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On the Marginal Source of Investment Funds

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Abstract

Under the "new view" of dividend taxation developed in Auerbach (1979), Bradford (1981) and King (1977) the marginal source of finance for new investment projects is retained earnings. In this case, the tax advantage of retentions precisely offsets the double taxation of subsequent dividends: taxes on dividends have no impact on the investment incentives of firms using retentions as a marginal source of funds and paying dividends with residual cash flows. We find evidence that dividends do respond to investment and cash flow for the nonfinancial corporate sector as a whole in a manner consistent with the new view. We also find that this dividend pattern is weaker for firms with better access to capital markets, as measured by bond rating and the number of analysts following them. Finally, we find that, although new share issues and repurchases respond to the same firm characteristics as dividends do, the pattern of these responses is consistent with a broader interpretation of the new view that preserves the main result of dividend-tax irrelevance with respect to the cost of capital.

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I. Introduction

Few important issues in corporate or public finance have remained unsettled for as long as the related questions of how corporations finance their new investment projects and how taxes affect their investment decisions. The initial focus in the corporate finance literature, dating from Modigliani and Miller (1958), was on the tax advantage to debt under the classical corporate tax system that permits deductions for interest but not dividends. Subsequent contributions emphasized the apparent tax advantage of retained earnings over new share issues as a source of equity funds, tracing this advantage to the reduction in shareholder dividend taxes that retentions, but not new share issues, induce under the classical system. Indeed, under the "new view" of dividend taxation developed in Auerbach (1979), Bradford (1981) and King (1977), this tax advantage of retentions precisely offsets the double taxation of subsequent dividends: taxes on dividends have no impact on the investment incentives of firms using retentions as a marginal source of funds and paying dividends with residual cash flows.

The difference between this result and that of the more "traditional" view, that dividend taxation imposes an additional tax wedge on corporate investment, bears on evaluations of changes in the tax treatment of dividends. Analyses of corporate tax integration proposals (e.g. U.S. Treasury 1992, American Law Institute Reporter's Study 1993) routinely accord a central place to the debate over which "view" of dividend taxation is more accurate, because integration promises far less significant efficiency gains (or larger efficiency losses) and larger windfalls to shareholders if dividend taxes impose little or no marginal tax burden to begin with and are simply capitalized into corporate share values.

Over the years, researchers have developed a variety of methods to determine the impact of dividend taxation on corporate investment. Some have argued that their findings reject the

new view. As we will discuss below, however, this evidence is inconclusive, based either on excessively restrictive representations of the "new" view or on questionable collateral assumptions. Indeed, perhaps the most surprising aspect of the continuing debate is that the most crucial prediction of the new view – that firms obtain their equity funds for investment through the retention of earnings, and distribute residual funds as dividends – has not been evaluated directly. In seeking to remedy this omission from the literature, we find evidence that dividends do respond to investment and cash flow for the nonfinancial corporate sector as a whole. We also find that this dividend pattern is weaker for firms with better access to capital markets, as measured by bond rating and the number of analysts following them. Finally, we find that, although new share issues and repurchases respond to the same firm characteristics as dividends do, the pattern of these responses is consistent with a broader interpretation of the new view that preserves the main result of dividend-tax irrelevance with respect to the cost of capital.

While these findings are the paper's central contribution, it is useful to place them in the context of the prior literature, to explain why they are consistent with past research that has purported to reject the new view for the corporate sector as a whole. Toward this end, the next section reviews the "new" and "traditional" views of dividend taxation, and Section III surveys the existing tests of the two views and explains why the evidence is inconclusive. Section IV presents a model of dividend behavior to motivate our empirical tests. Section V discusses data sources, Sections VI and VII present our main estimation results, and section VIII offers a brief look at time series behavior. The final section offers some brief conclusions.

II. Measuring the Impact of Dividend Taxation

Alternative views of the impact of dividend taxation rely on different assumptions about the sources and uses of equity funds (see Auerbach 1983, 2000 for further elaboration). A

standard result, that dividend taxes affect the firm's cost of capital, occurs in a model characterized by Poterba and Summers (1985) as the "traditional" view. In the model they describe, firms obtain equity funds to finance investment by issuing new shares, and distribute a fixed fraction of the earnings generated by this investment as dividends, retaining the rest for reinvestment. The retained funds increase the value of the firm dollar for dollar, because they substitute for the marginal equity funds being obtained in that period through additional new share issues. Thus, each dollar of equity funds contributed to the firm has a value to the shareholder one period later equal to $1+ r(1-t)[p(1-q)+(1-p)(1-c)]$, where r is the before-tax rate of return, t is the corporate tax rate, p is the dividend payout rate, q is the tax rate on dividends, and c is the accrual-equivalent tax rate on the capital gains induced by retentions. The return depends on the corporate tax rate and the weighted average of the dividend and capital gains tax rates, where the weights are determined by the dividend payout rate.

Under the new view, marginal equity funds come through retained earnings, so that the opportunity cost to the shareholder of a dollar of new investment is reduced by the dividend taxes foregone, net of the increased tax burden on the capital gains induced by the accrual. Because the value of new investment per dollar equals its cost to the shareholder, in equilibrium, the cost of retaining a dollar is $q^N = 1-q+cq^N$, or $q^N = (1-q)/(1-c)$. One period later, this investment plus its return is worth $q^N[1+r(1-t)(1-c)]/q^N$, per initial net dollar foregone, if all earnings are retained. If all earnings in the subsequent period are paid out, then the shareholder receives a payment of $[1+r(1-t)(1-c)]$. This payment forces the shareholder to pay $q\,[1+r(1-t)(1-c)]$ in dividend taxes, which will be partially offset by the capital gains tax avoided through the payment of the dividend, $[1+r(1-t)(1-c)]cq^N$. On net, the benefit of the entire transaction is: $[1+r(1-t)(1-c)](1-\theta+cq^N)/q^N$. In either case, as long as tax rates are constant over

time, the value per initial dollar invested is $[1+r(1-t)(1-c)]$. Thus, the dividend tax rate plays a role in valuing the firm, but does not influence its investment.

The relevance of the new view should, in principle, be resolvable simply by observing the form of finance firms appear to be using. The category "issuing new shares" is somewhat arbitrary, because many firms issue small amounts of shares for such purposes as executive compensation. As this type of behavior is not what we are interested in, we use a cutoff of a 2 percent increase in shares to define new issue activity. Based on this definition, Figure 1 displays the fraction of Compustat firms, unweighted and weighted by equity value, that issued new common stock over the period 1981-1998. (The third series in the figure provides the comparable weighted share for the "mature" dividend-paying company sub-sample that we consider for much of our analysis below.)

