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Corporation Dividend Payout Ratios and Target Ratios -- Their Significance and Determination

Guy Stevens

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Corporation Dividend Payout Ratios and Target Ratios -- Their Significance and Determination*

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This paper attempts a theoretical and empirical investigation of a widely known, important, but somewhat ignored variable, the corporate dividend payout ratio.* The payout ratio has long been a useful tool of corporate

* By "payout ratio" I mean the percentage of net earnings after taxes and preferred dividends paid out to the common shareholders in the form of dividends.

analysts, and recently, in a model developed by John Lintner,** a related form

** See John Lintner, "The Determinants of Corporate Saving," in Savings in the Modern Economy, eds. Heller, Boddy and Nelson (University of Minnesota Press, Minneapolis, 1953), pp. 235-255, and Lintner, "The Distribution of Incomes of Corporations among Dividends, Retained Earnings and Taxes," American Economic Review, May, 1956, pp. 97-113.

Lintner's model of the dividend decision seems to be the best of all those so far tested. Regression equations estimated using it fit the empirical data as well or better than any other (p.25 of the article in Savings in the Modern Economy). The model, fitted to pre-World War II data, has predicted post-war dividend levels significantly better than other formulations proposed by Tinbergen, Dobrovolsky and Modigliani. (pp. 110-111 of the AER article). Also, its assumptions are well grounded in reality (pp. 98-103 in AER).

has assumed a basic role in the process of dividend determination. Still, in both contexts, the most significant aspects of its behavior have not been rigorously explained. First, there are the great firm-to-firm differences noted in the observed payout ratios of American corporations; the persistence of these

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differences imply causation by more basic factors. Heretofore, this question has been attacked only in rather loose fashion by stock analysts and corporate finance experts.* In Lintner's model, a long run, unobservable payout ratio --

* The standard procedure is to lay down a number of rules as to how firms do or should act under certain circumstances; in no cases have I seen any attempt to prove the descriptive rules or to tell which are generally operative in the economy. See, for instance, Richards C. Osborn, Corporation Finance, (Harper and Brothers, New York, 1959), pp. 463-472, and J. F. Bradley, Fundamentals of Corporation Finance, (Rhinehart, New York, 1959), pp. 278-284.

the target ratio -- becomes a fundamental element. As with the observable forms above, Lintner assumes its determination by more basic considerations;**but

** John Lintner, AER reading, p.104

again, the nature and importance of these factors is spelled out only in the most general way.

The objectives of this paper are twofold: first, we shall try to estimate the determinants of an objectively defined estimate of the target ratio used so fruitfully by Lintner. Second, it is hoped to critically examine some of the basic assumptions of Lintner's model associated with the target ratio. Initially, a number of hypotheses concerning the determinants and nature of the target ratio are presented. As a test of these hypotheses, multiple regression equations have been fitted from SEC data, using the proxy observed payout ratio as the dependent variable. Data have been collected from a small sample of industrials and utilities over two five year periods: 1946-50 and 1954-58.

I. Lintner's Model and the Place of the Target and Payout Ratios

The nature of the firm's dividend decision, as proposed by Lintner, is as follows:

1. The main question posed by the management of an enterprise with a history of previous dividend decisions is, should the present rate be changed?*

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* *Ibid.*, p. 99

Thus the true dependent variable in this decision-making process is the change, if any, in the exisiting rate -- not the absolute level of the rate.

2. The primary factor determining whether the current rate should be changed is the level of net earnings.** Net earnings is, of course, the fundamental long run constraint on the average level of dividend payments. Also,

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** *Ibid.*, p. 99

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it is assigned predominant weight in the annual or quarterly process of dividend determination because management believes it to be (1) an important guide to policy in its own right and (2) one of the few variables that stockholders watch closely and use in their calculations of what the dividend rate should be.***

*** *Ibid.*, p. 100

3. The ideal relationship between dividends and earnings is postulated for the firm by the target ratio. This is the ideal payout ratio toward which the firm aims its policy over the long run.* In his field investigations,

* Ibid., p. 102

Lintner found that most firms had explicit target ratios that they tried to approximate, or that they acted as if they did.** He notes that, like observed

** Ibid., p. 102

payout ratios, these targets vary widely from firm to firm -- from 20% to 80%.***

*** Ibid., p. 102

4. To eliminate widely fluctuating dividend rates (which were almost universally deemed undesirable), the firm generally changes the dividend rate only when the change in earnings is felt to be fairly permanent, and then only by a fraction of the ideal change indicated by the target ratio.**** Thus two

**** Ibid., p. 100

things can cause the actual payout ratio for a period (say a year), to remain above or below the proportion dictated by the target: the belief that a change in earnings is not permanent (which, of course, could not persist for many periods), or the fact that the target ratio is approached only incrementally after a change in net earnings. This incremental fraction by which the firm adjusts to any change, like the target ratio, varies between individual firms.

The model can be summarized by a standart lag adjustment equation as below:*

$$\Delta D_{it} = c_i(r_i P_{it} - D_{i(t-1)}) \qquad (1)$$

where ΔD_{it} = the change in the dividend rate decided upon by the management of the "i"th firm at time "t".

P_{it} = net common profits of the above firm.

$D_{i(t-1)}$ = total dividends of the firm in the previous period, "t-1".

r_i = the target ratio of the "i"th firm; since this ratio is assumed to be independent of time, no time subscript appears.

c_i = the speed of adjustment factor for the "i"th firm, also independent of time.

Thus, as summarized above, the actual change in the dividend rate (ΔD_{it}) will be a fraction (c_i) of the ideal change $(r_i P_{it} - D_{i(t-1)})$. This ideal change is found by calculating the ideal dividend rate (the target ratio times the actual level of earnings) and subtracting the actual dividend rate of the previous period $(D_{i(t-1)})$.

By substituting $D_{it} - D_{i(t-1)}$ for ΔD_{it}, equation (1) can be transformed to the following:

$$D_{it} = c_i r_i P_{it} + (1-c_i) D_{i(t-1)} \qquad (2)$$

Thus total dividends in any period "t" can be expressed as a simple function of profits in "t" and dividends in "t-1".

