigma u_t$	$r=p\sigma e_t/\sigma u_t$	$p\sigma e_t/\sigma u_t<r< \sigma e_t/p\sigma u_t$	$r= \sigma e_t/p\sigma u_t$	$\sigma e_t/p\sigma u_t<r$
μ_t	+	+	+	O	-
K_t	-	O	+	+	+
$\delta MSE_t/\delta r$	+	MAX	-	-	-

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Martin - Marietta Corp. TICKER SYMBOL (ML)

Prior Estimates : FROM 1967: 2 UNTIL 1976: 2

$$
\begin{array}{lcccc}
\text{Price(t-1)} & & 0.706 & & 0.0115 \quad 0.613 \quad -0.859 \\
\text{RTE(t)} & b_{t-1} = & -2.729 & \Sigma_{t-1} = & 0.0901 \quad 1.873 \quad -0.924 \\
\text{DIV(t)} & & 38.79 & & -1.3914 \quad -19.069 \quad 227.31
\end{array}
$$

Kalman Estimates : FROM 1976: 4 UNTIL 1981: 3

YEAR	COEF&(T-STAT) OF	PRICE(t-1)	RTE	DIVIDENDS
76:4	RBAR2=.594	.706(6.68)	-2.73(-2.03)	38.83(2.61)
77:1	RBAR2=.606	.723(6.84)	-2.41(-1.81)	35.79(2.42)
77:2	RBAR2=.618	.719(7.14)	-2.47(-1.98)	36.40(2.62)
77:3	RBAR2=.614	.754(7.30)	-1.55(-1.28)	28.06(2.03)
77:4	RBAR2=.626	.743(7.74)	-1.75(-1.69)	30.22(2.51)
78:1	RBAR2=.635	.744(7.87)	-1.69(-1.73)	29.74(2.55)
78:2	RBAR2=.642	.755(7.90)	-1.25(-1.32)	26.12(2.26)
78:3	RBAR2=.671	.759(7.97)	-1.10(-1.18)	24.93(2.17)
78:4	RBAR2=.706	.778(8.25)	-0.81(-0.90)	21.79(1.95)
79:1	RBAR2=.730	.772(8.50)	-0.90(-1.10)	22.78(2.19)
79:2	RBAR2=.752	.795(8.84)	-0.39(-0.54)	17.62(1.81)
79:3	RBAR2=.783	.806(9.06)	-0.13(-0.19)	15.03(1.63)
79:4	RBAR2=.816	.832(9.50)	0.31(0.547)	10.01(1.18)
80:1	RBAR2=.849	.875(9.86)	0.88(1.670)	2.90(.356)

80:2	RBAR2=.872	.835(10.1)	0.62(1.270)	7.57(1.05)
80:3	RBAR2=.893	.838(10.3)	0.65(1.420)	7.11(1.02)
80:4	RBAR2=.895	.901(9.81)	1.20(2.360)	-1.06(-.13)
81:1	RBAR2=.915	.998(11.2)	1.44(2.57)	-11.33(-1.4)
81:2	RBAR2=.926	.907(11.7)	1.33(2.30)	-2.10(-.30)
81:3	RBAR**2=.938	.892(12.6)	1.30(2.28)	-0.87(-.13)

Comments:

The empirical findings from testing the price generating process for Martin-Marieta Corp, are consistent with the findings of this work. First, we see again that the coefficient of V_{t-1} (Price(t-1) is always less than one. Second, the coefficient of dividends is always greater than the coefficient of retained earnings if k_t is greater than zero. Regarding the coefficients, it seems that the coefficient of past price has an upward trend, the same is true for the coefficient of retained earnings while the opposite holds true for the coefficient of dividends.These trends can be explained by looking at table 1G.

	Φ_t	μ_t	K_t
increase in $\sigma^2 n_t$ constant $\sigma^2 u_t, \sigma^2 e_t$	decrease	increase	increase
increase in $\sigma^2 u_t$ constant $\sigma^2 n_t, \sigma^2 e_t$	increase	decrease	increase
increase in $\sigma^2 e_t$ constant $\sigma^2 n_t, \sigma^2 u_t$	increase	increase	decrease

That is, if the ratios of $\sigma^2 e_t/\sigma^2 n_t$, and $\sigma^2 e_t/\sigma^2 u_t$ increase through time then we should have movements similar to the ones observed for Martin-Marieta.