Figure 1 suggests several useful observations. First, while most firms do not reach even our low new-issues threshold in a given year, a substantial proportion of them does. Second, in general, small firms are more likely to rely on new share issues than are large firms, particularly in later years of the sample. Finally, it seems implausible that the majority of firms are using new share issues as a marginal source of finance, even if floatation costs induce them to issue shares in large blocks at a time to cover a few years' investment. Weighted by value, the fraction of firms issuing shares equal to at least 6 percent of their existing equity base over a three-year period is below 25 percent in recent years.

Firms that avoid new share issues still may not use reductions in dividends as a source of equity funds and increases in dividends as a residual use of funds. A maintained assumption of original statements of the new view was that firms at these margins also don't utilize share repurchases, a tax-favored alternative to the payment of dividends because of the favorable tax

treatment (lower rate and deduction of basis) of capital gains. But share repurchases have always been present to some extent. Indeed, as Figure 2 illustrates, share repurchases did grow during the mid-1980s, in concert with the merger wave that occurred at the same time, as firms also used cash to purchase the shares of other firms, in addition to their own. (Bagwell and Shoven 1989). This growth, particularly among large firms, led to the inference that firms finally had "discovered" how to avoid dividend taxation.

Though some have seen the surge in repurchases as evidence against the new view of dividend taxation, there are two difficulties with this logic. First, the incidence of repurchasing fell considerably around the time of the 1990-91 recession. Although it has recovered in recent years, there is no obvious upward trend for the full sample period.

Second, even if firms distribute some of their earnings through repurchases, the new view remains basically intact. Note that what is crucial for the new view is the *relative* taxation of the sources and uses of funds. For example, if firms obtain equity funds by reducing repurchases and retaining earnings, and distribute funds by increasing repurchases and dividends in the same proportion, then the new view is essentially intact. All that is needed is to apply a different value of q^N that reflects the fact that some distributions are taxed at rate q and others are taxed at rate 0 (Sinn 1991).[1] The same logic would apply if firms retained earnings and issued equity and to finance investment and used the proceeds of investment to increase dividends and reduce new share issues in the same proportion. Thus, rejection of the new view requires showing not only

[1]We continue to assume that capital gains are taxed on accrual, so that the act of repurchasing incurs no additional liability. The real-world situation is a bit more complicated because repurchases are subject to capital gains taxation only on realization. In the extreme case in which the stock has zero basis (its value is all capital gain), the capital gains tax applied to a reduction and subsequent increase in repurchases is a cash-flow tax, equivalent in impact to a tax on dividends. While this result does not hold precisely for the general case, it will still be true that a modified version of the new view holds, in which the tax on capital gains has *some* marginal impact on the return to investment (Scholes and Wolfson 1990).

that dividends are an unimportant marginal source of funds, but also that reducing the issuance of new shares is an unimportant marginal *use* of funds.[2]

III. Prior Evidence on the Impact of Dividend Taxation

Researchers have attempted to evaluate the impact of dividend taxation by testing alternative implications regarding financial and investment behavior and market valuation. The empirical evidence perhaps most widely cited as challenging the new view was in Poterba and Summers (1985), who estimated equations based on the *q*-theory of investment. The *q*-theory predicts that investment by firms facing convex adjustment costs will be positively related to the gap between the marginal value of capital, *q*, proxied by the stock market value per unit of capital, and the long-run equilibrium value of capital, q^*, i.e., $I = f(q-q^*)$. Under their characterization of the traditional view of taxation, with marginal equity funds coming through new share issues, $q^* = q^T = 1$. Under the new view, $q^* = q^N = (1-q)/(1-c)$. Estimating investment equations of the form $I = f(aq^T + (1-a)q^N)$ using postwar data from the United Kingdom, they accepted the hypothesis that $a = 1$, and rejected the hypothesis that $a = 0$ – the traditional hypothesis did a better job explaining investment behavior.

Several factors attenuate this finding. First, the calculation of q^N requires knowledge of the effective tax rates faced by the "marginal" investor. Yet the marginal investor's identity depends on the nature of financial equilibrium. If, for example, a specialized "Miller equilibrium" prevails, then the appropriate values of *q* and *c* are not those based on a weighted average of income, as used by Poterba and Summers, but rather those for which investors are just

[2] Even under the assumption of the traditional view that the firm relies on equity issues as a source of funds but not as a use of funds, the cost of capital may be independent of the dividend tax rate. An example is provided by Bernheim (1991), who develops a signaling model in which the fraction of distributions taking the form of dividends rather than repurchases responds to changes in the dividend tax rate to preserve the average tax rate on distributions.

indifferent between debt and equity. Even in a more realistic model, the weights should not generally be those used in constructing standard weighted-averages.[3] Given that identification in the U.K. sample came from frequent changes in tax rules affecting dividends, errors in measuring the change in $(1-q)/(1-c)$ would tend to bias the results in favor of the traditional view. Second, the test is meaningful only if the assumptions of the *q*-theory itself are satisfied, among them that firms face convex adjustment costs, capital is homogeneous and accurately measured, and returns to scale in production are constant. There has been a continuing dispute about the nature of adjustment costs, and even recent evidence in support of the *q*-theory using panel data (Cummins, Hassett and Hubbard 1994) suggests that aggregate measures of *q* contain considerable noise, and that tests based on these – such as that performed by Poterba and Summers – would likely be sharply biased. Finally, as discussed above, the new view's validity does not depend on new shares being eschewed as a source of finance, but rather that the sources of investment funds are similar to the uses of subsequent cash flows.

A second empirical finding often taken to weaken the new view is that dividend payout ratios respond positively to the return to a before-tax dollar of dividends relative to a before-tax dollar of capital gains, $(1-q)/(1-c)$. While this evidence certainly supports the argument that taxes influence dividend policy (and therefore contradicts the so-called "tax irrelevance" view based on the hypothetical availability of offsetting tax arbitrage strategies), it is less clearly evidence in favor of the traditional view specifically.

The argument that this evidence is inconsistent with the new view is based on the new view's prediction that the level of dividend taxes has no impact on the incentive to invest or pay dividends. However, there are two distinct reasons why an increase in dividend taxes would

[3] For further discussion, see Auerbach (2000).

reduce distributions under the new view. First, a *temporary* increase in the dividend tax rate does raise the cost of paying dividends under the new view, for it reduces the opportunity cost of funds more than the ultimate burden on the returns to investment: an increase in the current but not the future value of the dividend tax rate reduces q^N in the denominator of the expression given above in deriving the new view, but not the numerator.[4] Indeed consistent with this logic, Poterba and Summers (1985) find (based on an analysis of UK data) that dividends fall with a current rise in dividend taxes and rise with an anticipated rise in dividend taxes, even when the *level* of dividend tax rates is held constant.

Second, an increase in the dividend tax typically does not occur in isolation. In the United States, for example, dividends and interest are taxed at the same rate. An increase in dividend taxes also raises the tax rate on interest income, a change that makes corporate investment more attractive by lowering the after-tax return on alternative investments. Thus, it should spur more corporate investment and, under the new view, a reduction in dividends.