By summing equation (2) over all the firms (i) in the economy, a similar aggregative expression can be derived.

$$D_t = aP_t + bD_{(t-1)} \qquad (3)$$

In testing his model, Lintner fitted an equation of approximately this form to aggregative data for the years 1918-41 and various subsets of this span. As is noted above,* this two variable regression equation does an excellent job in explaining dividends for the total period and for individual

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* See footnote ** p. 1 of this paper

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years during and after the period. This caused Lintner to conclude that what might be called the economy's target ratio (a/(1-b) in equation (3)) and speed of adjustment (1-b) must remain quite constant over time, regardless of how increments of profits are added or subtracted from the individual firms making up the aggregate.** In all cases the calculated parameters were close to the

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** Lintner, Savings in the Modern Economy, p. 252.

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following:***

$$D_t = 352.3 + .15\, P_t + .70\, D_{(t-1)}$$

*** Lintner, AER, p. 109

Thus r (for the economy) = .15/.30 = .50 and c' = .30.

Some Implications

At this point, certain facts about this model, intimated earlier, become quite clear. First, even if one assumes the precise validity of Lintner's model and equations, it is still the fact that much about the dividend behavior of the firm and economy is left unexplained. The target ratio and speed of adjustment, which directly enter into the process of dividend determination, are themselves assumed to be determined outside of the system. Second, despite the existence of these unexplained factors, the predictive effectiveness of the model is not hindered -- providing these factors remain constant over time. This qualification is necessary for the individual firm in the firm model, and for the economy as a whole in the aggregative model. Such an assumption is, to say the least, surprising. If it is hypothesized that the target ratio is in some way a function of other variables (and Lintner acknowledges this*), then it should

* Ibid., p. 104

be expected to vary over time. Nothwithstanding the implausibility of the constancy assumption, it is supported by all of Lintner's published results: his aggregative equation explains all data well, and on the firm level, interview data imply that "once established the target payout ratio and the standard speed of adjustment were adhered to with little deviation over extended periods of time." ** These possibilities have been investigated in the empirical

** Ibid., p. 105

research that is presented below.

The model also yields a number of points important for the measurement of the target ratio. It becomes obvious that the observed payout ratio for a single period will usually be a poor approximation of the target. Because of the practice of lagged adjustment of dividends, the short run observed payout ratio is, to an appreciable extent, a function of the fluctuations in net earnings. One would suspect that a better approximation of the target ratio would be obtained by calculating an average observed payout ratio for a number of years: $\frac{\sum_{t=1}^{n} D_{it}}{\sum_{t=1}^{n} P_{it}}$. This,-- for several reasons: if the firm's earnings do indeed fluctuate around some central or slowly increasing level (rather than exploding upward or downward), then over a number of periods these fluctuations could be expected to wash out; also, an anomalous payout ratio in one period would be given much less weight in an average ratio. It can, in fact, be shown that, given rather realistic constraints on the relative size of earnings in any one period, the average payout ratio approaches r_i the firm's target ratio.*

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* See Appendix A

For the above reasons, the target ratio has been approximated in the empirical analysis by an average payout ratio. This average was calculated in all cases for a period of five years. It is not maintained that this proxy variable will closely approach the target ratio under all circumstances: the time period may be too short. Rather the choice of a five year time period is a compromise among a number of imperatives: the span must be long enough to allow fluctuations to wash out, but not so long that fundamental relationships can, or are likely to change. Finally, an aim of the research was to compare results for two distinct post-war periods; there are not that many post-war years available to allow the construction of longer term averages.

II. Some Hypotheses and Empirical Variables

We return to the basic question initially posed: what are the determinants of the target ratio? Lintner mentions a number of possible factors*; so do

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* Lintner, AER, p. 104

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many writers on the subject of corporate finance.** Unfortunately, however,

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** See footnote * p. 2 of this paper

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little of this is more than a mere listing of considerations that, given certain circumstances, could or should affect the payout ratio. To my knowledge, none of these descriptive or normative considerations have been tested against empirical data. Consequently, there is no saying which are false, which are true, or which take precedence when a number are operative. Below are listed some of the most frequently mentioned and/or most promising factors that might perceptibly affect our dependent variable.***

*** Most of the following considerations are listed in numerous sources; footnotes will be used only where the factor is novel to a particular source or person.

A. Factors Dealing With the Growth of the Firm

1. The greater the actual and projected growth of the firm(defined as growth in sales or output), all other things being equal, the greater will be the firm's need for financial resources -- for fixed investment, working capital, etc. All other things being equal, a faster growing firm would be expected to retain more earnings for reinvestment, i.e., its payout ratio would be lower

than the firm growing more slowly.

2. The greater the variety and magnitude of alternative sources of funds - high depreciation and profit flows internally, and attractive borrowing or financing sources externally - the greater will be the tendency for a firm to pay out a high proportion of its earnings in a given growth situation; or vice versa for a firm which must finance its total expansion through meager internal sources.

B. Factors Dealing with Firm Liquidity and Cyclical Stability

3. A firm, like an individual, has a number of reasons for demanding and assuring an adequate level of cash or other liquid balances at any particular time: to cover its transactions needs; as a precaution against unforeseen occurences; and as a fund for future investment (it may be speculative or just a build-up for future asset addition). The more secure the firm's liquidity position relative to its needs, the more it can afford to distribute from that ultimate source of liquidity, earnings.

C. Factors Dealing with Firm Profitability

4. It can be maintained that, under certain circumstances at least, a firm promoting the better interests of its stockholders will tend to pay out a percentage of its earning inversely proportional to the rate of return on the stockholders' capital.* This optimal policy can be justified in common

* I am indebted to Professor Alan Manne for this point and for the proof that appears in the Appendix.

sense terms: the higher the marginal rate of return on invested capital, the greater will be the yield of reinvested earnings in future dividends and increased asset value; up to a certain point, this increased flow of future dividends more than offsets the loss of utility incurred in waiting. Do firms really favor the stockholder's interests in this manner?

D. Factors Dealing with the Law

5. There are broad limitations placed on the firm's ability to pay out dividends by state and Federal law.* Section 531 of the Internal Revenue Code,

* See, for example, Bradley, *op. cit.*, p.282

for instance, penalizes retentions deemed to be motivated solely for the purpose of escaping income taxes. Also, provisions in the terms of prior claim securities often broadly limit the amount and percentage of dividends that can be paid. It would seem that the constraints to the payout ratio posed by the law do not often affect large, widely held corporations; in so far as can be determined, they have not influenced the policies of the firms studied below; this is desirable, for such an influence is hardly measurable.

