Dividend Policy Under Imperfect Capital Markets: Revised and Extended Results

by

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This paper attempts to take account of certain imperfections of existing capital markets which appear crucial for dividend policy decisions and to determine a rational policy in the light of these imperfections.

We begin with four premises, relating in part to empirical matters and in part reflecting theoretical considerations, on which we believe that wide, though not complete, agreement might be obtained among writers in the field. From these a simple payout rule which approximates optimality may be deduced.

(1) There is an optimal debt-equity ratio.[1] It is generally agreed that the value of the firm rises initially with the introduction of debt because of the tax-exempt status of interest charges. It is widely, though less generally, accepted that for a sufficiently high degree of leverage the probability distribution of the firm's before-tax net operating income begins to be significantly and adversely affected by further shifts to debt. The risk of serious financial difficulties, involving perhaps the costs of reorganization but certainly limiting management's freedom to act in the interest of long run profits, becomes at some point a dominating consideration. The lending criteria of

potential suppliers of short term funds are of critical importance in determining this point. The firm's risk (specifically, the probability of very poor long run outcomes) increases substantially once its borrowing capacity is exhausted - when debt is so high that additional funds cannot be obtained on reasonable terms and in the required amounts in the event of a run of abnormally low profits or other contingencies.[2]

(2) Each stock-holding consumer unit has a definite preference as to the proportion of its portfolio return which is received in cash and the proportion received in capital gains. For individuals in low income-tax brackets this preference depends upon requirements for current expenditures (over and above what is provided by earned income or other income sources) and perhaps on diversification considerations. If X dollars are required for current consumption, the stockholder wants to receive X dollars in dividends. He does not wish to go to the trouble and expense, or, probably more important, bear the risk of adverse market fluctuations which would be involved in liquidating some part of his portfolio each year. This is likely to be particularly true for widows or retired persons who account for a substantial part of all non-institutional stockholdings[3] and may frequently be substantially dependent on portfolio income. Put in another way, when total dividends fall short of X, the required rate of return on retained earnings (that which leaves the stockholder indifferent between dividends and retained earnings at the margin) will be higher than at X by an amount sufficient to recompense him for the cost and risk of converting distant

dividends to cash as required to finance his expenditure stream.

On the other hand, if only X dollars is desired for current expenditure, even consumers in the lower tax brackets do not wish to receive more than X dollars in dividends (unless they wish to make adjustments in the interests of portfolio balance)[4] for they must ordinarily pay some income tax on the surplus amount and must go to the trouble and expense of reinvesting it. When total dividends exceed X, the investor will require a smaller rate of return on retained earnings than at X by an amount reflecting the saving in taxes and in reinvestment costs. Thus there is a discontinuity at X in the price at which the investor is willing to exchange near term for far term dividends and hence in his capitalization rate for dividends.

For individuals in higher tax brackets the expense, inconvenience, and risk of systematic liquidation must be balanced against the tax advantages of capital gains relative to dividend income in arriving at the optimal mix of portfolio return, and such individuals may well prefer to receive all portfolio income as capital gains. Clearly the proportion of stockholders for whom the tax saving is the dominant consideration will be sensitive to changes in tax structures. Also it should be sensitive to changes in the short run variability of stock prices. If stock prices fluctuate randomly then the dispersion of the stochastic element will critically affect the risk involved in a policy of systematic liquidation.

Each stockholder will presumably adapt his portfolio to yield the mix of dividends and capital gains which he prefers. It is therefore in the interest of the firm to maintain a fairly stable dividend policy -

i.e., a firm can please some stockholders with a high payout and other stockholders with a low payout, but a payout which fluctuates erratically pleases nobody and may be expected to depress the value of the stock.[6] Actually the ideal situation from the point of view of many stockholders is less a stable payout ratio than a stable level or growth rate in the dollar amount of dividends, unaffected by short term fluctuations in earnings, since future dividends are then predictable, facilitating long run planning to optimize consumption.

(3) External equity financing is likely to be either unavailable or prohibitively expensive unless fairly large amounts are to be raised and even for sizeable issues is ordinarily more expensive than internal equity because of the substantial transaction costs, including underpricing to ensure success of the new issue. The cost of new equity, as viewed by management, will be further augmented in cases where management is more optimistic than the market generally - perhaps by reason of its greater information - as to the growth potentialities of the firm.

It follows that, except where the stock is clearly overpriced in the view of management, the required rate of return on new investment is higher if external equity financing is to be used in all or in part than for financing by a combination of retained earnings and debt so balanced as to maintain the optimum debt-equity ratio.[7] Thus apart from an unusually favorable pricing situation new stock issues will not be undertaken unless (a) large amounts of funds are

required, (b) the project thus financed promise a return higher than that required using the minimum-cost financing mix, and (c) cheaper sources of financing have already been exhausted.[8]

(4) The investment opportunities of the firm - i.e., the dollar volume of potential investment bringing a rate of return above the firm's cut-off - grow at a rate which in the short run is primarily determined by the economic environment and largely independent of the firm's current decisions (although in the long run research and development expenditures, diversification programs, the opening of new markets, and the acquisition or development of an adequate reserve of managerial resources should favorably affect this growth rate.) In particular, the volume of investment opportunities bringing a return above the firm's cut-off is not affected in the short run by the volume of funds available for financing; and the decision to increase the funds generated internally by lowering the payout ratio will not automatically bring forth an equivalent increase in investment opportunities.[9]

1. The Retention Strategy and Its Implications for the Target Retention Ratio

The payout rule proposed here attempts to take account of the considerations discussed above. Let the exogenously determined growth rate over the next several years, as currently envisaged by management, be g. Then

$$I_t = I_0 (1 + g)^t \tag{1}$$

represents the trend value of investment opportunities t years hence, although substantial year-to-year variation about this trend may be expected to occur in view of the lumpiness of the investment process.