That the cost of paying dividends may increase with the dividend tax rate even under the new view helps in interpreting related evidence on dividend signaling. In a study that focused on the question of whether dividend policy is driven by tax-based signaling, Bernheim and Wantz (1995) reasoned that if dividends are used as a signal, their information content should relate to their cost. Hence, the increase in value in response to a unit increase in announced dividends should be higher during periods with a higher tax penalty on dividends. Looking at the period 1978-1988, Bernheim and Wantz estimated that the information content per dollar of dividends fell along with the tax rate on dividends in 1981 and again in 1986. While their measure of the cost of dividends was based on the traditional view, their finding is not necessarily inconsistent

[4]This is an illustration of the well-known proposition that a cash-flow tax is neutral only if the tax rate is constant over time.

with the cost of paying dividends based on the new view: the relevant cost under the new view might well have fallen over time as well. For example, anticipations of reductions in marginal tax rates prior to 1981 and again before 1986 should have raised the opportunity cost of paying dividends relative to the cost after rates had reached historically low values after 1986 and would not have been expected to fall further.

Signaling models typically do not focus on the possibility that firms use retained earnings as their marginal source of funds, perhaps because using dividends as a signal may appear to be inconsistent with dividends being a residual, determined by the firm's investment level. In a world in which firms use only equity, and dividends are the only method of distributing earnings, it would be difficult for dividends to serve both functions at the same time. However, in a more realistic model, the apparent inconsistency can be overcome once one recognizes that these functions may occur at different frequencies. That is, dividends may serve as a signal at relatively low frequencies, with firms setting their dividends at levels they perceive to be consistent with long-run earnings potential, investment opportunities and debt capacity, with short-term fluctuations in capital needs leading to residual changes in dividends.

Clearly, dividend policy is more rigid at high frequencies than at low frequencies. Firms pay dividends on a quarterly basis, regardless of the timing of their investment needs within a year. On the other hand, fast-growing firms with high rates of investment relative to earnings have lower dividend payout ratios. The new view is not really "rejected" by the fixed nature of dividends over a period of months, because short-term borrowing can smooth out within-year misalignments of investment and retentions at little cost.

IV. Toward a Model of Dividend Policy

There is little disagreement about the impact of dividend taxation on new firms with inadequate internal funds to finance investment. The more important question is whether the vast majority of firms that pay dividends perceive the dividend tax to place a burden on new investment. To put it another way, what is important is whether firms view new equity issues as their marginal source of equity funds to a much greater extent than they view reductions in equity issues as a use of funds. To motivate the empirical analysis that follows, we offer a sketch of a model of dividend policy.

We envision an environment in which new share issues are unattractive because of their tax disadvantages and the non-tax costs associated with information asymmetries, which cause shares to fall in price upon the announcement of a new issues (Asquith and Mullins 1986). While share repurchases exist as an alternative to dividends, they are not a perfect substitute. They offer no tax advantage when done in proportion to existing holdings of stock, for such proportional redemptions are taxed as dividends. Thus, they are an alternative to dividends only in circumstances where they are also subject to the non-tax costs of asymmetric information – when firms have the potential to take advantage of tendering shareholders. As suggested by Brennan and Thakor (1990), these costs can lead to a situation in which firms use repurchases for large distributions, when the advantages of a repurchase overcome the costs of acquiring information about the true value of the firm. Indeed, share repurchases do follow this pattern. For example, in 1998, firms that repurchased shares redeemed an average of 7 percent of their outstanding equity, while firms paying dividends distributed an average of 2 percent of equity value.

If firms utilize share repurchases only when they wish to distribute large amounts of cash, this limits their usefulness as a signal. The fact that aggregate dividend models estimated on data from earlier periods continued to perform well even during the surge in repurchases in the mid-1980s (Auerbach 1989) suggests that repurchases are not used primarily to substitute for dividends, but may instead be reserved for circumstances in which firms have unexpectedly large amounts of cash to be distributed.[5]

With new shares unattractive and repurchases not available as a regular policy tool, this leaves dividends and debt as the two major financial variables that firms can adjust. If there were an optimal debt-equity ratio and dividends were cost-less to adjust, this would cause dividends to fluctuate as a residual of the investment process. Here, however, is where the potential value of dividends as a signal becomes relevant. If firms seek to use dividends to convey information about long-term value, there will be costs to adjusting dividends that must be weighed against the costs of deviating from an optimal debt-equity ratio. We might then observe fluctuations in debt-equity ratios being used to smooth dividends.

Figure 3 provides an illustration of the behavior one might expect from such a model. This figure presents the patterns of dividends and investment derived from the solution of a linearized version of a model, derived in the Appendix, in which firms face two types of quadratic financial policy costs: one based on the deviation of dividends from their long-run value (based on the firm's normal earnings), and the other based on the level of the firm's debt. In response to an unanticipated permanent increase in the productivity of its capital stock, the firm wishes to raise its capital stock to a new, higher level. However, doing so requires issuing debt, reducing dividends, or both.

[5]During that period, the extra cash came primarily from shifts in capital structure, as firms issued large amounts of debt.

The figure illustrates the response of the firm to a permanent positive productivity shock to production, beginning in period 1, with this information arriving during period 0, when period-0 dividends are paid. We assume that period-0 production and debt levels are already determined when the news arrives, so that the firm adjusts its period-0 dividends, borrowing and investment. In the long run, dividends rise to a new level consistent with the higher level of productivity (and capital), while investment falls back to zero.

The solid lines in the figure illustrate the pattern of dividend changes (relative to the initial dividend level) and investment for one set of adjustment costs, and suggest several observations. First, even though dividends rise eventually in response to the firm's increase in productivity, they fall in the short run to help finance investment. Second, they fall initially by less than is needed to finance investment – the remaining funds come initially from increased debt, which over time is paid off as dividends recover slightly less quickly than investment falls. Third, investment itself is smoothed, even though there are no adjustment costs to investment itself, to accommodate the costs of adjusting dividends and debt.

The figure's dotted lines represent the dividend and investment paths for the case in which the costs of adjusting dividends are higher. These higher costs induce more investment smoothing, and also cause a greater share of the initial investment jump to be financed by increased debt, rather than reduced dividends. In fact, dividends rise initially in period 0, even though period-0 earnings are not affected by the productivity increase. With a strong enough incentive to set dividends at their new, higher long-run level, the firm borrows initially not only to invest, but also to pay dividends. However, the dividend level is still depressed *relative* to its long-run dividend level. This illustrates the importance for conditioning dividend policy on firm fundamentals in considering the responsiveness of dividends to investment.

As argued above, dividend smoothing poses little challenge to the new view if it occurs at very high frequencies. The relevant empirical question is whether, even over longer periods, dividends remain smooth even as investment fluctuates. In the limit, keeping dividends smooth even in the face of a growing debt-equity ratio would ultimately make new share issues an attractive alternative to additional borrowing. Firms with high costs of deviating from their optimal debt-equity ratio and a strong desire to smooth dividends would then be forced into issuing new shares, as the traditional view envisions. Likewise, firms unable to adjust dividends upward would find themselves using share repurchases as a residual use of funds.