E. Management Biases and the Nature of the Stockholders

6. Indubitably the target ratio is to some extent a function of the proclivities of management and their interpretation of the relevant facts. The management's estimates of the character and desires of the stockholders can also affect the final target ratio. Its confidence in the reliability of the firm's accounting figures and projections is likely to be another factor.

The Empirical Variables

For this paper, in addition to the approximated target ratio used as the dependent variable, five empirical variables were constructed and used in the regression equations. It is hoped that they measure various aspects of the first three groups of hypotheses presented above -- factors dealing with firm growth, liquidity and profitability. That a number of potentially important determinants of the target ratio are neglected in the empirical research is the fault of the limited scope of this paper and the author's inability to devise adequate variables. It seemed, for example, very difficult to measure inter-firm differences in management bias, the effects of the law, and the availability of outside sources of finance - notwithstanding their admitted importance. Efforts were made to minimize or hold constant the effects of these immeasurables in the selection of the sample.

1. The variable G, the firm's percentage change in sales, was used as a composite measure of the firm's growth rate and prospects over the five year period studied and the near future thereafter. The absolute change in sales was calculated by finding the difference between the peak sales level attained during the selected period and a base sales level, this latter a two or three year average sales level for the years at the beginning of the period. An averaged base was employed to allow for the unusually poor years due to depression or post-war conversion often found at the beginnings of both periods studied. The variable, for each of the periods, was of the following construction:*

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* The following abbreviations are used throughout:

1. D: common dividends for the year period
2. D_p: preferred dividends for the year period
3. Dep : Depreciation for the year period
4. S : total sales for the year period
5. Bk. : book value per common share for the year
6. Int : interest payments on the funded debt for the year
7. A : total assets for the year
8. E : total common earnings after taxes and preferred dividends for the year period.
9. Numerical subscripts refer to the year; "high" used as a subscript in the variable G stands for the year of peak sales.

1946 - 50: $$G = \frac{S_{high} - 1/2(S_{45} + S_{46})}{1/2(S_{45} + S_{46})}$$ where the high year is later than 1947.

1954 - 58: $$G = \frac{S_{high} - 1/3(S_{52} + S_{53} + S_{54})}{1/3(S_{52} + S_{53} + S_{54})}$$ where the high year is later than 1955.

Variables of this basic formulation are not uncommon in the literature of economic research. At least one has been shown to be significantly correlated to actual investment expenditure or firm growth* -- presumably because of the

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* Robert Eisner, A Distributed Lag Investment Function, Cowles Foundation Paper No. 143. p. 19.

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acceleration principle. As well, it is possible that G also reflects expectations for the future and future investment plans.** According to the growth hypotheses outlined above, then, one would expect a negative relation between

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** Eisner, for instance, hypothesized that investment in time period "t" is a linear function of sales changes in the series of years previous.

G and the approximated target ratio.

As for most of the variables developed for this analysis, it must be granted that G is a "rough" measure. First there is the consideration, usually confirmed by statistical tests, that the variable is most closely correlated to growth for firms that are already near capacity; for those with a degree of excess capacity at the beginning of the period, a large increase in sales may be necessary for any effects to be transmitted to financial plans or the target ratio. Also, increased sales levels caused by price changes will not be related to firm growth -- at least that caused by the accelerator.***

*** (Preceding page) Of course it is possible that in this case the variable would measure the impetus given to growth by the inflationary business situation. Another drawback of G is that it cannot measure expansion induced by new technology or wholly new opportunities where past sales are not a factor.

2. Two variables, P_1 and P_2, were designed to reflect different aspects of firm profitability:

$$P_1 = \frac{\sum_{t=1}^{5} E_t}{\sum_{t=1}^{5} Bk_t} \qquad P_2 = \frac{\sum_{t=1}^{5} (E_t + Dp_t + .5\ Int_t)}{\sum_{t=1}^{5} A_t}$$

"t" varies from 1946 - 50 and 1954 - 58 depending on the period under investigation.

P_1 was expected to measure the average rate of return on the common shareholders' equity; P_2 the marginal rate of return on an additional unit of investment in the firm, whether from retained earnings or any other source.*

* The variable P_2 measures the present total flow of funds over costs per unit of total costs.

There are distinctions between the two variables that, it was thought, could be significant. First, the average rate of return on equity capital is influenced by at least one factor not related to the actual flow of profits -- this is the degree to which the firm has "traded on its equity" or "levered" its equity. If the marginal rate of return is greater than the rate paid to bond holders or lenders, then a firm can increase the average rate of return on its equity capital by borrowing or floating bonds.

Both variables are subject to influences that may reduce their ability to measure the concepts stated. Price level changes may cause distortions. Book value and part of total assets are stated in terms of historical costs; if past price levels were considerably different from those of the present, the values for the variables could be substantially overstated (where historical price levels were lower) or understated (where said price levels were higher). It was felt that, in the first period considered especially, historical costs were probably considerably below the then present levels. However, no simple deflation of the absolute levels seemed promising.* Also, for P_2 to accurately measure the marginal rate of return, it must be true that the average rate of return (after

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* Professor Ralph Jones of Yale University advised me that it would be very hard indeed to get true values of firm profitability by using any simple price deflators. He pointed out also that profit figures are often distorted, not only by price changes, but also by the different accounting practices followed by different firms.

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taxes) of an extra unit of invested capital is equal to the marginal, and that each unit of total assets is balanced by a unit of invested capital or funded debt. Usually this latter assumption is not true, for a portion of total assets is balanced by current liabilities; thus, the measure probably understates the real marginal rate of return. Despite these methodological difficulties, P_2 was used in the regressions and produced encouraging results.

Each profitability variable was tried in inverted form (using the reciprocal) in addition to the simple form expressed above. This was done to distinguish between a possible inverse relationship with the payout ratio (as hypothesized on page 10 above) and a negative one.

3. The final two variables, L_1 and L_2, were constructed as alternative measures of the liquidity position of the firm. Each reflects an aspect of the average relative level of liquid funds flowing through the firm.

$$L_1 = \frac{\sum_{t=1}^{5} (E_t + Dep_t)}{\sum_{t=1}^{5} A_t} \qquad L_2 = \frac{\sum_{t=1}^{5} Dep_t}{\sum_{t=1}^{5} A_t}$$

It was hypothesized that the larger these liquidity flows relative to the size of the firm (and therefore, presumably, to its needs), the more liberal a firm could afford to be in distributing dividends. Thus a positive relation was expected between these variables and the payout ratio.