Moreover, since the coefficients of retained earnings from negative becomes positive and the opposite is observed for dividends, from table 2D, we can say that initialy the target pay-out ratio was in the range $\sigma e_t/p\sigma u_t < r$, but as the ratio of $\sigma e_t/\sigma u_t$ increased through time the inequality reversed itself to $r < p\sigma e_t/\sigma u_t$. (see table 2D)

Table 2D.

	$r<p\sigma e_t/\sigma u_t$	$r=p\sigma e_t/\sigma u_t$	$p\sigma e_t/\sigma u_t<r<\sigma e_t/p\sigma u_t$	$r=\sigma e_t/p\sigma u_t$	$\sigma e_t/p\sigma u_t<r$
μ_t	+	+	+-	O	-
K_t	-	O	+	+	+
$\delta MSE_t/\delta r$	+	MAX	-	-	-

Moreover, as long as k_t is positive, the coefficient of dividends should always be greater than the coefficient of retained earnings and the opposite. From the kalman estimates we see that this relationship holds.

Occidental Petroleum Co. TICKER SYMBOL (OXY)

Prior Estimates : FROM 1968: 2 UNTIL 1980: 4

$$\begin{array}{lcc} \text{Price(t-1)} & & 0.919 \\ \text{RTE(t)} & b_{t-1} = & 0.145 \\ \text{DIV(t)} & & 5.408 \end{array} \qquad \Sigma_{t-1} = \begin{array}{ccc} 0.0020 & -0.004 & -0.5811 \\ -0.0004 & 0.121 & -0.6988 \\ -0.1515 & -1.407 & 33.1930 \end{array}$$

Kalman Estimates : FROM 1981: 1 UNTIL 1986: 4

YEAR	COEF&(T-STAT) OF	PRICE(t-1)	RTE	DIVIDENDS
81:1	RBAR2=.820	.922 (20.39)	.0942(.273)	5.088(.8838)
81:2	RBAR2=.821	.926 (20.83)	.0897(.261)	4.416(.7859)
81:3	RBAR2=.812	.936 (20.94)	.0989(.348)	2.541(.4547)
81:4	RBAR2=.812	.937 (21.53)	.1013(.295)	2.432(.4576)
82:1	RBAR2=.809	.944 (22.01)	.1054(.307)	1.388(.2667)
82:2	RBAR2=.809	.947 (22.63)	.1312(.394)	.727(.1503)
82:3	RBAR2=.809	.947 (23.15)	.1293(.406)	.768(.1736)
82:4	RBAR2=.809	.945 (23.51)	.1026(.342)	1.254(.3137)
83:1	RBAR2=.809	.945 (23.79)	.1018(.371)	1.267(.3562)
83:2	RBAR2=.806	.943 (23.70)	-.0245(-.097)	3.024(.9432)
83:3	RBAR2=.806	.943 (23.89)	.0019(.0882)	2.710(.9262)
83:4	RBAR2=.806	.943 (24.09)	-.0071(-.033)	2.841(1.026)

84:1	RBAR2=.801	.942 (23.68)	-.0841(-.393) 4.062(1.494)
84:2	RBAR2=.799	.940 (23.64)	-.0493(-.232) 3.556(1.327)
84:3	RBAR2=.802	.940 (23.80)	-.0535(-.255) 3.709(1.413)
84:4	RBAR2=.801	.940 (23.90)	-.0455(-.218) 3.440(1.329)
85:1	RBAR2=.803	.939 (24.05)	-.0532(-.258) 3.621(1.430)
85:2	RBAR2=.805	.940 (24.09)	-.0723(-.353) 3.975(1.592)
85:3	RBAR2=.807	.938 (24.17)	-.0565(-.278) 3.749(1.519)
85:4	RBAR2=.809	.938 (24.35)	-.0545(-.271) 3.708(1.526)
86:1	RBAR2=.802	.937 (24.03)	-.0136(-.067) 3.132(1.288)
86:2	RBAR2=.802	.936 (24.18)	-.0213(-.106) 3.318(1.394)
86:3	RBAR2=.803	.936 (24.32)	-.2979(-.151) 3.460(1.483)
86:4	RBAR2=.803	.936 (24.47)	-.0177(-.092) 3.326(1.454)