We wish to determine the extent to which firms do alter their dividend policies in response to fluctuations in investment needs. The essence of our argument is that the use of dividends as a signal, as represented by the well-known tendency of dividends to rise with a firm's prospects, is not necessarily inconsistent with the use of retained earnings as the marginal source of equity funds. Even if firms set their dividends primarily to reflect long-run earnings prospects, the combination of dividend adjustments and short-term borrowing can allow them to accommodate fluctuations in the need for investment funds without regular use of new share issues or share repurchases.

That is, the use of dividends as a signal does not imply that dividends will be set without regard to other costs. Such insensitivity would imply that deviating from the optimal dividend has infinite cost to the firm, but this seems extreme and unrealistic. For example, imagine a signaling model in which there are two types of firms, "good" firms with a low cost of paying dividends, and "bad" firms with a high cost of paying dividends. Suppose that each firm receives an unobserved, temporary idiosyncratic shock to its cash flow that raises its cost of paying dividends. Without such shocks, we might observe a separating equilibrium in which

good firms pay a higher dividend to distinguish themselves from bad firms. In the presence of the shocks, such complete sorting could break down, and some of the good firms might find it advantageous to lower their dividends temporarily, even if doing so reduced their value by increasing their probability of being a bad firm, from the perspective of uninformed investors.

Thus, we would expect dividends to increase with an increase in the firm's intrinsic value, but to decrease with the firm's need for investment funds, *conditional* on the firm's value. Conditional on investment needs, and the firm's intrinsic value, dividends should also respond positively to cash flow.

This discussion also highlights a potential identification problem that a test of the new view faces. If dividends in the long run are a linear function of q, and investment is as well, then the correlation between investment and dividends – holding *q* constant – is unidentified. However, although investment is determined solely by intrinsic value in the model illustrated in Figure 3, in a more realistic setting there are a variety of reasons why we might expect needed investment funds to fluctuate, conditional on the firm's value. First, investment may vary independently, given that capital is not, in reality, homogenous and projects may be "lumpy" in nature. So, for example, if in our sample there were two otherwise identical firms, one that had purchased a new plant yesterday, and one that had not, then the firm who had just purchased the plant should have lower dividends today. Second, the firm's cash flow may vary, as a result of nonrecurring revenues or tax benefits.

Our strategy, then, is to estimate the responsiveness to investment and cash flow while controlling adequately for the strong dependence of these variables on the firm's underlying prospects. This approach is in the spirit of earlier work of Dhrymes and Kurz (1967), who sought to characterize the joint decisions with respect to investment, dividends and external

finance using cross-section data, but goes beyond such work by using panel data to distinguish long-run from short-run responses. While our argument is consistent with the observation that fast-growing firms tend to retain a greater share of their earnings, it also predicts that such a relationship holds for higher frequency fluctuations.

V. The Data

We estimate equations to explain the firm's common-stock dividends using an unbalanced firm-level panel data set derived from the Compustat industrial, full-coverage, and research files, for the period 1981-98.[6] The variables are defined as follows. *Investment* equals capital expenditures. *Cash flow* equals after-tax income[7] plus depreciation. *Value* is the value of the firm's common stock. *Debt* is the sum of the firm's financial obligations, including short-term and long-term debt. Each of these variables is scaled by the firm's assets at the beginning of the period.

We delete all observations for firms with SIC codes between 60 and 69, corresponding to the Finance, Insurance and Real Estate industries. These categories include financial companies for which our model is not really suitable, as well as companies with special rules regarding distributions, notably real estate investment trusts (REITs). We also exclude observations after firms have undergone a major merger. Finally, to prevent the influence of questionable data, we also omit a small number of observations with investment-assets ratios less than 0 or greater than 1, cash-flow-assets ratios less than –1 or greater than 1, dividend-asset ratios above .5, debt-asset ratios greater than 1, or equity value-asset ratios greater than 20.

[6] Given the use of lagged variables in our empirical specifications, our basic results cover dividend payments beginning in 1982.

[7] For after-tax income, we use "income before extraordinary items – available for common," which is net of preferred dividends. This is consistent with our exclusion of preferred dividends from our dividend measure.

Table 1 gives the sample means and standard deviations of the variables just defined. The dividend-assets ratio is the average taken over all observations, including those that equal zero. The average for those observations with positive dividends is substantially higher because, as will be discussed shortly, our basic sample includes many observations with zero dividends.

VI. Initial Results

A goal of our empirical work is to identify whether, conditional on value, dividends appear to respond negatively to investment and positively to cash flow, and to measure the relative responsiveness of these two reactions. It is also important to control for the firm's initial level of debt, to measure debt capacity and thereby account for the possibility of using additional borrowing as a source of funds. Table 2 presents a series of initial estimates. Each column of the table presents results for a model relating dividends (as a share of firm assets) to the levels of lagged investment, cash flow, debt and value (also relative to assets). All specifications also include dummy variables for each year in the sample, to account for trends in dividend levels that might be attributable to a variety of common factors, including tax law changes and the overall growth in the ratio of equity values to assets that occurred over this period.

The first column of Table 2 presents a simple linear model, based on all observations in the sample. Below the coefficients in this and all subsequent panel specifications are robust standard errors, based on the estimated variance-covariance matrix of the model's errors. The coefficients from this first set of results appear to support the implication of the "new view" hypothesis that, conditional on value, cash flow should exert a positive impact on dividends, and investment a negative impact. As expected, dividends are positively related to value, but this does not eliminate the separate impact of investment and cash flow. The negative coefficient on

initial debt is consistent with our expectation that a higher debt level discourages firms from additional borrowing and forces them to find alternative sources of funds.

In estimating the linear model, we make no special provision for the fact that so many observations (63 percent of the total!) have a value of zero for the dependent variable, the ratio of dividends to assets. The second column of Table 2 treats these zeros using the standard Tobit specification, which substantially strengthens the impact of the investment and cash flow variables. However, this is not necessarily the most sensible approach to dealing with zero-dividend observations. Most of these observations occur among firms that have never paid dividends in prior years. Although it represents more than half of the observations, this well-defined group of zero-dividend firms accounts for only 9 percent of the equity value of our sample universe: these are most likely small "immature" firms for whom the paper's hypothesis clearly doesn't yet apply. Dropping these observations eliminates 87 percent of the zero-dividend observations.[8]

The results for the remaining firms, which we label "mature", corresponding to the full-sample results just presented, are shown in the third and fourth columns of Table 2. Not surprisingly, the Tobit and least squares results are now closer together, and both exhibit large coefficients for both the cash flow and investment variables. However, because there are still a substantial number of observations of zero dividends – 18 percent of the mature sample – the Tobit model seems more appropriate. And, given that the results are still noticeably different from those of the linear model, we will present results in subsequent tables for the Tobit model.