It might be noted that liquidity is not merely a question of flows; it is also a stock concept measurable at any point in time. No stock variables have been used in this study, for it was thought quite possible that the effect of the measure might be thrown off by time lags. A high stock of liquidity might indeed lead to an increased target ratio and increased distributions; this in turn might lead to a lower level of liquidity because of distributions; over the five year period, then, the relative level of liquidity might be rather low, and the target ratio high, despite the direct causation. Flow variable would not be affected by dividend distribution in this way; the average level of profits and depreciation is not lowered by increased distributions -- except possibly through a reduction in investment which would produce new profit and depreciation flows.

III. <u>The Sample and Methodology</u>

The primary goal of the empirical analysis was to determine the degree to which the varying five year payout ratios of a selected sample could be accounted for by the limited number of variables introduced in the previous section. In connection with this aim, a number of regression equations were estimeated using D/P (the five year average payout ratio discussed above) as the dependent variable. These regressions have been estimated for two samples of firms, representing the utility and industrial sectors of the economy; as mentioned, two periods were used - 1946-50 and 1954-58.

The samples are not randomly chosen, nor large. Despite these limitations, it is hoped that the nature of the samples will permit at least some positive statements to be made concerning the questions originally posed. For the industrial sector, 29 of the 30 firms making up the current Dow Jones Industrial Average were selected for study; the utility sample is comprised of 13 of the 15 firms of the similar Dow Jones Utilities Average.* The firms in the Dow Jones

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* The three firms eliminated were A.T.& T. in the industrial sample and Niagara Mohawk Power Corporation and Public Service Electric and Gas Co. among the utilities. The former was excluded because it was felt that it could not really be considered a good example of an industrial corporation. The latter two were eliminated because of ddficiencies of information.

Averages are relatively large, well established, and noted for a large group of common shareholders. It was assumed that these characteristics would help avoid the inclusion of firms whose payout ratios were the result of special or immeasurable circumstances, such as those where dividend policy was dictated or perceptibly influenced by a small group of controlling stockholders, the law, or by the special nature of the firm. As well, the use of the Averages promised a group of firms that was decidedly varied as to industry, and which, in total, accounts for a sizable part of the economy's aggregate earnings and dividends.

Two distinct periods were used for a number of reasons. Primarily, this was necessary to test Lintner's hypothesis that the target ratios remain roughly constant over time. Also, by such a two period analysis, it could be determined whether the explanatory regression equations remained invariant over time.

IV. The Empirical Results

A. Industrials: 1954-58.

The behavior of the firms in the industrial sample, as measured by our six parameters, varied widely during the 1954-58 period. A comparison of average values with those of 1946-50 show this to be a period of somewhat lower profitability, much more moderate growth, and decidedly higher payout ratios.

RELEVANT STATISTICS FOR THE INDUSTRIAL SAMPLE: 1954-58.

Variable	Mean	σ	Range
D/P	.61	.17	(.37, 1.28)
G	.36	.29	(-.01, 1.53)
P_1	.126	.046	(.02, .21)
P_2	.091	.035	(.018, .16)
L_1	.13	.049	(.03, .21)
L_2	.043	.021	(.005, .10)

Preliminary regressions were fitted using G and each of the four possible forms of the profitability variables. In every case the signs of the parameters were predicted by our previous hypotheses. However, the profitability measures alone were significant,* showing a remarkable increase in significance

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* A standard "t" test was performed to determine the significance of the regression coefficients. An "F" test was used on the multiple correlation coefficient. Significance at the 5% level is indicated by one star (*) beside R^2 or the indicated parameter. A double star indicates significance at the 1% level.

with the use of the reciprocals.

$$\begin{array}{llll} D/P = .823^{**} & -.107G & -1.35P^{*} & \quad (1) \\ \quad\;\; .085 & \;\; .104 & \;\; .66^{1} & \end{array}$$

$$R^2 = .214^{*}$$

$$\begin{array}{llll} D/P = .785^{**} & -.110G & -1.44P_2 & \quad (2) \\ \quad\;\; .084 & \;\; .108 & \;\; .90 & \end{array}$$

$$R^2 = .167$$

$$\begin{array}{llll} D/P = .472^{**} & -.029G & +.015P_1^{-1**} & \quad (3) \\ \quad\;\; .05 & \;\; .077 & \;\; .0024 & \end{array}$$

$$R^2 = .576^{**}$$

$$\begin{array}{llll} D/P = .444^{**} & -.0179G & +.0129P_2^{-1**} & \quad (4) \\ \quad\;\; .059 & \;\; .083 & \;\; .0038 & \end{array}$$

$$R^2 = .525^{**}$$

(In these equations single asterisk superscripts on estimates denote significance at .05 level, double asterisks denote significance at .01)

Despite the slightly greater significance of P_1^{-1} in the preceding equations, P_2^{-1} was chosen on the basis of its overall performance to be the profitability variable used in all regressions for the testing of the liquidity measures. The following were fitted using L_1 and L_2 :

$$\begin{array}{lllll} D/P = .424^{**} & -.0193G & +.0131P_2^{-1**} & +.374L_2 & \quad (5) \\ \quad\;\; .085 & \;\; .085 & \;\; .0028 & \;\; 1.17 & \end{array}$$

$$R^2 = .527^{**}$$

$$\begin{array}{lllll} D/P = .238 & -.0356G & +.0171P_2^{-1**} & +1.17L_1 & \quad (6) \\ \quad\;\; .128 & \;\; .08 & \;\; .0034 & \;\; .66 & \\ & & & \text{(sig. at 10\% level)} & \end{array}$$

$$R^2 = .579^{**}$$

Thus for the industrial sample in the 1954-58 period, it can first be said that the observed payout ratios were significantly correlated with a number of variables reflecting profitability considerations, and to some extent, one variable (L_1 in equation 6) reflecting liquidity considerations.

The most successful regression, (6) above, succeeded in explaining 58% of the variance of the dependent variable.