Comments:

The empirical findings from testing the price generating process for Occidental Petroleum Co. are consistent with the theoretical findings of this work. First, we see again that the coefficient of Price(t-1) is always less than one. Second, the coefficient of dividends is always greater than the coefficient of retained earnings, so that k_t is greater than zero.

Regarding the coefficients, it seems that the coefficient of past price and earnings have an upward trend from 1981,1 to 1982,3, and the coefficient of dividends a downward trend. This movement is possible if the ratios $\sigma^2 e_t/\sigma^2 u_t$ and $\sigma^2 e_t/\sigma^2 n_t$ increase through time.

The opposite seems to hold for some time period . Which can be explained if the ratios σ^2e_t/σ^2u_t and σ^2e_t/σ^2n_t decrease during these periods.Thereafter, the coefficients seem to move randomly with a small downward trend for the coefficient of price, and earnings and the opposite for dividends. From 1982,3 to 1986,4 these ratios seem to move (on the average) in opposite directions. Table 1G traces these possible movements.

Table 1G

	Φ_t	μ_t	K_t
increase in σ^2n_t constant σ^2u_t,σ^2e_t	decrease	increase	increase
increase in σ^2u_t constant σ^2n_t,σ^2e_t	increase	decrease	increase
increase in σ^2e_t constant σ^2n_t,σ^2u_t	increase	increase	decrease

Moreover, since the coefficient of retained earnings from positive becomes negative, while the coefficient of dividends is always positive, from table 2D, we can say that initialy the target pay-out ratio was in the range $p\sigma e_t/\sigma u_t < r < \sigma e_t/p\sigma u_t$, but as the ratio of $\sigma e_t/\sigma u_t$ decreased through time the inequality reversed itself to $p\sigma e_t/\sigma u_t < r$.

Table 2D.

	$r<p\sigma e_t/\sigma u_t$	$r=p\sigma e_t/\sigma u_t$	$p\sigma e_t/\sigma u_t<r<\sigma e_t/p\sigma u_t$	$r=\sigma e_t/p\sigma u_t$	$\sigma e_t/p\sigma u_t<r$
μ_t	+	+	+	O	-
K_t	-	O	+	+	+
$\delta MSE_t/\delta r$	+	MAX	-	-	-

Ogden Corp. TICKER SYMBOL(OG)

Prior Estimates : FROM 1967: 2 UNTIL 1975: 3

$$\begin{array}{ll} \text{Price(t-1)} & \\ \text{RTE(t)} & b_{t-1} = \\ \text{DIV(t)} & \end{array} \begin{array}{r} 0.949 \\ 0.529 \\ -2.272 \end{array} \quad \Sigma_{t-1} = \begin{array}{rrr} 0.0037 & -0.294 & -0.5134 \\ -0.0118 & 0.428 & -0.5416 \\ -0.2645 & -2.969 & 70.2270 \end{array}$$

Kalman Estimates : FROM 1978: 1 UNTIL 1983: 1

YEAR	COEF&(T-STAT) OF	PRICE(t-1)	RTE	DIVIDENDS
78:1	RBAR2=.825	.953(16.06)	.4732(.7707)	-2.303(-.278)
78:2	RBAR2=.820	.942(16.18)	.6390(1.084)	-2.200(-.266)
78:3	RBAR2=.820	.940(16.45)	.6840(1.215)	-2.279(-.280)
78:4	RBAR2=.815	.947(16.65)	.5850(1.055)	-2.662(-.327)
79:1	RBAR2=.815	.945(17.01)	.6048(1.119)	-2.523(-.315)
79:2	RBAR2=.808	.936(16.74)	.7200(1.330)	-1.987(-.245)
79:3	RBAR2=.809	.937(16.92)	.6828(1.287)	-1.952(-.243)
79:4	RBAR2=.808	.940(17.14)	.6588(1.253)	-2.002(-.256)
80:1	RBAR2=.809	.939(17.44)	.6640(1.283)	-2.379(-.305)
80:2	RBAR2=.811	.939(17.72)	.6605(1.298)	-2.414(-.314)
80:3	RBAR2=.813	.939(17.97)	.6674(1.334)	-2.368(-.312)
80:4	RBAR2=.816	.935(18.10)	.6875(1.385)	-1.808(-.241)
81:1	RBAR2=.816	.939(18.34)	.6818(1.379)	-2.663(-.360)