One might explain the findings thus far as simply reflecting long-run differences among firms, rather than short-run changes in dividend policy. That is, perhaps some fast-growing

[8] In order to avoid selection based on future information, we drop observations based only on past behavior, i.e., observations for firms with no dividends in the current observation or in any past observations.

firms invest a lot and pay small dividends (relative to assets), while other firms grow slowly, investing little and paying large dividends. While our theory concerns the short-run responsiveness of dividends to investment needs and cash flow resources, our estimates might reflect not only these responses, but also more permanent cross-section variation among firms.

To eliminate the influence of this long-run cross-section variation, a simple if inelegant correction is to include fixed firm effects in the equation. However, this approach is problematic for two reasons. First, it is not a feasible solution for the Tobit model. There do exist procedures for overcoming this problem of nonlinearity (see, for example, Honoré 1992). But a second problem, even for the linear model, is that fixed effects estimation may lead to inconsistent estimates in a short panel, given that the right-hand side variables in the estimated equation are predetermined but not exogenous regressors. To avoid this problem and still eliminate the influence of firm effects, one might adopt the approach suggested by Arellano and Bond (1991). This method involves estimation of the differenced equation using the Generalized Method of Moments (GMM) using twice lagged regressors (in levels) as instruments. However, given the lack of good instruments, this approach, too, presents problems. Some progress has been made dealing with weak instruments, through the use of "system" GMM estimation that simultaneously estimates the *levels* equation using *differenced* lagged regressors as instruments (Blundell and Bond 1998). However, given that our overall sample and most subsamples include a considerable number of zero-dividend observations, we seek a solution that can be applied in the context of Tobit estimation.[9]

[9] For one of the subsamples analyzed below, in the second column of Table 6, linear estimation is possible because there are no zero-dividend observations. We reestimated this model using the system GMM approach. The coefficients were of the same sign as those in the second column of Table 6, and the coefficients on the investment and cash flow variables were considerably larger in absolute value and statistically significant, even in the one-stage estimates. However, the test for no second-order serial correlation was rejected for these estimates.

As our alternative, we include a very large number of dummy variables to account for inter-firm differences. These dummy variables include approximately 360 industry dummies[10] and four size dummies, respectively for firms with assets below the sample median, between the median and the 75th percentile, between the 75th and 90th percentiles, and above the 90th percentile. Finally, to account for more dynamics in the dividend response, we add an additional lagged value for each of the independent variables. We adopt this approach to dynamic specification, rather than the alternative of including a lagged dependent variable, because of the likelihood of serial correlation among the within-firm residuals that would lead to inconsistent parameter estimates of this and hence other coefficients. The results of these additions are reflected in the last two columns of Table 2.[11] Even with the large set of control variables, the patterns remain the same. The additional lag of each variable has the same, predicted sign as the initial lag, and usually is statistically significant.

Thus far, our results suggest that dividends are sensitive to cash flow and investment. This is particularly so for those specifications controlling for the decision to pay dividends. However, we should expect this sensitivity to vary according to firm characteristics, notably the access the firm has to external capital markets. We utilize two measures of market access to divide our sample and gain some initial insight into this relationship. Our first cut is according to whether (according to Compustat) the firm has a bond rating. Our second measure is derived from data provided by I/B/E/S International, Inc., which tracks analysts' forecasts for the firms they follow. Not all firms have analysts' forecasts reported, and having such forecasts is a measure of the degree to which the capital market has information about a firm. We should

[10] We use 4-digit industry dummies based on SIC codes, except in a handful of instances in which a 4-digit industry has just a few observations. In these cases, we group contiguous 4-digit industries.

[11] The reduction is sample size is due to the inclusion of additional lags.

expect firms with a bond rating and a record of I/B/E/S analysts' forecasts to have the greatest access to capital markets. As most firms with a bond rating also have an I/B/E/S record, we consider three categories of firms: those with both, those followed by I/B/E/S but with no bond rating, and those with neither a bond rating nor an I/B/E/S record.

The effects of this sample division are shown in Table 3. Because Compustat does not provide bond ratings before 1985, this reduces our sample size somewhat. However, as one sees in the first column of the table – which repeats the model estimated in the last column of Table 2 for this shorter sample – the results are little affected by this attrition. There is some difference between the two I/B/E/S samples shown in the next two columns. Those without bond ratings evidence a somewhat higher sensitivity to cash flow and investment than those with bond ratings. The last sample, without a bond rating or an I/B/E/S, exhibits even greater sensitivity. These results suggest that capital market access is at least one of the underlying explanations for firm responsiveness to investment and cash flow conditions, confirming that this response is measuring the extent of the firm's dependence on internal funds.

VII. Accounting for External Equity Policy

The model estimated thus far ignores the question of whether firms issue or repurchase shares, considering only the impact of investment and cash flow on dividend policy. However, there are two reasons to take into account the firm's simultaneous decision to enter the external equity market. First, identifying the determinants of whether a firm issues new shares or repurchases may help us identify those firms likely to be subject to capital market constraints, in a more sophisticated manner than that provided by the simple sample breakdowns just considered. Second, a firm's dividend policy responsiveness may vary according to whether it actually enters the capital market. For example, if a firm does overcome the fixed costs of

issuing equity, it may then find it optimal to issue a substantial amount and depend less on depressing its dividend. Both of these factors suggest that firms likely to issue equity, whether because of permanent characteristics or temporary conditions, may be less likely to use dividend fluctuations as a source of equity capital.

We model the representative firm's new share/repurchase decision using a bivariate probit model. Included in the model are all variables from the dividend equations of Table 3, along with dummy variables corresponding to different bond ratings and the number of analysts recorded in the I/B/E/S data for the firm. Including these variables as a series of dummies is the most general way to estimate how capital market access relates to each of them.

Table 4 present the results of this bivariate probit estimation. The coefficients on investment, cash, and debt are all opposite across the two equations, all of the predicted sign and, in most cases, highly significant. High investment, low cash flow, and high debt all make new issues more likely, and repurchases less likely. Next to each column of coefficients is the implied marginal effect of each variable, evaluated at the means of all independent variables. The coefficients are generally somewhat larger in magnitude than those of the dividend equations, indicating that external equity decisions are relatively sensitive to a firm's current situation.

Note, also, that in each of the equations, the coefficients on cash flow and investment are of the same absolute magnitude. A Wald test that the sum of the two investment coefficients equals the sum of the two cash flow coefficients is accepted at all standard levels of significance, for both equations. This is an important finding, for it undercuts a key assumption of the traditional view argument for a net impact of dividend taxes, namely that external equity is more responsive to investment than to subsequent cash flow that the investment generates.