In every case the independent variables had signs that confirmed our previous hypotheses; however, the variables were of varying explanatory ability and their coefficients of varying significance. As noted, the profitability measure - usually represented by P_2^{-1} - was by far the most significant variable used. It consistently had regression coefficients significantly different from zero at the 1% level. The coefficient of L_1, used in equation (6), approached significance at the 5% level. The use of this liquidity measure added approximately 5% to the explanation of the variance of the dependent variable. (See the difference between R^2 in equations (4) and (6)).

G and L_2 , while exhibiting the predicted signs, were not of explanatory significance. It may be that the empirical variables did not adequately reflect the hypotheses which they were supposed to measure; In the case of L_2 this seems possible in the light of the better performance of L_1. In the case of G it seems possible because of the decidedly more significant results reported below for the 1946-50 period. During this period of faster growth and greater pressure on capacity, it is quite likely that G was a better indicator of growth prospects.

B. Utilities: 1954-58

In both periods considered, the firms making up the public utility sample exhibited much more homogeneous behavior than their industrial counterparts; the standard deviation and range of most of the variables were considerably smaller for the utilities. It will also be noted that, between the two periods, the behavior of the utility sample itself was much more invariant. These phenomena were not unexpected; there is much greater homogeneity among the individual firms in the utility sector, and the firms are noted for their relative stability.

Relevant Statistics* for Utility Sample: 1954-58.

Variable	Mean	σ	Range
D/P	.67	.077	(.53, .77)
G	.52	.22	(.27, .86)
P_1	.10	.035	(.074, .20)
P_2	.044	.0071	(.033, .058)
L_1	.061	.016	(.035, .096)

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* L_2 was not calculated for the utility sample; when attempted for the earlier period, the values were extremely small and showed little variability. After considering that liquidity flows would probably be less significant for the utilities because of their greater stability and smaller reliance on internal funds for investment, it was decided to drop L_2.

The most striking characteristic of the industrial regressions is repeated in the results obtained for the utilities: the profitability measure is again by far the most significant explanatory variable. Of the four possibilities, P_2 and its reciprocal were of the greatest explanatory ability, each producing highly significant results:

$$D/P = \underset{.09}{1.05^{**}} \;\; \underset{.071}{-.021G} \;\; \underset{2.22}{-8.49P_2^{**}} \qquad (7)$$

$$R^2 = .66^{**}$$

$$D/P = \underset{.126}{.291^{*}} \;\; \underset{.074}{-.011G} \;\; \underset{.0044}{+.0165P_2^{-1**}} \qquad (8)$$

$$R^2 = .65^{**}$$

Once again the growth variable, though consistently negative in sign, is of insignificant explanatory ability. Still, on the basis of the profitability variable alone (virtually), 66% of the variance of the dependent variable can be accounted for.

The addition of the liquidity measure does nothing to improve the fit or significance of the equations.

$$D/P = .334 \quad -.0113G \quad +.0115P_2^{-1*} \quad -.320L_1 \qquad (9)$$
$$\qquad .22 \qquad .077 \qquad .006 \qquad 1.33$$
$$R^2 = .654^*$$

Rather, the sign of the liquidity variable is contrary to that hypothesized, the multiple regression coefficient is little changed, and the general significance of the results is reduced.

Thus for the 1954-58 period, only the profitability variable is significantly related to the payout ratios of the utility sample; contrary to the results presented for the industrial sector, no other measure even approaches statistical significance. What has been offered in the way of explanation for the failure of G in the industrial case is also applicable here. A possible reason for the insignificance of L_1 can be found in the nature of the public utility; because of their greater overall stability (in revenue, profit and liquidity flows for example), and greater reliance on external sources for capital, the utility would be expected to have a considerably smaller precautionary and (perhaps) investment demand for cash balances and liquidity flows. Thus, their actions could be expected to be more independent of liquidity considerations.

Despite the significance of only one variable, the overall results are quite significant; in fact, 10% more of the variance of the payout ratio is accounted for in the best utility regression than in the best for the industrial sector. This difference is not statistically significant, but at least suggests the validity of the hypothesis that utilities are subject to fewer constraints than industrials in the formulation of dividend policies, and especially, target ratios.

C. Industrials and Utilities: 1946-50.

As indicated above, for the industrials, 1946-50 was a period of greater relative growth and profitability and lower payout ratios. Except for a slightly increased average growth rate, the behavior of the utility sample remained essentially unchanged.

Relevant Statistics for The Industrial Sample: 1946-50

Variable	Mean	σ	Range
D/P	.50	.14	(.32, .86)
G	.82	.58	(-.11, 2.32)
P_1	.17	.064	(.06, .39)
P_2	.11	.032	(.045, .17)
L_1	.13	.042	(.05, .21)
L_2	.032	.016	(.005, .07)

Relevant Statistics for The Utilities Sample: 1946-50

Variable	Mean	σ	Range
D/P	.66	.093	(.47, .82)
G	.57	.15	(.29, .85)
P_1	.10	.037	(.056 .17)
P_2	.036	.0080	(.028, .052)
L_1	.045	.016	(.035, .072)

The overall regression results for the industrial sample were considerably different and definitely poorer than the 1954-58 period. Multiple regression coefficients were uniformly low and insignificant.* Only one variable, G,

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* Two regressions, using all the independent variables mentioned above along with an asset: sales ratio, produced multiple regression coefficients of .53 and .39. However, except for G the significant parameters had signs unexplainable by our previous hypotheses.

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consistently showed the predicted sign and any statistically significant coefficients.