If the curves D_t and D_{t+1} in Figure 1 represent the marginal efficiency of investment at times t and t + 1, respectively, and k is the required before tax return based on the bond yield i_b and the capitalization rate for dividends, i_e,[7] then (1) implies that OB, the I-coordinate of D_{t+1} for r' = k, is equal to (1 + g) times OA, the I-coordinate of D_t for r' = k, where r' is of course marginal return. If we further assume that for all r' > k the ratio of the I-coordinate of D_{t+1} to that of D_t is 1 + g and that all investment for which r' > k is carried out, then it follows that the average return on new investment, r, remains unchanged over time since the areas bounded by D_t and D_{t+1} above the line r' = k are proportional to the amounts of investment in the two years. It should be emphasized that equation (1) represents management's expectations at time 0 and not necessarily the actual future path of investment. The expected time path may be changed either as to level or growth rate in response to new information.

We consider an initial position in which there is no impact on stock value associated with the payout level per se, so long as the optimal investment stream is carried out at the lowest possible cost and so long as dividends do not vary sharply and erratically. This is the theoretical expectation in perfect capital markets, neglecting personal tax considerations,[10] and we take no position at this point as to whether it represents an equilibrium under the present assumptions. Further discussion of the question of a dividend premium is undertaken in section 2. We further assume that the firm is initially at its optimal debt-equity ratio , L*.[11]

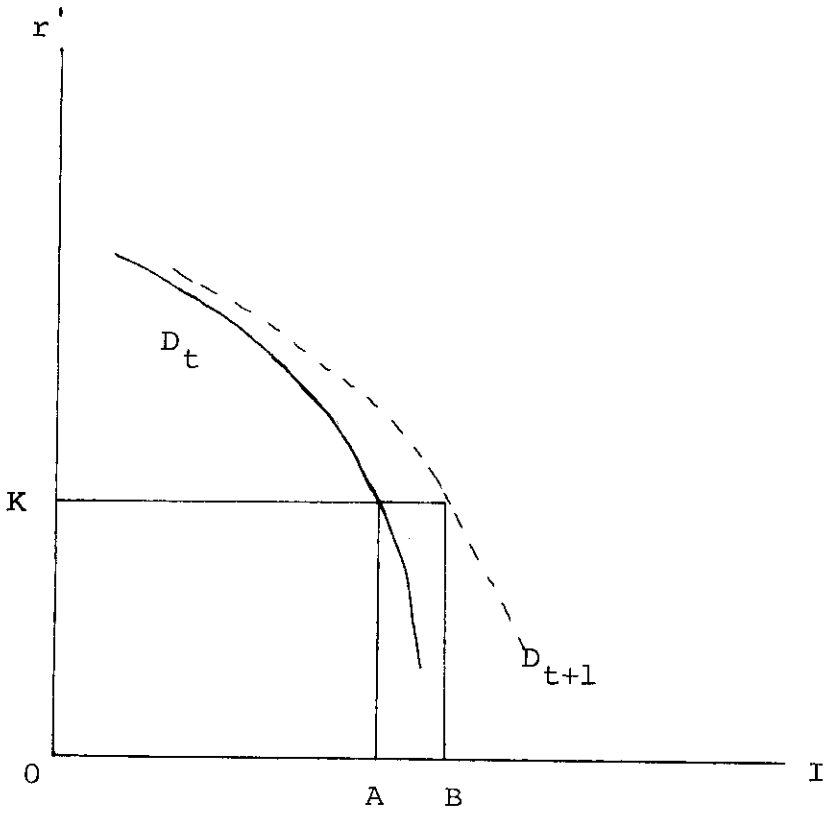

Figure 1

In the present section we abstract from stochastic variation of actual investment about its growth trend (1), as well as stochastic deviations of current earnings from their expected value based on existing assets. The effects of these stochastic elements are examined in Section 3. In the present case, unless the stock is so over-priced as to more than offset the relatively high transactions costs associated with a new equity issue, it is clear that the optimal retention ratio, b_t, is given by

$$b_t Y_t (1 + L^*) = I_t = I_0 (1 + g)^t \tag{2}$$

where Y_t is after tax earnings on equity in the t^{th} period and where equation (2) yields a solution for $b_t \leq 1$. Then retained earnings, $b_t Y_t$, will be used to finance a fraction $\frac{1}{1 + L^*}$ of I_t, while the remainder, $\frac{L^*}{1 + L^*} I_t$, is financed by additional debt, maintaing the debt-equity ratio at L^*. External equity is not used in this situation, though it may be used when (2) yields an inadmissable solution.

This solution is optimal since the lowest cost financing mix is chosen and since all investment, and only that investment, is undertaken for which the marginal rate of return exceeds (or equals) k, the level required to just maintain the value of the stockholders' equity under this financing mix. The latter condition assures that $\frac{\partial S}{\partial I} = 0$, where S is the intrinsic value of the existing equity, based on the expected value and risk of the future dividend stream. Furthermore, $\frac{\partial S}{\partial L} = 0$ since the debt-equity ratio remains as its optimum. Finally, any decrease in the retention ratio, holding constant investment and the debt-equity ratio, cannot affect the capitalization rate for dividends

so long as the market is assumed indifferent to payout and can affect the dividend stream on existing stock only unfavorably, in view of the additional costs associated with the substitution of external for internal equity. (For each dollar added to dividends in period t, by such substitution the value of the subsequent dividend stream discounted forward to t is reduced by more than one dollar.)

With the retention strategy (2), the time path of earnings is determined as follows, assuming that the average before-tax rate of return on acceptable investment opportunities remains constant over time at r, the tax rate remains constant at T and the cost of new debt at i_b [12]

$$Y_1 = Y_0 + I_0 \left(r - i_b \frac{L^*}{1 + L^*}\right) (1 - T)$$

$$= Y_0 \left[1 + b_0 (1 + L^*) \left(r - i_b \frac{L^*}{1 + L^*}\right) (1 - T)\right]$$

since from (2) $I_0 = b_0 Y_0 (1 + L^*)$.

In general

$$(3) \qquad Y_t = Y_{t-1} + I_{t-1} \left(r - i_b \frac{L^*}{1 + L^*}\right) (1 - T)$$

$$= Y_{t-1} \left[1 + b_{t-1} (1 + L^*) \left(r - i_b \frac{L^*}{1 + L^*}\right) (1 - T)\right]$$

If b_t as defined in (2) is constant over time (say, equal to b) then (3) reduces to

$$(4) \qquad Y_t = Y_0 \left[1 + b (1 + L^*) \left(r - i_b \frac{L^*}{1 + L^*}\right) (1 - T)\right]^t$$

The growth rate of Y must then be exactly g, since the left hand side of (2) must grow at the same rate as the right.