81:2	RBAR2=.819	.939(18.69)	.6807(1.393)	-2.722(-.375)
81:3	RBAR2=.823	.937(18.94)	.6945(1.438)	-2.481(-.346)
81:4	RBAR2=.829	.933(19.05)	.6962(1.448)	-1.660(-.235)
82:1	RBAR2=.833	.935(19.21)	.6961(1.454)	-2.230(-.319)
82:2	RBAR2=.828	.940(19.18)	.6887(1.424)	-3.300(-.471)
82:3	RBAR2=.829	.933(19.12)	.6990(1.441)	-2.270(-.325)
82:4	RBAR2=.834	.926(18.85)	.6604(1.347)	-O.514(-.074)

Comments:

The empirical findings from testing the price generating process for Ogden Corp. are consistent with the findings of this work. First, we see again that the coefficient of V_{t-1} (Price(t-1) is always less than one. Second, the coefficient of dividends is negative, which implies that K_t is less than zero or that the target pay-out ratio is very small relative to the ratio $\sigma^2 e_t/\sigma^2 u_t$. The coefficients' movement is not contradictory to our theoretical arguments. It seems that the coefficient of past price has a very small downward trend, that the coefficient of earnings moves in opposite direction from the coefficient of price and so do dividends.

Moreover, since the coefficients of retained earnings are always positive and the opposite is observed for dividends, we can say that the target pay-out ratio is in the the range $r < \sigma e_t/p\sigma u_t$ (see table 2D).

Table 2D.

	$r<p\sigma e_t/\sigma u_t$	$r=p\sigma e_t/\sigma u_t$	$p\sigma e_t/\sigma u_t<r<\sigma e_t/p\sigma u_t$	$r=\sigma e_t/p\sigma u_t$	$\sigma e_t/p\sigma u_t<r$
μ_t	+	+	+	O	-
K_t	-	O	+	+	+
$\delta MSE_t/\delta r$	+	MAX	-	-	-

to be negative , the coefficient of dividends should always be less than the coefficient of retained earnings. From the kalman estimates we see that this relationship holds.

Alberto Culver Co. TICKER SYMBOL (ACV)

Prior Estimates : FROM 1970 : 1 1978: 4

Price(t-1)		0.895		0.0179	-0.919	0.1811
RTE(t)	$b_{t-1} =$	0.134	$\Sigma_{t-1} =$	-0.4214	11.688	-0.4810
DIV(t)		2.356		0.3521	-23.852	210.380