In no case was any form of the profitability measure of explanatory value. Paradoxically, in the majority of regression, its sign was opposite to that theorized. P_2 gave the most significant results -- but with a positive sign.

$$D/P = \underset{.086}{.447^{**}} \; \underset{.051}{-.109G^{*}} \; \underset{1.44}{+1.37P_2} \qquad (10)$$

$$R^2 = .167$$

$$D/P = \underset{.117}{.610^{**}} \; \underset{.053}{-.08G} \; \underset{.0081}{-.0037P_2^{-1}} \qquad (11)$$

$$R^2 = .09$$

The addition of liquidity variables produced no significant or explainable results.

$$D/P = \underset{.14}{.762^{**}} \; \underset{.051}{-.097G} \; \underset{.0081}{-.0078P_2^{-1}} \; \underset{1.6}{-3.06L_2} \qquad (12)$$

$$R^2 = .20$$

$$D/P = \underset{.284}{.451} \; \underset{.055}{-.087G} \; \underset{.013}{+.0026P_2^{-1}} \; \underset{1.19}{+.73L_1} \qquad (13)$$

$$R^2 = .10$$

The regression results for the utility sample confirm the industrial findings; the growth variable again is the only significant explanatory measure. Fortunately, however, the overall results are considerably more significant.

$$D/P = \underset{.171}{.811^{**}} - \underset{.145}{.41G^{*}} + \underset{.0039}{.00275P_2^{-1}} \qquad (14)$$
$$R^2 = .58^{*}$$

$$D/P = \underset{.46}{1.04^{*}} - \underset{.15}{.398G^{*}} - \underset{.0087}{.00138P_2^{-1}} - \underset{4.4}{2.36L_1} \qquad (15)$$
$$R^2 = .60^{*}$$

G is statistically significant at the 5% level in each case. Both L_1 and P_2^{-1} are of little explanatory ability. Still, because of the performance of G, from 58% to 60% of the variance of the dependent variable can be explained.

Thus for 1946-50 the tables are turned. Growth prospects assume the important role in the explanation of the approximated target ratio, and profitability and liquidity considerations seem to drop out of the picture. There are a number of possible explanations for these phenomena -- all untested. As mentioned above, there is considerable indication that the growth measure was more closely correlated with actual and projected expansion in the 1946-50 period. This is suggested by the fact that growth rates averaged higher and most firms were believed to be producing closer to capacity than in the later period. (The evidence seems more questionable for the utility sample). To some extent -- perhaps all -- the poorer showing of the profitability measures can be explained as the result of the distortions introduced by the post-war inflation. The profitability of the firm was more likely to be overstated in 1946-50 than later; in this former period much of the book value of the sample firms was stated in pre-war cost terms; this was much less true in 1954-58.

D. Pooled Regressions

Three regressions were fitted to the pooled data for both periods - still keeping the sectors separate. Each of the three variables that exhibited significant and predicted behavior in the earlier equations was included at least once $(G,\ P_2^{-1}\ ;\ L_1)$.

Industrials:

$$D/P = .458^{**} \quad -.057G \quad +.011P_2^{-1**} \qquad (16)$$
$$\qquad .049 \qquad .037 \qquad .0026$$
$$R^2 = .353^{**}$$

$$D/P = .207^{*} \quad -.0739G^{*} \quad +.017P_2^{-1**} \quad +1.44L_1^{**} \qquad (17)$$
$$\qquad .10 \qquad .036 \qquad .0033 \qquad .53$$
$$R^2 = .432^{**}$$

Utilities:

$$D/P = .642^{**} \quad -.199G^{**} \quad +.00493P_2^{-1} \qquad (18)$$
$$\qquad .089 \qquad .076 \qquad .0025 \text{ (almost at 5\%)}$$
$$R^2 = .395^{**}$$

All coefficients are of the hypothesized sign and each is significant at the 5% or 1% level, or close to it. The greater number of observations lends the added degree of significance to the results -- even though no more than 45% of the total variance is explained.

By examining the sums of the residuals squared, for the pooled regression and the similar separate regressions, it was possible to statistically test the hypothesis that the equations for the individual periods were significantly different.* "F" values were formed for the three above cases, and for the

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* Mood, Alexander M., Introduction to the Theory of Statistics, (McGraw-Hill Book Company, New York, 1950), p.350.

utility regression the null hypothesis could be rejected at the 5% level. Of course, this significant difference could be another result of the roughness of our independent variables.

V. Conclusions and Summary

Probably it should be said that this paper has raised more questions than it has solved. Still, I do think it has suggested much; in support of specific hypotheses a number of very significant empirical results have been presented, and a few more will be shown below. It cannot be maintained, however, that any of these hypotheses have been proved beyond a shadow of a doubt. In part this conclusion is dictated by the empirical results that have been obtained -- they are not free of contradiction. Also it is due to the various limitations imposed by the smallness and non-random nature of the sample.

With all due regard for the necessary qualifications, it remains the fact that many of the empirical results are positive in nature. They will permit, I believe, a few strong, and a few more not-so-strong statements with respect to the questions originally posed.

1. In answer to the fundamental question attacked in the regression analysis: what are the determinants, if any, of the observed payout ratios of the samples examined? -- it can be stated that three variables, reflecting respectively firm growth, profitability, and liquidity have been shown to be significantly, and explainably, related to payout ratios. There is good reason to conclude, from the statements of other authors and the implied causation of the equations, that these determinants have not been special cases, but general factors influencing the payout ratios of a majority of the firms.

Despite some unexplained results, it is the fact that in three of the four cases considered regression equations using G, P_2^{-1}, and L_1 have been able to account for 58% to 66% of the variance of the dependent variable. As well, pooled regressions for both samples have been shown to have consistently significant multiple and individual regression coefficients -- the latter having the hypothesized sign in every case. Thus there is considerable evidence that the observed payout ratios are predictably determined by more basic and general considerations.

If the methodology and construction of the dependent variable is sound, everything said above about the observed payout ratios is also true for Lintner's target ratios. If so, this study has added a bit more to the explanation of the behavior of the firm and to Lintner's model. It would indeed be interesting to examine Lintner's survey data and see if the observed ratios do approximate the unobservable targets. There is some evidence that they do. Lintner notes that most target ratios were in the 40% to 60% range, with 50% the most common value;*