However, the decision rule we have proposed does not necessarily generate constant retention ratios over time. From (2) it follows that

$$(5) \qquad \frac{b_t Y_t (1 + L^*)}{b_{t-1} Y_{t-1} (1 + L^*)} = \frac{I_t}{I_{t-1}} = 1 + g$$

If the growth rate of income as defined in (3) is different from g, the retention rate will in fact vary over time, and in so doing will cause the growth rate of Y to approach g. For if $Y_t < (1 + g) Y_{t-1}$ then from (5) $b_t > b_{t-1}$ so that the growth rate of Y increases over time approaching g as a limit. Similarly if $Y_t > (1 + g) Y_{t-1}$, then from (5) $b_t < b_{t-1}$ and the growth rate of Y falls over time, again approaching g as a limit. Thus the growth rate of earnings, through the operation of the retention strategy (2), adapts itself to the growth rate of investment opportunities and if the latter has been constant for a substantial period we may expect (4) to hold at least approximately, with the retention ratio given by

$$(6) \qquad b = g \div (1 + L^*) \left(r - i_b \frac{L^*}{1 + L^*}\right) (1 - T).$$

Equation (6) provides a precise definition of the target retention ratio at any given time, based on the expectations (1). This target ratio is found to be a function of the expected growth rate of acceptable investment opportunities, the average return on these investments, the optimum debt-equity ratio, the bond yield and the tax rate. It is independent of the initial levels of both investment opportunities and earnings.

However, the time path by which the retention ratio approaches its target depends on both initial values, as does the time path by which the growth rate of earnings approaches its limiting value g. For example, a target ratio of 1/3 is obtained assuming a growth rate of 4%, an average before-tax return on new investment of 18% and a bond yield of 6%, with the debt-equity ratio and tax rate both equal to one-half. If initial investment opportunities and after-tax earnings are $4 million and $12 million, respectively, the initial retention ratio is 2/9 (rising to .225 in the next period) while the initial growth rate of income is 2-2/3% (rising to 2.70% in the next period). The respective time paths of those variables are represented by $B_1(t)$ and $G_1(t)$ in Figures 2 and 3. On the other hand if initial investment opportunities and earnings are $8 million and $12 million, respectively, the initial retention rate is 4/9 and the initial growth rate of earnings is 5-1/3%. In this case the time paths are represented by $B_2(t)$ and $G_2(t)$, respectively.

Note that the payout ratio implied by (2), while it changes over time, does so only gradually. The dollar amount of dividends will decline only when the initial growth rate of earnings, g', is so low relative to that of investment opportunities that the fall in the payout ratio over time more than offsets the rise in the earnings base. This occurs only if $g'_t < g\ b_t$, an extremely unlikely situation for reasonable values of the g, r and T.[13] Thus the strategy (2) will generally lead to gradual dividend growth so long as investment opportunities exceed zero.

If the decision rule (2) leads to $b_t > 1$, then in order to finance that part of I_t in excess of $Y_t\ (1 + L^*)$ either new equity must be issued