The correlation of the two decisions is nearly –1, suggesting that they are determined by only a single latent variable. That is, we may view the process in terms of an ordered probit in which firms determine a desired level of new issues, positive or negative, choosing to repurchase if the desired level is below some critical value, to issue if the desired level is above some critical value, and to do neither if the desired level is between the two critical values, presumably because of the transaction costs of entering the equity market. This decision process is depicted in Figure 4, which shows a distribution of desired share issues (negative if repurchases) and the two critical values, labeled y_1 and y_2.

Variables that shift the position of the distribution of desired share issues in Figure 4 relate to the level of cash needed relative to the amount available, and should have an opposite impact on new issues and repurchases. These variables include debt, investment and cash flow, which we have already discussed. The importance of such shifts is reflected in the fact that the sample correlation of new share issue probability and repurchase probability is –.45. Variables related to capital market access, though, may have similar effects on the two decisions, by widening or narrowing the gap between the limits y_1 and y_2. Candidates for this category include the firm's bond rating and the number of analysts following the firm. The coefficients for these measures are displayed (with standard-error bounds) in Figures 5 and 6, the values listed for each bond-rating or number of analysts indicating the effect relative to firms with no bond rating or no recorded analysts. The categories for each measure are ordered so that capital market access should increase as one moves from left to right, in the direction of firms with higher bond ratings and more analysts' coverage.

The patterns suggest that the probability of repurchasing does indeed generally increase with bond rating and analysts' coverage. The opposite is true of new issues, but this pattern is

not necessarily inconsistent with our hypothesis that these variables measure capital market access. Note, in particular, that relative to firms without a bond rating or analysts' coverage, new issues *are* more likely for firms with low bond rating and a small number of analysts. That is, there is a nonmonotonic relationship between capital market access and the probability of new share issues, increasing at first and then decreasing. This is perfectly understandable, once we recall that the firm has the option of borrowing as well, and is likely for tax reasons to prefer using borrowed funds to issuing new equity. Firms with the highest credit ratings may therefore choose to borrow before issuing new shares; those with lower credit ratings may be compelled to issue new shares, and those with no credit ratings may find neither option available and opt for internal funds.

With these results in hand, we can return to the question of heterogeneity of dividend responses. Table 5 presents results for four sub-samples of firms, according to their estimated probabilities of repurchasing or issues shares. We divide firms roughly into thirds according to each marginal probability distribution, labeling those in the bottom third as having a low probability and those in the top third as having a high probability. We then look at the high- and low- probability groups separately, leaving out the middle group in each case to reduce the noise of our sample separation process.

While there is no clear pattern for firms with high and low probabilities of repurchasing, the difference between firms with low and high probabilities of issuing new shares is much more evident. This difference provides support for the hypothesis that firms with weaker capital market access – as measured by the likelihood of issuing new shares – rely more heavily on internal funds. Indeed, these results are striking in light of the remaining heterogeneity likely to

be present within the low-probability sample – some of the firms relying less on new issues may be relying more on debt, as discussed above in connection to Figures 5 and 6.

This heterogeneity is evidenced by the fact that the low-probability sample has the greatest shares of firms at two extremes. It has the highest concentration of firms with neither a bond rating nor an I/B/E/S record (2901 observations, or 42 percent of all such observations, compared to 1610 – 23 percent – for the high-probability sample). But it also has the vast preponderance of observations for firms with a high bond rating and a large number of analysts. Of the 1034 observations with a bond rating of at least A+ and more than 15 analysts' forecasts reported by I/B/E/S – the categories with negative coefficients for the respective variables in Figures 5 and 6 – 811 observations are in the low probability sample and just 41 are in the high-probability sample. These 811 observations account for 11 percent of the observations in the low probability sample, but 58 percent of that sample's equity value. Moreover, *none* of these observations are censored (having zero dividends), even though such observations comprise 14 percent of the low-probability sample.

As a simple attempt to deal with this heterogeneity, we rerun the model for the low-probability new-issue sample separately for those firms with a bond rating of at least A+ and more than 15 analysts. The result, given in the first two columns of Table 6, confirm that the large firms with a high bond-rating and a large number of analysts exhibit less sensitivity to cash flow and investment than the remainder of the low-probability sample, but still somewhat greater sensitivity than firms in the high-probability sample.[12]

[12] The results for this sub-sample are identical to those obtained using OLS (because there are no censored observations). The adjusted R^2 for this regression is .828. This is much higher than that in the fifth column of Table 2, for the same specification estimated on the entire sample of mature firms, confirming the presence of considerable heterogeneity in that earlier sample.

Further evidence of the greater dividend sensitivity of firms with weak capital-market attachment comes from the last two columns of Table 6, in which we consider two samples of observations, those below the mean probability both of issuing new shares and repurchasing, and those above the mean probability for both events. The responsiveness to both investment and cash flow is clearly greater for the low-probability group.

VIII. Time Series Results

Thus far, all of our analysis has concerned responsiveness of dividend policy at the firm level; every specification has included time dummies to control for aggregate variables, including tax policy. Given the length of our panel, we are limited in our ability to carry out aggregate analysis. However, there are a couple of exercises that will be useful to shed further light on the results presented thus far.

The first question is whether there have been important changes over time in patterns of financial behavior. As discussed above, spurts of repurchasing in the 1980s and again in recent years have led to the suggestion of such a shift. However, to what extent are trends present, once we control for other determinants of financial activity? Figure 7 presents the time dummies from the bivariate probit in Table 4 for repurchasing and new share issues, with 1985 taken as the benchmark. Except perhaps for the upward spike in the repurchase dummy in 1998, there is no obvious trend in either variable. Indeed, the two series exhibit cyclical behavior, with new issues becoming more likely, and repurchases less likely, around the period just after the 1990-91 recession, when prospects for improving profitability may have spurred investment that outstripped the internal funds available for firms just exiting a period of low profits.

As to trends in dividends, we have noted that many of our observations are for firms that pay no dividends at all. Indeed, the propensity of firms to pay dividends has fallen over time.

Fama and French 2000 argue that this is due in part to the changing composition of the universe of firms. It is useful, though, to inquire how much of the aggregate trend can be explained by the factors as we considered in our panel estimation. That is, we will estimate a "between" regression trying to explain the time series behavior of dividends, starting with the same model used in the "within" (time periods) estimates already presented.

The dependent variable for this model is the series of time dummies from a representative dividend equation, that for all mature firms given in the first column of Table 3. We construct the cash flow, investment, value, and debt variables, and the assets variable used to deflate them, using parallel definitions to the extent possible with data from the National Income and Product Accounts and the Federal Reserve Flow of Funds Accounts.[13] The resulting regressions are shown in Table 7. The estimates in the table's first column, for a model with just a constant and time trend, show that there is a significant time trend in our data as well. The second column provides estimates for our standard model. The second lags of all the explanatory variables are quite insignificant; dropping them yields the results in the third column of Table 7. As the results in these two columns illustrate, inclusion of our explanatory variables does not succeed in eliminating (or even reducing) the time trend. Clearly, there is something going on over time in addition to what our model explains. On the other hand, the variables in our model have the same effects as those found in the micro regressions. Indeed, cash flow and, particularly, investment have effects that are even larger than in the micro estimates.