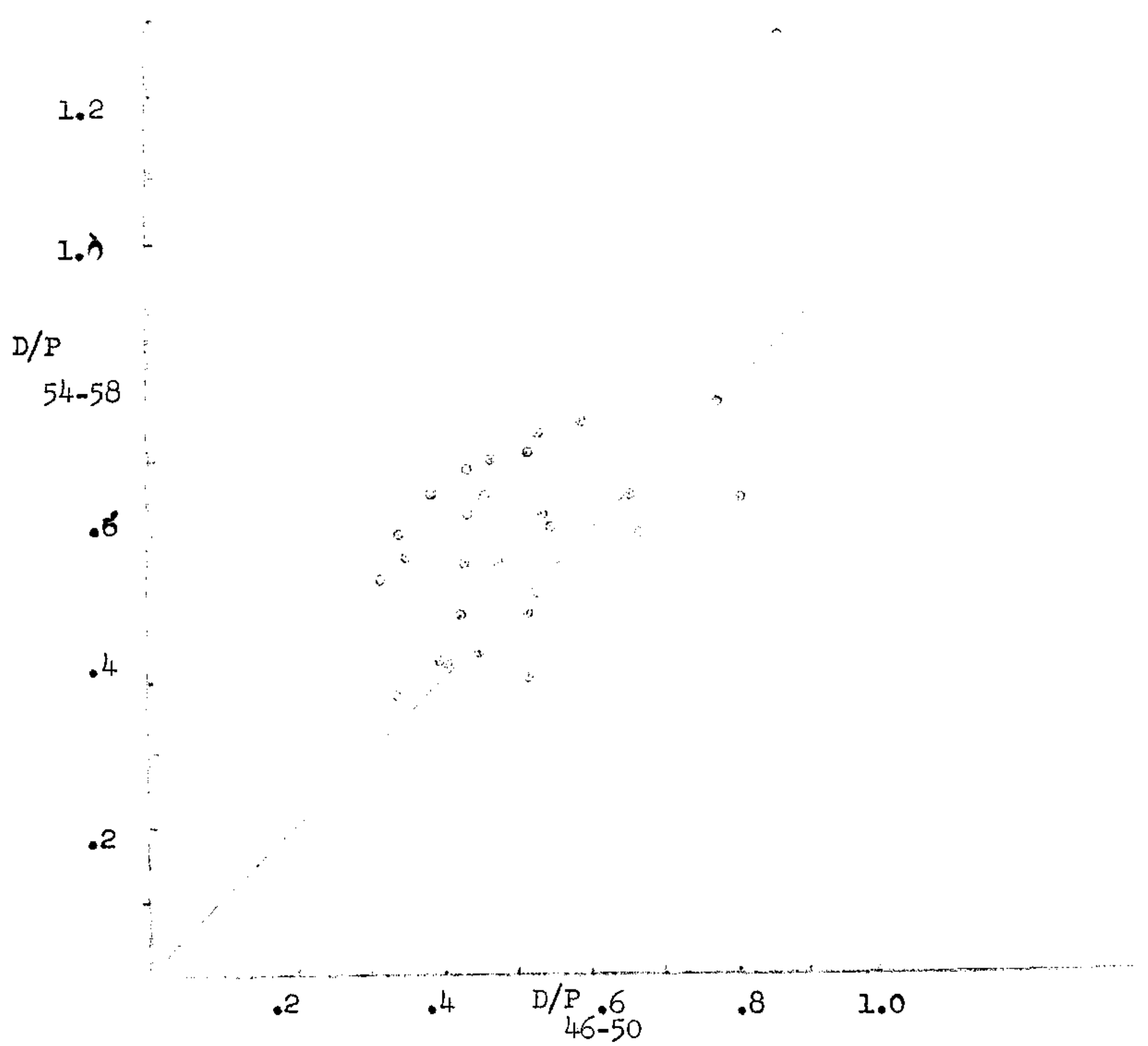
* Lintner, AER reading, p.102

As well, according to Lintner's empirical work .50 was the aggregate target ratio for the economy (p.4 above). For the industrial sample examined during the 1946-50 period (Lintner surveyed only industrials and did most of his work before 1953), the average (mean) payout ratio was exactly 50%, and 19 of 29 were between 40% and 60%.

2. The second goal of the paper was to get an indication of the stability of the observed payout ratios and the unobservable target ratios over time. As noted above, Lintner postulated that the firm target ratio was "adhered to with little deviation over extended periods of time". Also, it was established that a

necessary condition for the predictive accuracy of the aggregative equation was the constancy of the "target ratio for the economy."

Concerning these two assumptions, the data imply that, for the samples examined at least, the first is not true, and the second, if true for the 1954-58 period, is certainly favored by a considerable amount of good fortune. If one does admit the assumption that the observed payout ratios closely reflect the targets, then a simple graphing of the observed values for each firm will show that the targets for the two periods diverge considerably. Such an operation is performed below.



Lintner's assumption of constancy implies that the locus of points plotted should be along the 45 degree line, i.e., that the target ratios for the firm in the two periods are equal. This is clearly not the case for the majority of observations plotted. Looking at individual cases, one finds that 14 of 29 industrials have payout ratios that changed by more than .10, and 12 of these by more than .19.

The average value in 1954-58 is .61 for the industrials, as compared with .50 for a few years before. Using a "t" test for the significance of the difference between the two means of the sample, a "t" value of 2.68 for 56 degrees of freedom was obtained -- significant at the 1% level. There is little possibility that this difference is attributable to chance alone.

Thus there is ample evidence for the rejection of Lintner's constancy assumption. This rejection is of course consistent with, and even implied by the basic thesis confirmed in the regression analysis: that target ratios are determined by a number of basic considerations that are <u>variable</u> over time.

If the industrial sample is at all representative of the total population from which Lintner derived his aggregative equation, then it would be extremely unlikely that the average firm target could increase by .11 while the aggregate payout ratio remained constant. It would be assumed from these considerations that Lintner's aggregative equation would give less accurate predictions for the 1954-1958 period than before. How much so is hard to tell, but in any case this is an easily testable hypothesis.

Appendix A

The Payout Ratio and the Target Ratio

The empirical analysis in this paper has used an average payout ratio as a measure of the Lintner target ratio. In support of this procedure the proof presented below shows that such an average ratio will converge, under certain plausible conditions, to the target ratio as the number of years included in the average increases. This proof was generously provided by Mr. T. N. Srinivasan. Following the proof, a pair of examples are provided to lend additional credence to the procedure.

Following Lintner, the dividend rate (D_t) in any period is expressed as a function of the current net earnings (P_t) and the dividends in the preceeding period (D_{t-1}), i.e.:

$$D_t = crP_t + (1-c)D_{t-1}$$

where r = Target Payout Ratio

The average payout ratio for an n-year period is:

$$A_n = \frac{\sum_{t=1}^{n} D_t}{\sum_{t=1}^{n} P_t}$$

Under the following conditions it will be shown that $A_n \rightarrow r$ as $n \rightarrow \infty$

a) $0 \leq P_t < M$ i.e. profits in any year are positive and bounded.

b) $|1-c| < 1$ i.e. $0 < c < 2$

c) $\sum_{t=1}^{n} P_t \rightarrow \infty$ as $n \rightarrow \infty$ i.e. The sum of profits is divergent.