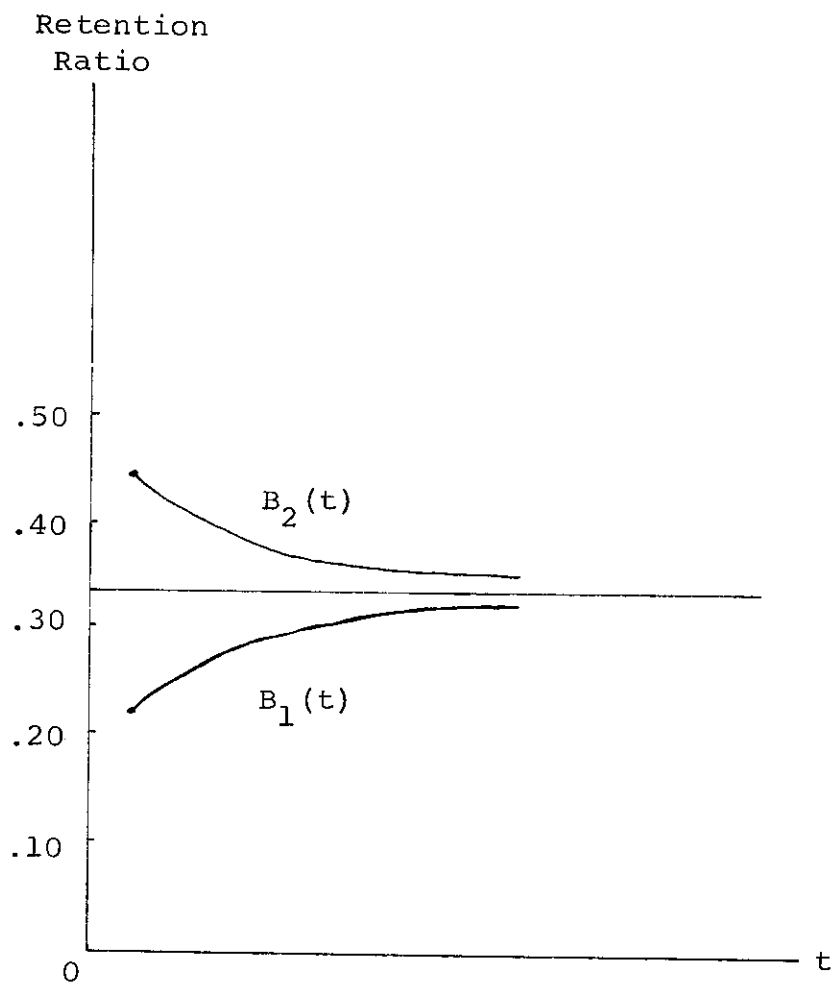

Figure 2

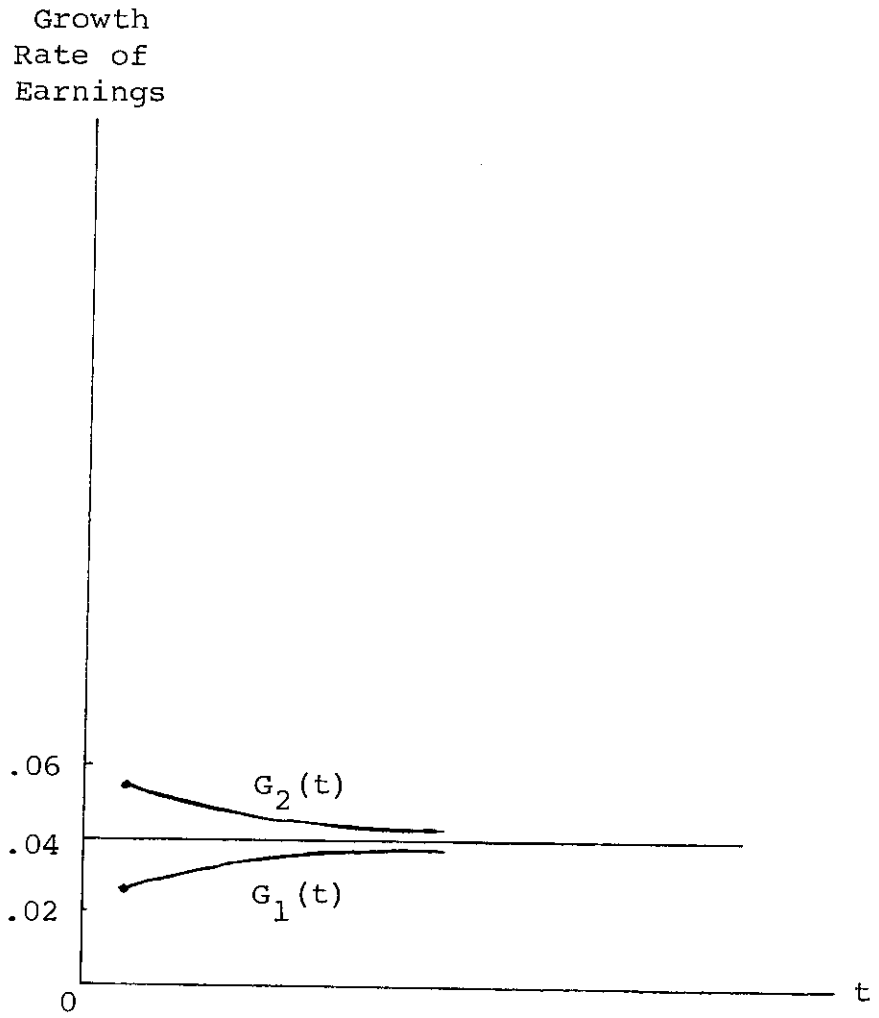

Figure 3

or the debt-equity ratio must be pushed beyond its optimum or both. In any case (unless the stock is overpriced) the required rate of return for the excess investment is raised, say to k', and this may be expected to render some (or all) of this investment unprofitable, reducing I_t to I_t'. The optimal financing mix for that part of the excess investment which remains acceptable will, of course, be determined by equating the marginal cost of new stock financing with that of debt financing after due allowance for transaction costs as well as the effect on stock value of departure from the optimal debt-equity ratio.

2. Is There a Premium for Dividends?

We are now ready to inquire whether the initial position which we have assumed, in which the market pays no premium either for dividends or for retained earnings, is in fact an equilibrium position. We have seen that for most firms in most time periods the strategy (2) is optimal under the initial assumptions. For these firms individually and thus in the aggregate, the volume of dividends is determined by the current volume of earnings and the nature of investment opportunities as described above. In the less common case where (2) yields an inadmissible solution for b_t (i.e., > 1) dividends should be zero in order to minimize financing cost. Finally for firms with stock sufficiently overpriced so that new issues become a cheaper source of equity capital than retained earnings, financing cost is minimized by setting dividends equal to earnings and providing the entire amount of equity financing from new issues.[14]

The aggregate volume of dividends determined by these decision rules may be either less than, equal to, or greater than the volume of portfolio income which households wish to use for current expenditures. If it is less, then the rate at which the dividend stream is capitalized, i_e

will be relatively high to compensate stockholders for the cost and risk of liquidation in order to finance current expenditures. This will lower stock prices generally and lower the prices of low-payout stocks (with a large volume of profitable investment opportunities relative to current earnings) relative to those of high payout stocks (with a smaller volume of profitable investment opportunities relative to current earnings). The cutoff rate for new investment will be correspondingly high and the stream of profitable investment opportunities reduced. If aggregate dividends exceed the volume desired by stockholders for current expenditure, i_e will be relatively low by an amount reflecting the savings to the investor, in taxes and transactions costs, of a marginal increase in earnings retention. The prices of low payout stocks will be correspondingly high relative to those of high payout stocks and the stream of profitable investment opportunities correspondingly large. In neither case will it be possible for a firm, given its investment opportunities, to increase its value by changing its payout policy, so long as the correct value of i_e is utilized in determining the cutoff for new investment and the optimal debt-equity mix is maintained. So long as this is true the market must remain indifferent as between dividends and retained earnings at the margin and there can be no premium for either one.

However, the price of stock per dollar of <u>current</u> earnings should be higher for low payout than for high payout stock of equal risk to the extent that current price reflects the larger volume of profitable future investment opportunities available (relative to current earnings), with return in excess of the cutoff rate. This is not an effect of payout policy per se but of the differences in growth potential which in turn engender differences in optimal payout. It is, of course, possible that the market for high payout stock may be dominated by investors who must (in spite of the relatively large dividend)

liquidate stock to finance current expenditures, while the market for low payout stock may be dominated by investors for whom even the relatively small dividends received are superfluous for current expenditures. Then the capitalization rate for dividends will be higher for high payout than for low payout stocks of equal risk, but the market price of the high payout stocks should not be unfavorably affected, so long as all the investments undertaken bring rates of return commensurate with the relatively high cost of capital imposed by the high capitalization rate for dividends. [15]

3. Transitory Earnings and Lumpy Investment

Since erratic fluctuations occur both in earnings and in investment opportunities, the actual time paths of investment, earnings, and the retention ratio will differ from those implied by (1), (2) and (3), which are now interpreted as functions in the expected or normalized, rather than the actual, values of investment and earnings. Departures from normalized values are represented by stochastic disturbances, u and v, introduced into (1) and (3). The corporation's response to these may take any of a number of forms, including a temporary departure from the retention strategy (2) or from the optimum ratio of long-term debt to equity, postponement or acceleration of investment, or adjustments in short term debt and/or liquid assets. The extent to which these various alternatives are used in practice is an empirical question, which we address in the next section.