One must take some care in interpreting this result, because there are other factors influencing behavior at the macro level. An obvious candidate is tax policy, as represented by

[13] From NIPA, investment equals nonresidential investment and cash flow equals after-tax corporate profits plus the capital consumption allowance for the corporate sector excluding Finance, Insurance and Real Estate. From the FOF balance sheets, assets, debt and value are for the nonfinancial corporate sector; assets are tangible assets at historic cost; debt is credit market debt; value is net worth, at market value.

the tax discrimination variable, (1-*q*)/(1-*c*) commonly used in time series regressions to explain dividend behavior. We construct this variable using values of *q* and *c* for households obtained from the NBER's TAXSIM model, adjusted for the share of equity held by tax-exempt investors, as reported by the Flow of Funds Accounts for each year.[14] The last column of Table 7 shows the impact of including this variable, lagged one period to avoid possible simultaneity problems.[15] The tax variable has the predicted sign (lower taxes – a higher value of the tax variable – leads to higher dividends), although it is insignificant. But it leaves the investment and cash flow variables significant. That dividends, in the aggregate, do respond to these variables is illustrated in Figure 8, which graphs the regression relationship of the dependent variable (the dividend dummy) to investment, i.e., after each has been purged of the part predictable by the other regressors in this last equation.

IX. Conclusions

Our results suggest that firms in the U.S. nonfinancial corporate sector do vary their dividends in response to cash flow, investment, and debt. That is, they use retained earnings to supply a portion of their marginal investment funds. The sensitivity of this response depends on firm characteristics, as those firms we identify as having weak capital-market access – with no bond rating or analysts on record – are more sensitive in their dividend decisions than are other firms. These firms are less likely to issue new shares than is the typical firm, and so it makes sense that they would be more likely to use retained earnings as a source of funds. On the other

[14] We include in this category the holdings of state and local governments, state and local government retirement funds, pension funds and foreign investors. The taxable share ranges between .65 and .69 over the sample period.

[15] Including the current value of (1-*q*)/(1-*c*) instead led to similar results. The one-period-ahead value, when included, had an extremely small effect.

hand, another group of firms that are relatively unlikely to issue new shares consists of those at the other extreme – with high bond ratings and a large number of analysts following them. These firms' dividends appear only slightly more responsive to cash needs than the group we project as likely to issue shares. However, the former group also has greater access to borrowing than does the typical firm in the group likely to issue shares, and so may well be relying on debt, rather than external equity, as a source of funds. But heavier reliance on debt does not, in itself, represent a rejection of the most important implication of the new view of equity policy, that provisions to reduce the tax burden on dividends will have no impact on the cost of capital. This result will still be true if firms use dividends and debt together to finance marginal investment without reliance on new share issues.

Indeed, even the presence of new issues and repurchases appears to be consistent with this key implication of the new view, if they respond not only to investment but also to cash flow. Our probit results support the hypothesis that new issues (and repurchases) account for the same marginal share of the sources of investment funds and the uses of cash flow. We constructed similar tests of equality in our dividend equations, rejecting all in favor of larger cash flow coefficients. This rejection may constitute partial support for the traditional view, but it also may simply reflect the imperfect nature of firm equity value as a control for future profitability, with some of this effect being picked up by the investment variable. To the extent that such a problem is less severe at the aggregate level, this argument is supported by the time series results in Table 7, for which the investment coefficient was substantially larger in magnitude.

Thus, we have found strong support for the hypothesis that dividends do respond to investment as well as to cash flow, a key tenet of the new view. We have found further support

for an extended version of the new view in the result that, while new share issues are also quite responsive to investment, they are equally responsive to increases in cash flow. This undercuts a key element of the reasoning in favor of the traditional view that dividend taxes raise the cost of capital.

Ultimately, though, there is no reason to argue that one view is "correct" and another is "incorrect." What matters for tax policy decisions is the relative importance of the different views, in terms of the extent to which dividend taxes affect the cost of capital. Our results suggest that standard calculations based on a model in which dividend taxes affect all distributions but no marginal funds is clearly invalid. But we have not proved that dividend taxes have no effect at all.

In a world in which firms vary in the responsiveness of their dividends and their ability to issue new shares, the more accurate model may be a hybrid in which funds are drawn from different sources, the weights depending on the relative costs of doing so. Estimating the parameters of such a model is beyond the scope of the present paper. Presumably, it would first require more progress in direction taken in this paper's appendix, extending the approach to include the costs faced by firms in making adjustments at different margins.

Appendix

Consider a firm whose objective is to maximize:

$$\text{(A1)} \quad \sum_{t=0}^{\infty}(1+r)^{-t}(1-q)\left[D_t - \tfrac{1}{2}a\left(D_t - D^*\right)^2\right]$$

where ρ is the investor's after-tax discount rate, θ is the dividend tax rate, and α is a parameter representing the cost of having dividends deviate from their "long-run" level, D^*.

The firm's cash flow identity is:

$$\text{(A2)} \quad D_t = F_t(K_t) - \left[K_{t+1} - (1-d)K_t\right] + B_{t+1} - \left[1 + i_t(1-t)\right]B_t$$

where $F_t(\cdot)$ is the firm's production function at date t (expressed after-tax, for simplicity), K_t is the capital stock at date t, δ the rate at which capital decays, B_t the stock of debt at date t, i_t the interest rate on this debt, and τ the corporate tax rate applicable to interest deductions. To reflect non-tax borrowing costs, we express i_t as an increasing function of leverage:

$$\text{(A3)} \quad i_t = \bar{i} + \tfrac{1}{2}bB$$

To generate investment fluctuations, we assume that the production function experiences fluctuations in productivity; that is,

$$\text{(A4)} \quad F_t(\cdot) = q_t G(\cdot)$$

To analyze the firm's behavior over time, we derive first-order conditions for K_t and B_t using (A1) - (A4) and linearize these conditions around a steady state where $\theta = \theta^* = 1$. The resulting solution for the capital stock can be expressed as a partial adjustment model:

$$\text{(A5)} \quad K_t - K_{t-1} = (1 - l_1)\left(\hat{K}_t - K_{t-1}\right)$$

where

$$\text{(A6)} \quad \hat{K}_t = \sum_{s=t}^{\infty} (l_2 - 1)\, l_2^{-(s-t+1)} \tilde{K}_s$$

and

$$\text{(A7)} \quad \tilde{K}_s = K^* + \frac{q_s - 1}{g} - \frac{(1+r)\,a}{g(r+d)}\left[x(q_{s+1} - q_s) + \left(G^* - x(1+r)\right)(q_s - q_{s-1})\right]$$

where $\lambda_2 > 1 > \lambda_1$ are the two roots of the second-order difference equation in K, $\gamma = -G''/G'$ measures the curvature of the production function, and $x = (\rho + \delta)/\beta(1-\tau)$.