Kalman Estimates : FROM 1979 : 1 1984: 2

YEAR COEF&(T-STAT) OF PRICE(t-1) RTE DIVIDENDS

79:1	RBAR2=.879	.8902 (6.871)	.9802(.294)	2.616(.1837)
79:2	RBAR2=.881	.8941 (7.135)	.8934(.276)	2.454(.1753)
79:3	RBAR2=.882	.8889 (7.387)	1.0132(.324)	2.576(.1868)
79:4	RBAR2=.883	.8936 (7.726)	.8996(.298)	2.503(.1840)
8O:1	RBAR2=.884	.8939 (8.100)	.8934(.309)	2.502(.1864)
8O:2	RBAR2=.885	.8846 (8.417)	1.1248(.407)	2.447(.1844)
8O:3	RBAR2=.881	.8564 (8.344)	1.8428(.683)	2.239(.1681)
8O:4	RBAR2=.881	.8499 (8.241)	1.8878(.717)	2.252(.1711)
81:1	RBAR2=.881	.8582 (8.833)	1.7916(.704)	2.319(.1784)
81:2	RBAR2=.881	.8676 (9.321)	1.5251(.629)	2.688(.2094)
81:3	RBAR2=.880	.8857 (10.06)	1.0189(.448)	3.579(.2824)
81:4	RBAR2=.880	.8785 (10.76)	1.2026(.569)	3.384(.2705)
82:1	RBAR2=.880	.8815 (11.52)	1.1216(.568)	3.499(.2836)
82:2	RBAR2=.881	.8860 (12.24)	1.0017(.538)	3.684(.3026)
82:3	RBAR2=.881	.8884 (12.92)	.9375(.532)	3.789(.3153)
82:4	RBAR2=.877	.8664 (12.96)	1.5012(.877)	3.194(.2645)
83:1	RBAR2=.876	.8696 (13.12)	1.4183(.836)	2.823(.2354)
83:2	RBAR2=.876	.8699 (13.25)	1.3885(.828)	3.343(.2851)
83:3	RBAR2=.876	.8663 (13.33)	1.7964(.875)	1.842(.1618)
83:4	RBAR2=.874	.8679 (13.40)	1.4055(.859)	3.700(.3319)
84:1	RBAR2=.874	.8682 (13.55)	1.3931(.864)	3.845(.3533)
84:2	RBAR2=.874	.8687 (13.67)	1.3618(.854)	4.308(.4036)

84:3	RBAR2=.874	.8698 (13.79)	1.3079(.827)	5.069(.4827)
84:4	RBAR2=.874	.8719 (13.93)	1.2343(.788)	5.908(.5713)

Comments:

The empirical findings from testing the price generating process for Alberto Culver Co. are consistent with the expected ones. That is, the coefficient of V_{t-1} is always less than one and since the coefficients of retained earnings and dividends are positive the coefficient of dividends is always greater than the coefficient of retained earnings.

From 79,1 to 79,2 we observe an increase in the coefficient of price and a decrease in the coefficients of earnings and dividends. This implies that for the period there was a decrease in uncertainty. In the next period, the coefficient of price decreases and this decrease is followed with an increase in the coefficients of earnings and dividends. This implies an increase in the degree of uncertainty for the period. In the same way we can explain the movement of the coefficients through time. While the main finding is that the results do not condradict our theoretical findings.

Moreover, it seems that from 79,1 to 8O,4, there is relative decrease in the variability of earnings around the mean which causes the coefficient of price and dividend to decrease and the coefficient of earnings to increase. Thereafter, and till 82,3, we observe exactly the opposite.

Since the coefficients of retained earnings and dividends remain positive, from table 2D, we see that the target pay-out ratio r seems to be in the range $p\sigma e_t/\sigma u_t < r < \sigma e_t/p\sigma u_t$.

Table 2D.

	$r<p\sigma e_t/\sigma u_t$	$r=p\sigma e_t/\sigma u_t$	$p\sigma e_t/\sigma u_t<r<\sigma e_t/p\sigma u_t$	$r=\sigma e_t/p\sigma u_t$	$\sigma e_t/p\sigma u_t<r$
μ_t	+	+	+	O	-
K_t	-	O	+	+	+
$\delta MSE_t/\delta r$	+	MAX	-	-	-

Moreover, if k_t is positive, the coefficient of dividends should always be greater than the coefficient of retained earnings. And we see that this is true throughout.

Alcan Aluminum LTD . TICKER SYMBOL (AL)

Prior Estimates : FROM 1967: 2 UNTIL 1975: 3

Price(t-1)		0.936		0.0113	0.160	-0.7931
RTE(t)	b_{t-1} =	-0.816	Σ_{t-1} =	0.0183	1.151	-0.7095
DIV(t)		11.299		-1.2605	-11.36	222.910

Kalman Estimates : FROM 1980: 1 UNTIL 1984: 3

YEAR	COEF&(T-STAT) OF	PRICE(t-1)	RTE	DIVIDENDS
80:1	RBAR2=.526	.934 (8.89)	-.762(-.724)	10.82(.736)
80:2	RBAR2=.448	.998 (9.11)	-.851(-.758)	5.30(.342)