Random fluctuations in income, with investment opportunities conforming to (1), might be met by a departure in the opposite direction of the actual retention ratio from its normal value

$$b^*_t = \frac{EI_t}{EY_t(1+L^*)} \quad .$$

Then funds available could be matched to investment opportunities without further adjustments. In practice, however, in order to stabilize dividends the adjustment of the retention ratio will ordinarily be in the same direction as the income deviation, v. If dividends are fully protected and investment opportunities fully realized, then cash assets must be adjusted and/or borrowing varied (relative to its optimum for normal income) by virtually the full amount of v. If $v < 0$, then in order to sta-

bilize dividends the retention ratio must fall to

$$b_t = b_t^* + (1 - b_t^*) \frac{v}{EY_t} + \text{lower order terms.}$$

In other words for moderate declines in income, the retention ratio would change by an amount roughly equal to the complement of the normal retention ratio multiplied by the percentage deviation of earnings from normal. For positive income deviations the retention ratio is expected to rise by a somewhat smaller factor since some growth in dollar dividends is probable in this case. In general the adjustment in cash and/or borrowing may be considerably less than the income deviation, v, since the stochastic fluctuations in investment opportunities may well be positively correlated with those in income.

To the extent that the firm increases (decreases) its borrowing or decreases (increases) its investment in response to income variations, subsequent levels of earnings on equity will be affected: in the first case by the increase (decrease) in interest charges and in the second by the return lost (gained) because of the change in investment. The result is to initiate a new time path for earnings of the same form as (3) but with a different initial value. We have seen, however, that the target retention ratio (6) is not dependent on the initial values.

Thus we expect the actual retention ratio to fluctuate stochastically about its normal value as defined by (2), in response to stochastic fluctuations in income. Initially the movement will be in the same direction as the income deviation, but in subsequent periods the retention ratio may shift in the opposite direction in order to reestablish the target debt-equity ratio or to carry out postponed investment.

To the extent that random fluctuations in investment opportunities are positively correlated with those in earnings, no further adjustment in the retention ratio may be indicated beyond that induced by the earnings deviation. In that case the only effect of the investment deviation is to reduce the concomitant adjustments in cash and/or borrowing. However, when investment requirements above normal are not associated with earnings above normal, the firm may react by increasing retention either in the current period (to finance internally the additional investment) or in subsequent periods (to return the debt-equity ratio to its preferred level, if the initial adjustment took the form of an increase in borrowing). Thus in some cases the retention ratio may fluctuate about its normal level in response to random fluctuations in investment opportunities.

However financed, the departure of investment from the path (1) will initiate a new time path for earnings of the form (3) but with a different initial value. Again the target retention ratio (6) remains unaffected.

4. Empirical Results for Manufacturing Industries

We now attempt to test empirically the extent to which the observed quarterly retention ratio for all manufacturing and for several manufacturing industries is determined by

(1) The "normal" retention ratio, b_t^*, defined as

$$b_t^* = \frac{EI_t}{EY_t(1+L^*)} \quad ;$$

(2) The ratio of actual to normal earnings, Y_t/EY_t; and

(3) The ratio of actual to normal investment, I_t/EI_t.

The observed retention ratio may also reflect efforts to adjust the current debt-equity ratio toward the optimal ratio in situations of dis-

equilibrium, but no attempt is made here to account for this factor.

It is expected that long term sources of funds -- i.e. equity and long term debt -- will be utilized to finance fixed investment and the growth in net working capital. Some part of the growth in current assets will normally be financed out of increases in current liabilities (especially accounts payable and current income tax liability) and so will have little or no impact on dividend decisions. The relevant investment variable for present purposes is therefore taken to be the sum of net fixed investment and the change in net working capital. Correspondingly, the debt-equity ratio is taken to be the ratio of long term debt to equity.

According to the theoretical argument presented above, the actual retention ratio should equal b^* in periods when income and investment are at their normal or expected levels and the debt-equity ratio at its optimum. When income is above (below) normal, it is expected, and fairly well established by existing evidence, that the retention ratio will be pushed up (down) in the interest of limiting erratic fluctuations in the dollar amount of dividends. To the extent that the unexpected profits may be associated with above normal requirements for fixed and/or working capital investment, some or all of the additional funds to finance such investment will be automatically available and the effects on the retention ratio of such investment deviations will be subsumed in the effect of the earnings deviation.

When investment opportunities are above normal for reasons not associated with abnormally high current profits, the additional expenditures may be financed either by increasing retention or by raising the debt-equity ratio above normal. To the extent that short term rather than long term debt is used, deviations in fixed investment may be financed by oppo-

site deviations in the growth of net working capital. In the case of extremely large investment deviations, new issues of stock must be recognized as a fairly probable alternative method of financing.

There is some question of the direction of causation in cases where a relatively large increase in net working capital is associated with a relatively high retention ratio. It is possible that an autonomous increase in working capital requirements (or a desire to raise short term liquidity ratios toward a target level) has been met by raising the retention ratio; but it is also possible that an increase in earnings retention generated by abnormally high profits has led to a temporary buildup of cash and marketable securities or a temporary reduction in short term debt, in the absence of any corresponding increase in immediate requirements for fixed or inventory investment. Then the deviations from normal of both the retention ratio and the growth in net working capital are caused by the earnings deviation. However, so long as the latter variable is included in the regressions fitted, there is no reason to expect significant overstatement on this account of the impact of abnormal growth in net working capital on the observed retention ratio.