Proof:

Define $D_t = crP_t + (1-c)D_{t-1}$

Then $D_t = D_0(1-c)^t + cr \sum_{i=1}^{i=t} (1-c)^{t-i} P_i$

Let $A_n = \dfrac{\sum_{t=1}^{t=n} D_t}{\sum_{t=1}^{t=n} P_t}$

$$\text{Then } A_n = \frac{D_0 \sum_{t=1}^{t=n} (1-c)^t + cr \left(\sum_{t=1}^{t=n} \sum_{i=1}^{i=t} (1-c)^{t-i} P_i \right)}{\sum_{t=1}^{t=n} P_t}$$

$$= \frac{D_0 \frac{(1-c)}{c} \left[1-(1-c)^n \right] + cr \left(\sum_{t=1}^{t=n} P_t \sum_{i=0}^{n-t} (1-c)^i \right)}{\sum_{t=1}^{t=n} P_t}$$

$$= \frac{D_0 \frac{(1-c)}{c} \left[1-(1-c)^n \right] + cr \left[\sum_{t=1}^{t=n} \frac{P_t}{c} \left[1-(1-c)^{n-t+1} \right] \right]}{\sum_{t=1}^{t=n} P_t}$$

$$A_n = \frac{\frac{D_0(1-c)}{c}\left[1-(1-c)^n\right] + r\sum_{t=1}^{t=n} P_t - r\sum_{t=1}^{t=n}(1-c)^{n-t+1} P_t}{\sum_{t=1}^{t=n} P_t}$$

$$= r + \frac{D_0(1-c)}{c}\,\frac{\left\{1-(1-c)^n\right\}}{\sum_{t=1}^{t=n} P_t} - r\,\frac{\sum_{t=1}^{t=n}(1-c)^{n-t+1} P_t}{\sum_{t=1}^{t=n} P_t}$$

$$= r + p_n + q_n$$

Since we are given that $\sum_{t=1}^{t=n} P_t$ diverges as $n \to \infty$

and that $|1-c| < 1$, $p_n \to 0$ as $n \to \infty$

If we show that $q_n \to 0$ as $n \to \infty$, then $A_n \to r$ as $n \to \infty$

Now consider $q_n = \dfrac{\sum_{t=1}^{t=n}(1-c)^{n-t+1} P_t}{\sum_{t=1}^{t=n} P_t}$

Let us assume that $P_t \geqq 0$ for all t at least one $P_t \neq 0$

Since $|(1-c)^k| < |(1-c)|$ for all $k > 1$ $\{$because $|1-c| < 1\}$

We have $|q_n| \leqq \dfrac{|(1-c)|\sum_{t=1}^{t=n} P_t}{\sum_{t=1}^{t=n} P_t} = |(1-c)|$

Hence q_n is bounded above and below. So q_n cannot diverge.
With the additional assumption that P_t is bounded, i.e.:

$$P_t < \text{Some } M$$

$$\text{Then } |q_n| \leq \frac{M \sum_{t=1}^{t=n} |1-c|^{n-t+1}}{\sum_{t=1}^{t=n} P_t} = |1-c| \cdot \frac{\{1 - |1-c|^n\}}{\{1 - |1-c|\}} \cdot \frac{M}{\sum_{t=1}^{t=n} P_t}$$

Hence $q_n \to 0$ as $n \to \infty$

So in this case $A_n \to r$ as stated in the paper.

It is also quite easy to construct examples (where P_t is unbounded) where $q_n \to$ a limit other than zero.

Appendix B (1)

An Optimal Dividend Policy*

Given the assumptions that are listed below, it can be shown that a business firm will maximize the "utility" of its stockholders by paying out, in the form of dividends, a fraction of its earnings inversely proportional to the rate of return on the corporate capital. The assumptions that are explicit or implicit in the model are as follows:

1. The firm is completely financed by equity capital.
2. The average rate of return on the corporate investment is equal to the marginal, and the two do not change over time.
3. We assume that the utility of any sum of money is = to the log of the sum -- the rather conventional formulation.
4. Finally, one assumes that a stream of income over time is discounted by the recipient - in this case the stockholder - by a factor e^{-st}, where s is a subjective discount factor and t is time.

This model works out to a clear-cut answer; I have tried to generalize it a bit, adding borrowed capital and interest payments, and was unable to come up with a final answer because of the presence of a number of integrals which could be solved only by methods of approximation.

I. Terminology

1. $y(t)$: corporate capital at time t (in $).
2. $y'(t)$: amount of reinvestment at time t - the rate of change of y.
3. p : fraction of earnings paid out -- the firm payout ratio.
4. r : the rate of return on the corporate capital.
5. $v(t)$: total dividends at time t.
6. $u(t)$: Utility at time t.
7. U : intertemporal utility.
8. s : stockholder's subjective discount factor.

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* This proof was formulated by Professor Alan S. Manne.

Appendix B (2)

Proof

1. Earnings at time $t = ry(t)$
2. $y'(t) = (1-p)ry(t)$ let q equal $(1-p)$
3. Solving the differential equation in step 2, one gets $y(t) = y(0)e^{qrt}$
4. $v(t) = pry(t) = pry(0)e^{qrt}$
5. Utility of v at time t : $u(t) = \log(v(t)) = \log(p) + \log(ry(0)) + qrt$
6. Intemporal Utility -- $U = \int_0^\infty e^{-st} \log(v(t))\, dt$

$$= \log(p) \int_0^\infty e^{-st}\, dt + \log(ry(0)) \int_0^\infty e^{-st}\, dt$$

$$+ qr \int_0^\infty te^{-st}\, dt .$$

7. $\int_0^\infty e^{-st}\, dt = 1/s$

   $\int_0^\infty te^{-st}\, dt = 1/s^2$
8. $U = \log(p)/s + \log(ry(0))/s + qr/s^2$
9. Differentiating U with respect to $q = 1-p$, and setting $dU/dq = 0$, one finds that the utility is maximized with respect to q when $1/1-q = r/s$

   or

   $1-q = p = \frac{s}{r}$, the payout ratio is inversely proportional to the rate of return on the corporation capital.