8O:3	RBAR2=.449	.990 (10.27)	-.822(-.746)	6.21(.417)
8O:4	RBAR2=.451	.987 (11.18)	-.816(-.754)	6.42(.445)
81:1	RBAR2=.445	.965 (11.71)	-.798(-.742)	8.39(.596)
81:2	RBAR2=.437	.966 (11.78)	-.957(-.910)	9.84(.708)
81:3	RBAR2=.439	.969 (12.12)	-.936(-.902)	9.36(.686)
81:4	RBAR2=.430	.984 (12.61)	-.817(-.797)	6.51(.493)
82:1	RBAR2=.419	.972 (12.66)	-.670(-.663)	6.91(.525)
82:2	RBAR2=.419	.972 (12.81)	-.601(-.658)	6.42(.506)
82:3	RBAR2=.414	.974 (12.90)	-.268(-.332)	3.71(.305)
82:4	RBAR2=.415	.986 (12.93)	.373(.533)	-2.53(-.217)
83:1	RBAR2=.458	.982 (13.26)	.406(.595)	-2.30(-.200)
83:2	RBAR2=.510	.980 (13.43)	.448(.686)	-2.44(-.214)
83:3	RBAR2=.537	.978 (13.48)	.266(.443)	-0.75(-.068)
83:4	RBAR2=.593	.981 (13.43)	.533(.940)	-3.16(-.288)
84:1	RBAR2=.681	.993 (13.70)	.808(1.55)	-6.65(-.627)
84:2	RBAR2=.762	.996 (13.94)	.871(1.81)	-7.42(-.722)

Comments:

The empirical findings from testing the price generating process for Alcan Alumunium LTD, are consistent with the findings of this work. First, we see again that the coefficient of V_{t-1} (Price(t-1) is always less than one, but very close to one. Second, the coefficient of dividends is decreasing with time, while the coefficient of retained earnings moves in the opposite direction. This particular behavior is possible if the ratio $\sigma e_t/\sigma u_t$ increases through time. Since the coefficients of retained earnings from negative become positive, and the opposite is observed for dividends, from table 2D, we can see that initialy the target pay-out ratio was in the range $\sigma e_t/p\sigma u_t < r$, but as the ratio of $\sigma e_t/\sigma u_t$ increased through time the inequality reversed itself to $r < p\sigma e_t/\sigma u_t$. (see table 2D)

Table 2D

	$r<p\sigma e_t/\sigma u_t$	$r=p\sigma e_t/\sigma u_t$	$p\sigma e_t/\sigma u_t<r<\sigma e_t/p\sigma u_t$	$r=\sigma e_t/p\sigma u_t$	$\sigma e_t/p\sigma u_t<r$
μ_t	+	+	+	O	-
K_t	-	O	+	+	+
$\delta MSE_t/\delta r$	+	MAX	-	-	-

Moreover, as long as k_t is positive, the coefficient of dividends should always be greater than the coefficient of retained earnings and the opposite. From the kalman estimates we see that this relationship holds.

Air Products & Chemicals Corp. TICKER SYMBOL (APD)

Prior Estimates : FROM 1967: 2 UNTIL 1981: 3

$$\begin{array}{lcrcrrr} \text{Price(t-1)} & & 0.485 & & 0.0067 & -0.935 & 0.6723 \\ \text{RTE(t)} & b_{t-1} = & 12.072 & \Sigma_{t-1} = & -0.1534 & 3.969 & -0.8578 \\ \text{DIV(t)} & & -119.1 & & 1.4565 & -44.96 & 692.080 \end{array}$$