Quarterly regressions explaining the retention ratio were fitted over the period 1951-69 for all manufacturing and for ten manufacturing industries. Gross fixed investment data were obtained from the OBE-SEC series on plant and equipment expenditures; income and balance sheet data were taken from the FTC-SEC Quarterly Financial Reports for Manufacturing Corporations. Some problems arise in combining data from the two sources, since the coverage is not identical; and for three industries it was necessary to substitute change in total assets (derived entirely from the FTC-SEC source) for the preferred investment measure, net fixed investment plus

the change in net working capital (derived by combining data from both sources). Conceptually the change in total assets differs from the preferred investment variable in that it includes that part of the growth in current assets which is financed by a growth in current liabilities and it may also reflect such factors as revaluation of long term assets or the acquisition of stock in subsidiaries which are only indirectly relevant to payout decisions.

Normal values for investment and earnings were estimated from simple averages of actual values over the current and previous 11 quarters. Alternative estimates from linear time trends based on the current and previous 19 quarters performed adequately in the case of earnings. However, the bunching of fixed investment expenditures in such periods as 1955-57 was so pronounced as to require a much longer span than five years to derive reasonable estimates of normal investment from a time trend.

It is clear that neither of the measures used is more than a crude approximation. Much better information than historical averages or trends is available to corporations in projecting their requirements for long term funds and presumably this is fed into payout decisions. One relevant item is the percent of capacity represented by current operations. Some attempt has been made to include a proxy for this variable in the regression for total manufacturing.

The optimal ratio of long term debt to equity depends in part upon the cost of debt (i.e. the corporate bond yield adjusted for the tax advantage of debt) relative to the cost of equity, and in part upon the need to maintain a margin of unused borrowing capacity as a precaution against contingencies. The latter depends in turn on a number of considerations not likely to vary greatly in the short run: the standards of short term

lenders; the degree of business risk; the management's tradeoff between expected return and risk. In the absence of changes in the corporate bond rate, a 12 quarter average of the ratio of long term debt to the book value of equity was expected to provide a reasonable estimate of the optimal ratio. In view of the substantial variation in the corporate bond yield which actually occurred over the sample period, this yield (Moody's series for industrial bonds) was included as an additional regression variable to account for deviations from the historical capital structure of the optimal financing mix for current investment. An attempt to substitute market for book values in computing the debt-equity ratio was unsuccessful. Market value of stock was based on relatively small samples within each industry and gave implausible results when blown up to industry levels. Furthermore, the volatility of stock prices gave rise to what appeared to be unreasonable variability in our resulting estimates of optimal debt-equity ratios.

Table 1 shows quarterly regression results for all manufacturing and 10 manufacturing industries. The normal retention ratio, with normal investment requirements based on an historical average of net fixed investment plus growth in net working capital, is highly significant for all manufacturing and for petroleum, chemicals and paper. It is marginally significant for iron and steel and machinery other than electrical. For three other industries -- motor vehicles, food and textiles -- a variant of the normal retention ratio was again highly significant, with normal investment requirements based in this case on an historical average of the growth in total assets. For two industries, nonferrous metals and electrical machinery, the normal retention ratio was unsuccessful though for the latter a variant, with normal investment based only on the historical growth

Table 1

Regressions Explaining the Proportion of Earnings Retained*
Manufacturing Industries, Quarterly Data, 1951-69

Industry	Coefficient of					R^2	Durbin Watson Statistic
	Normal Retention Ratio	Income Deviation	Fixed Investment Deviation	Working Capital Deviation	Corporate Bond Yield		
All Manufacturing	.268 (7.6)	.371 (8.3)	.022 (1.8)	.028 (4.3)	.032 (7.6)	.866	2.01
Petroleum	.159 (8.3)	.398 (10.0)		.002 (1.4)		.701	2.09
Chemicals	.139 (4.5)	.314 (7.3)	.048 (5.4)	.017 (3.8)	.046 (8.2)	.855	2.00
Paper	.345 (3.1)	.614 (12.5)				.519	2.23
Iron and Steel[1]	.339 (1.9)	.577 (12.3)				.669	2.35
Nonferrous Metals	---	.426 (8.7)				.608	1.93
Machinery other than Electrical	.168 (2.0)	.405 (7.6)				.700	1.77
Electrical Machinery	.090[2] (1.7)	.482 (9.4)				.572	2.18
Motor Vehicles	.912[3] (5.6)	.791 (7.4)				.487	2.06
Food	.062[3] (3.5)	.779 (17.0)				.865	2.02
Textiles	.163[3] (3.1)	.968 (8.0)				.480	2.00

*Adjusted for first order auto correlation of residuals. Seasonal dummies are included in the regressions when significant. T-tests are shown in parentheses below the coefficients to which they refer.

[1]One quarter omitted when a steel strike generated extreme values of some variables.

[2]Normal investment is a 12-quarter average of the change in net working capital.

[3]Normal investment is a 12-quarter average of the change in total assets.

in net working capital, came close to significance at the 5 percent level. The coefficients of the normal ratio are not large, ranging from 1/6 to 1/3 when the preferred investment measure is used. This confirms that our empirical approximation is a rather crude proxy for the true target ratio.

The percent deviation of current income from an historical 12 quarter average was highly significant for all industries, reinforcing the evidence of earlier studies that stability in the dollar value of dividends tends to be maintained in the face of transitory fluctuations in earnings through adjustment of the payout ratio. The coefficients range from 1/3 to 1/2 for all manufacturing and for five of the individual industries, suggesting an effect close to that implied by the stabilization of dollar dividends (see Section 3 above). Coefficients of the income deviation are moderately higher, about .6, for paper and iron and steel and considerably higher for motor vehicles, food, and textiles.

The ratio of current to normal investment both in fixed and in working capital is significant for all manufacturing and for chemicals.