Kalman Estimates : FROM 1981: 4 UNTIL 1986: 4

YEAR	COEF &(T-STAT) OF	PRICE(t-1)	RTE	DIVIDENDS
81:4	RBAR2=.895	.7771 (7.519)	4.531(2.08)	- 38.007(-1.607)
82:1	RBAR2=.893	.8278 (8.342)	3.466(1.66)	-29.621(-1.271)
82:2	RBAR2=.888	.8651 (8.790)	2.727(1.31)	-24.815(-1.055)
82:3	RBAR2=.886	.8712 (8.843)	2.709(1.30)	-26.581(-1.133)
82:4	RBAR2=.879	.8402 (8.328)	3.141(1.47)	-26.582(-1.095)
83:1	RBAR2=.880	.8734 (8.872)	2.348(1.13)	-16.400(-.7067)
83:2	RBAR2=.881	.9712 (11.57)	0.054(0.03)	10.263(.56151)
83:3	RBAR2=.888	.9597 (12.72)	.3094(.213)	7.40(.467)
83:4	RBAR2=.891	.9365 (13.24)	.8301(.625)	1.53(.106)
84:1	RBAR2=.896	.9396 (13.66)	.7555(.593)	2.48(.182)
84:2	RBAR2=.895	.9287 (13.51)	1.0203(.805)	-1.36(-.10)
84:3	RBAR2=.898	.9289 (13.60)	.9735(.777)	-0.16(-.01)

84:4	RBAR2=.902	.9295 (13.70)	.9337(.754)	0.71(.056)
85:1	RBAR2=.906	.9313 (13.86)	.8717(.715)	1.76(.144)
85:2	RBAR2=.909	.9430 (13.98)	.5558(.458)	6.22(0.52)
85:3	RBAR2=.912	.9230 (14.33)	1.0403(.936)	0.895(.08)
85:4	RBAR2=.913	.9473 (14.32)	.3397(.303)	10.08(.96)
86:1	RBAR2=.918	.9981 (14.8O)	-.8055(-.72)	2O.8(2.01)
86:2	RBAR2=.917	.92OO (14.38)	.7124(.687)	9.6(O.94)
86:3	RBAR2=.922	.9O4O (17.9O)	1.O393(.66)	7.2(O.875)
86:4	RBAR**2=.926	.93O7 (19.85)	.4663(.9O)	11.5(1.49)

Comments:

The empirical findings from testing the price generating process for Air Products & Chemicals Corp.are consistent with the expected ones. That is, the coefficient of V_{t-1} (Price(t-1) is always less than one and the coefficients movement' which is very volatile, is not contradictory to our theoretical arguments. There is on the average an upward trend on the coefficient of price and dividends, while the opposite is true for earnings.That is, it seems that the coefficients of price and dividends on the average move together.

This behavior is possible if the relative ratios $\sigma^2 u_t/\sigma^2 n_t$ and $\sigma^2 u_t/\sigma^2 e_t$ increase through time. Moreover, from table 2D, we see that the movement in the ratio $\sigma e_t/\sigma u_t$ allows the coefficients of earnings and dividends to receive positive and negative values, consistent though with the ones described in table 2D.

Table 2D

	$r<p\sigma e_t/\sigma u_t$	$r=p\sigma e_t/\sigma u_t$	$p\sigma e_t/\sigma u_t<r<\sigma e_t/p\sigma u_t$	$r=\sigma e_t/p\sigma u_t$	$\sigma e_t/p\sigma u_t<r$
μ_t	+	+	+	O	-
K_t	-	O	+	+	+
$\delta MSE_t/\delta r$	+	MAX	-	-	-

Moreover, if k_t is positive, the coefficient of dividends should always be greater than the coefficient of retained earnings, and the opposite . The kalman estimates are also consistent with this argument. That is, it is not possible to observe for the same time period a negative coefficient for dividends and earnings.

Lucky Stores Corp. STICKER SYMBOL (LKS)

Prior Estimates : FROM 1971: 4 UNTIL 1981: 4

$$\begin{array}{lc} \text{Price(t-1)} \\ \text{RTE(t)} \\ \text{DIV(t)} \end{array} \quad b_{t-1} = \begin{array}{c} 0.849 \\ 1.053 \\ 3.725 \end{array} \qquad \Sigma_{t-1} = \begin{array}{rrr} 0.0048 & -0.576 & 0.1721 \\ -0.0752 & 3.523 & -0.8953 \\ 0.1152 & -16.15 & 92.438 \end{array}$$

Kalman Estimates : FROM 1982: 1 UNTIL 1986: 4

YEAR	COEF&(T-STAT) OF	PRICE(t-1)	RTE	DIVIDENDS
82:1	RBAR2=.476	.8442 (12.44)	1.036(.558)	4.342(.4611)

82:2	RBAR2=.463	.8481 (12.43)	1.358(.734)	1.774(.1922)
82:3	RBAR2=.456	.8475 (12.50)	1.033(.579)	3.960(.4570)
82:4	RBAR2=.453	.8522 (12.49)	.440(.253)	7.519(.9077)
83:1	RBAR2=.492	.8580 (12.30)	-.000(-.33)	10.185(1.222)
83:2	RBAR2=.570	.8608 (12.38)	-.0245(-.13)	10.361(1.246)
83:3	RBAR2=.610	.8643 (12.41)	-.2460(-.21)	11.110(1.360)
83:4	RBAR2=.610	.8672 (12.52)	-.5199(-.30)	12.424(1.526)
84:1	RBAR2=.597	.8718 (12.49)	-.6394(-.37)	12.509(1.523)
84:2	RBAR2=.596	.8740 (12.66)	-.6427(-.376)	12.283(1.511)
84:3	RBAR2=.599	.8767 (12.71)	-.9427(-.56)	14.091(1.778)
84:4	RBAR2=.603	.8751 (12.78)	-.8556(-.51)	13.573(1.737)
85:1	RBAR2=.615	.8764 (12.90)	-.9514(-.57)	14.154(1.841)
85:2	RBAR2=.634	.8833 (12.76)	-1.2203(-.73)	15.610(2.001)
85:3	RBAR2=.662	.8804 (12.95)	-1.1702(-.71)	15.452(2.002)
85:4	RBAR2=.691	.8837 (12.76)	-1.0368(-.61)	14.767(1.879)
86:1	RBAR2=.734	.8991 (13.94)	-1.4387(-.93)	16.200(2.166)
86:2	RBAR2=.778	.9371 (15.40)	-2.4234(-1.68)	19.637(2.702)
86:3	RBAR2=.829	.9931 (17.73)	-3.8693(-3.00)	24.509(3.468)
86:4	RBAR2=.836	.9513 (19.57)	-4.3986(-3.52)	30.449(5.219)

Comments:

The empirical findings from testing the price generating process for Lucky Stores Corp., are consistent with the findings of this work. First, we see again that the coefficient of V_{t-1} (Price(t-1) is always less than one. Second, the coefficient of dividends is increasing with time, while the coefficient of retained earnings moves in the opposite direction. Moreover, we see an upward trend in the coefficient of past price.This particular behavior implies that the ratios $\sigma^2 u_t/\sigma^2 n_t$ and $\sigma^2 u_t/\sigma^2 e_t$, increase with time. Since the coefficients of retained earnings from positive become negative while for dividends the coefficient is always positive , from table 2D, we can see that the target pay-out ratio r, with the decrease in the ratio $\sigma e_t/\sigma u_t$, will move from the range $p\sigma e_t/\sigma u_t < r < \sigma e_t/p\sigma u_t$ to the range $\sigma e_t/p\sigma u_t < r$.

Table 2D

	$r < p\sigma e_t/\sigma u_t$	$r = p\sigma e_t/\sigma u_t$	$p\sigma e_t/\sigma u_t < r < \sigma e_t/p\sigma u_t$	$r = \sigma e_t/p\sigma u_t$	$\sigma e_t/p\sigma u_t < r$
μ_t	+	+	+	O	-
K_t	-	O	+	+	+
$\delta MSE_t/\delta r$	+	MAX	-	-	-

Moreover, as long as k_t is positive, the coefficient of dividends should always be greater than the coefficient of retained earnings and the opposite. From the kalman estimates we see that this relationship holds.

CONCLUSIONS FROM THE OVERALL EMPIRICAL TESTING:

The empirical findings, demonstrate the time variation of the parameter and significance of dividends, earnings and past price. There is enough evidence to conclude that the theoretical arguments of this work can not be rejected from the empirical findings. That is, in all twelve cases the coefficient of price had a value less than one; while, we never observed, for the same time period, negative signs for earnings and dividends. Moreover, all the movements in the coefficients could be explained from the expected theoretical relations.

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