In the case of fixed investment, actual plant and equipment expenditures for the current quarter were averaged with anticipated expenditures for the next two quarters and the result compared with the historical 12-quarter average. The poor performance of this variable for most industires suggests that an abnormally high 3-quarter level of actual and anticipated fixed investment does not have much immediate impact on payout decisions, though some lagged impact may still occur. Nor does current payout policy appear to be much influenced by current variations in requirements for net working capital. A later section investigates briefly the extent to which investment deviations are associated with earnings deviations and new stock issues as well as the extent to which fixed investment deviations

are offset by deviations in the opposite direction of the growth in net working capital.

The corporate bond yield was significant only for all manufacturing and for chemicals. However, when the dependent variable is replaced by the ratio of retained earnings plus depreciation to cash flow, the bond yield becomes significant for electrical and other machinery, textiles and nonferrous metals. Considerable seasonal variation occurs in the retention ratios with a marked tendency for the fourth quarter ratio to be relatively low, perhaps reflecting the prevalence of special dividends in that quarter and perhaps reflecting the tidying up of earnings figures at the year end. The fourth quarter dummy was significantly negative for all industries except iron and steel, motor vehicles and textiles. In several cases dummies for other quarters were also significant.

5. Effects of Depreciation and New Equity Issues

Two limitations of the Table 1 regressions give us some concern: (1) measurement errors in the dependent variable may be correlated with those in the explanatory variables, introducing bias into the estimated coefficients and (2) error may be introduced by our model's neglect of new equity issues. To the extent that the liberalization of depreciation allowances in the sample period may have introduced measurement errors of varying magnitude into depreciation as reported in the FTC-SEC data, these errors will contaminate our measures of net income, retained earnings and net fixed investment. If the measurement error in depreciation represents a fairly constant proportion of each of these derived variables, little damage will be done. If measurement errors are random, the 12-quarter averages of income and investment should be largely unaffected, but the numerators of both the income and the net fixed investment devia-

tion will reflect the error. Both the numerator and the denominator of the dependent variable will be affected, but the numerator (being a smaller number) will be changed by a larger percentage, changing the ratio. If the measurement error changes significantly from one three-year period to another with changes in the relevant tax laws, then the 12 quarter averages of earnings and net fixed investment, and thus our estimate of the normal retention ratio, will be affected. In all cases the effect will be to bias regression coefficients upward.

To pick up the effects on the dependent variable of measurement errors in depreciation, the ratio of depreciation to normal earnings was introduced into the regressions. To pick up the effects of new equity issues, which clearly reduce the need for earnings retention, given the level of investment requirements, the ratio of the change in the capital stock account to normal earnings was included in the regressions. Unfortunately the latter variable, as derived from FTC-SEC data, reflects not only new issues but also stock dividends and revaluations associated with mergers, neither of which entail the inflow of additional cash for the financing of new investment.

For all manufacturing and for three individual industries -- petroleum, chemicals, and paper -- the depreciation ratio was significant. In only two cases, paper and motor vehicles, was the change in capital stock significant. For petroleum, chemicals and paper all the other variables remain significant and in the case of paper the correlation coefficient is significantly increased. For all manufacturing, however, the fixed investment deviation becomes completely insignificant and the normal retention ratio drops below significance at the 5 percent level. The new regressions are shown in Table 2.

Table 2

Effects on Earnings Retention Regressions of Depreciation and New Equity Issues*
Manufacturing Industries, Quarterly Data, 1951-69

Industry	Coefficient of							R^2	Durbin Watson Statistic
	Normal Retention Ratio	Income Deviation	Fixed Investment Deviation	Working Capital Deviation	Corporate Bond Yield	Depreciation Ratio	Change in Capital Stock		
All Manufacturing	.089 (1.4)	.419 (12.9)		.023 (4.3)	.034 (8.3)	-.333 (-3.3)		.879	2.09
Petroleum	.130 (6.0)	.379 (9.9)		.002 (1.8)		-.140 (-2.3)		.715	2.08
Chemicals	.118 (4.0)	.411 (7.9)	.034 (3.6)	.014 (3.2)	.056 (9.1)	-.328 (-3.0)		.871	2.03
Paper	.236 (3.6)	.548 (13.0)				-.190 (-4.2)	-.030 (-2.3)	.750	2.15
Motor Vehicles[1]	.256 (3.1)	.573 (10.8)					-.266 (-2.1)	.588	2.08

*Adjusted for first order auto correlation of residuals. Seasonal dummies are included in the regressions when significant. T-tests are shown in parentheses below the coefficients to which they refer.

[1]One quarter dropped because of an extreme observation.

6. The Financing of Abnormal Investment Expenditures

The regression results shown above indicate that, except for the chemical industry, the quarterly retention ratio is not explained to any significant extent by the deviation of either fixed or working capital investment from its 12-quarter average, suggesting that such deviations are not to any great extent financed by variation in the percentage of earnings retained. It is then of some interest to investigate how these deviations are in fact financed. Alternative sources of funds include abnormally high earnings, reduction (or abnormally low growth) in working capital, and new equity issues.

A rough indication of the relative importance of these alternative sources may be obtained by regressing the fixed investment deviation against the earnings deviation, the working capital deviation and a variable (described in the previous section) reflecting new equity issues, in addition to the retention ratio. Care must be taken in interpreting these regressions, however, since the direction of causation is not always clear. A multiple-equation model, fitted by methods other than ordinary least squares, is more appropriate in this case than the single equation model used here. When earnings are above normal,this may provide the motivation as well as the financing for abnormally large fixed investment, so that the earnings deviation may be considered a true causal variable. If requirements for working capital investment are abnormally high, this may force a postponement of fixed investment and thus serve as a causal variable. But if low fixed investment requirements lead to a temporary build-up of cash items or if high fixed investment requirements are met by drawing down liquid assets accumulated in anticipation of such needs, then the causation works in the other direction. New equity issues or an increase in the retention ratio are more plausibly a result than a cause of abnormally high fixed investment.

Since large fixed investment projects frequently involve expenditures covering several quarters, the lagged fixed investment deviation was also included in the regressions, with the effect of raising the significance of the other variables.

With similar qualifications, the working capital deviation may be regressed against the earnings deviation, the fixed investment deviation, the new issues proxy and the retention ratio. Results of these two sets of regressions are shown in Tables 3 and 4 for those industries for which a significant degree of explanation could be obtained.

The deviation of earnings from normal is significant in explaining both the fixed and working capital deviations for all manufacturing and for chemicals. It is significant in explaining the fixed investment deviation for three other industries.

The retention ratio contributes significantly to both investment deviations for all manufacturing. It contributes to the working capital deviation for four of the individual industries.

The change in capital stock contributed to explaining the working capital deviation in two industries and, when lagged one quarter, to explaining the fixed capital deviation in one industry. The working capital deviation is significant in explaining the fixed investment deviation in all manufacturing and one industry, while the fixed investment deviation is significant in explaining abnormal changes in working capital for all manufacturing and two industries.

Thus it appears that deviations of earnings from normal are the most important source of financing for fixed investment deviations, while working capital deviations are to a moderate extent associated with variation in the retention ratio, though the direction of causation is not clear. There is also some suggestion that abnormally high fixed investment is financed by

Table 3

Financing of Fixed Investment Deviations*

Industry	Coefficient of					R^2	Durbin Watson Statistic
	Earnings Deviation	Working Capital Deviation	Retention Ratio	Change in Capital Stock	Lagged Fixed Investment Deviation		
All Manufacturing	1.033 (6.2)	-.101 (-2.8)	.823 (2.2)		.666 (10.9)	.854	2.08
Chemicals	1.479 (4.6)	-.076 (-2.6)			.795 (11.4)	.741	2.06
Other Machinery	.540 (4.3)				.694 (10.4)	.729	2.01
Paper	.987 (3.8)				.805 (14.7)	.859	2.08
Textiles[1]	.258 (4.3)			.042[2] (2.6)	.752 (13.5)	.884	1.95

*Regressions adjusted for first order correlation of residuals. T-test is shown in parentheses below the coefficient to which it refers.

[1]Dependent variable is the ratio of gross fixed investment to 12-quarter average. Earnings deviation is the ratio of net income plus depreciation to 12-quarter average.

[2]Lagged one quarter.

Table 4

Financing of Working Capital Investment Deviation

Industry	Coefficient of				R^2	Durbin Watson Statistic
	Earnings Deviation	Fixed Investment Deviation	Retention Ratio	Change in Capital Stock		
All Manufacturing	3.019 (3.9)	-1.204 (-6.3)	3.867 (2.9)		.640	1.82
Chemicals	2.511 (2.3)	-.776 (-3.8)	5.122 (2.6)		.409	2.00
Petroleum		-1.494 (-2.2)	21.819 (4.3)		.289	1.95
Nonferrous Metals			7.432[1] (2.1)	4.666 (4.2)	.221	2.01
Electrical Machinery			4.499 (2.8)	.617 (2.1)	.119	2.05

[1]Ratio of retained earnings plus depreciation to net income plus depreciation.

reduction in working capital, though this may in part reflect the use of liquid assets accumulated for this purpose through past earnings retention, borrowing or new stock issues.

7. Summary and Conclusions

A theory is developed that, apart from stochastic fluctuations in investment and earnings about their growth trends, the optimal retention ratio for most firms in most time periods is a simple function of investment opportunities, earnings and the preferred debt-equity ratio. If the growth rates of investment and earnings are different, this short-run target ratio will change gradually over time, approaching a limit which depends in a specified way on the tax rate, the growth rate (which now becomes equal for investment and for earnings), the average return earned on new investment, the corporate bond yield and the preferred debt-equity ratio.

The empirical analysis indicates that for manufacturing industires the actual quarterly retention ratio fluctuates about the "normal" or short-run target (based on 12-quarter averages of earnings, investment and the debt-equity ratio) in accordance with deviations of net income, and occasionally with deviations of fixed or working capital from their normal values (based in each case on 12-quarter average). The normal retention ratio is significant for eight of the ten manufacturing industries. The deviation of income from normal is significant in all cases and is in the direction, and in most cases of about the right magnitude, for maintaining dividend stability.

Deviations of fixed investment are positively correlated with the deviations of income from normal and these apparently provide much of the required financing. There appears to be little dependence upon simultaneous changes in the retention ratio to finance fixed investment deviations. There

is some positive correlation between deviations of working capital investment from normal and the retention ratio in the same time period, but the direction of causation is not entirely clear.

FOOTNOTES

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1. There may be a range around the optimum over which the firm's capitalization rate remains constant for all practical purposes (i.e., within the limits of accuracy of any available measurement techniques).

2. For a discussion of these considerations see Alexander A. Robichek and Stewart C. Myers, Optimal Financing Decisions, Prentice-Hall, 1965, pp. 40ff; Nevins D. Baxter, "Leverage, Risk of Ruin and the Cost of Capital," Journal of Finance, September, 1967.

3. Over one-fourth of the dividend paying stockholdings of individuals reporting occupation in a large sample based on income tax data were attributed to retired persons and others (e.g., housewives) not in the labor force. See Jean Crockett and Irwin Friend, "Characteristics of Stock Ownership," Proceedings of the Business and Economic Statistics Section of the American Statistical Association, 1963, p. 157.

4. Even in this case the stockholder may well prefer to pay capital gains rather than income tax, since the achievement of portfolio balance may be deferred if the market is unfavorable and in any event the stockholder is fairly well hedged since he will be buying and selling simultaneously.

6. The reluctance of firms to cut dividends is, of course, well established empirically. This reflects not only the considerations just adduced but also the fear of generating unfavorable expectations as to future profitability.

14. Since a high rate of change in dividends may be disliked even if the market is indifferent to the level of dividends, payout may be held to some level less than 100 per cent if the over-pricing of equity is expected to be temporary. The decision rule for dividend policy will then be modified by this consideration, becoming somewhat more complex than that stated in the text. If there is a maximum payout above which management does not wish to raise dividends in the light of long run considerations then payout should be set at this maximum.

15. More precisely, the market price should be affected only indirectly, via the reduction in profitable future investment opportunities associated with a relatively high cost of capital. This again is an effect of growth potential rather than payout policy per se and would only be exacerbated by an increase in payout since dependence on still higher cost alternative sources of financing would further reduce the volume of profitable future investment.