According to (A6) - (A7), the firm targets a forward-looking weighted average, $\hat{K}$, of the optimal "spot" capital stock, $\tilde{K}$, which deviates from K^* based on the productivity of K^* (both directly and through the impact of dividend smoothing, as represented in (A7) by the term multiplied by α). The partial adjustment itself is motivated by this same incentive to smooth dividends.

Corresponding to this optimal investment path is one for dividends,

$$\text{(A8)} \quad D_t - D^* = -(1+gx)\left(K_{t+1} - K_t\right) + r\left(K_t - K^*\right) + x(q_{t+1} - 1) + \left(G^* - x(1+r)\right)(q_t - 1)$$

If we define $d_t = (D^* - D_t)/(K_{t+1} - K_t)$ to be the share of investment financed by deviations in dividends form their long-run value, we can solve for d_t by comparing (A8) and (A5), for a particular path of θ. In Figure 3, we trace out the response to a once-and-for-all increase in θ to θ^* at the end of period 0, after period -0 production occurs but before dividends are determined. This yields (after some algebra):

$$d_t = \begin{cases} (1+gx)\left[\dfrac{(l_2 - 1)(1 + r + gG^*)}{l_2(1+gx) - (1 + r + gG^*)}\right] & t = 0 \\ (1+gx)\left(1 + \dfrac{r}{1 - l_1}\right) & t > 0 \end{cases}$$

The difference at date 0 is caused by the fact that productivity is lower in that period ($\theta_0<1$). This has a direct impact on the ability to pay dividends (see (A8)) and also influences the value of $\tilde{K}_1$, the desired capital stock in period 1 (see (A7)).

The alternative paths in Figure 3 are for different values of α, the dividend-smoothing parameter.

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Table 1. Sample Statistics for Included Variables

(Sample Period: 1982-98)

Variable (scaled by assets)	Mean Value	Standard Deviation
Dividends	.010	.024
Investment	.102	.125
Cash Flow	.048	.192
Value	1.26	1.69
Debt	.251	.203

Table 2. Basic Dividend Models

Dependent Variable: Dividend/Assets Ratio
(Sample Period: 1982-98)

Sample:	All	All	Mature	Mature	Mature	Mature
Independent Variable:						
Investment (-1)	-0.014 (0.001)	-0.063 (0.003)	-0.038 (0.003)	-0.042 (0.003)	-0.042 (0.003)	-0.044 (0.004)
Investment (-2)	--	--	--	--	-0.012 (0.002)	-0.016 (0.003)
Cash (-1)	0.029 (0.001)	0.167 (0.004)	0.096 (0.005)	0.160 (0.008)	0.061 (0.005)	0.113 (0.008)
Cash (-2)	--	--	--	--	0.032 (0.005)	0.059 (0.008)
Value (-1)	0.001 (0.0001)	-0.005 (0.0003)	0.007 (0.001)	0.005 (0.001)	0.006 (0.001)	0.005 (0.001)
Value (-2)	--	--	--	--	0.002 (0.001)	0.001 (0.001)
Debt (-1)	-0.009 (0.0005)	-0.017 (0.001)	-0.009 (0.001)	-0.014 (0.002)	-0.006 (0.002)	-0.015 (0.004)
Debt (-2)	--	--	--	--	-0.016 (0.002)	-0.019 (0.003)
Dummies?	No	No	No	No	Yes	Yes
$\bar{R}^2$	0.070	--	0.190	--	0.340	--
Observations	68578	68578	30881	30881	27624	27624
Estimation Technique	OLS	Tobit	OLS	Tobit	OLS	Tobit

Notes: All specifications include year dummies

Investment, Cash, Value, and Debt are divided by firm assets.

Robust standard errors are in parentheses.

Table 3. Mature Firm Models

Dependent Variable: Dividend/Assets Ratio
(Sample Period: 1985-98)

Sample:	All Mature Firms	Analysts, Bond Rating	Analysts, No Bond Rating	No Analysts or Bond Rating
Independent Variable:				
Investment (-1)	-0.046 (0.004)	-0.011 (0.006)	-0.047 (0.005)	-0.083 (0.010)
Investment (-2)	-0.015 (0.003)	-0.002 (0.005)	-0.019 (0.004)	-0.027 (0.008)
Cash (-1)	0.114 (0.009)	0.055 (0.010)	0.081 (0.011)	0.111 (0.020)
Cash (-2)	0.062 (0.009)	0.059 (0.013)	0.047 (0.009)	0.036 (0.015)
Value (-1)	0.005 (0.001)	0.007 (0.001)	0.005 (0.001)	0.012 (0.002)
Value (-2)	0.002 (0.001)	0.001 (0.001)	0.002 (0.001)	0.001 (0.001)
Debt (-1)	-0.021 (0.004)	-0.029 (0.005)	0.001 (0.005)	-0.019 (0.008)
Debt (-2)	-0.019 (0.004)	-0.004 (0.005)	-0.032 (0.005)	-0.001 (0.009)
Observations	22369	6162	8384	7509

Notes: All specifications estimated as Tobits, with year, industry, and size dummies.
Investment, Cash, Value, and Debt are divided by firm assets.
Robust standard errors are in parentheses.

Table 4. Determinants of New Share Issues and Repurchases

Mature Firms, Bivariate Probit
(Sample Period: 1985-98)

Dependent Variable:	*New Shares*		*Repurchases*	
		$\partial F / \partial x$		$\partial F / \partial x$
Independent Variable:				
Investment (-1)	1.236 (0.136)	0.257	-1.138 (0.216)	-0.165
Investment (-2)	0.187 (0.097)	0.039	-0.297 (0.150)	-0.043
Cash (-1)	-0.464 (0.164)	-0.096	1.258 (0.205)	0.182
Cash (-2)	-0.767 (0.167)	-0.160	0.587 (0.199)	0.085
Value (-1)	0.196 (0.025)	0.041	-0.107 (0.026)	-0.016
Value (-2)	-0.185 (0.032)	-0.038	-0.065 (0.026)	-0.009
Debt (-1)	0.740 (0.125)	0.154	-1.050 (0.150)	-0.152
Debt (-2)	0.612 (0.124)	0.127	-0.008 (0.149)	-0.001
Pseudo R^2		.132		
Observations		22352		
Correlation		.998		

Notes: Both branches include year, industry, and size dummies, plus dummies for bond rating and number of analysts.

Investment, Cash, Value, and Debt are divided by firm assets.

Robust standard errors are in parentheses.

Table 5. Sample Splits Based on New Issue and Repurchase Probabilities

Dependent Variable: Dividend/Assets Ratio
(Sample Period: 1985-98)

Sample:	Repurchase High (pr > .140)	Repurchase Low (pr < .063)	New Issue High (pr > .202)	New Issue Low (pr < .095)
Independent Variable:				
Investment (-1)	-0.082	-0.023	-0.011	-0.113
	(0.010)	(0.006)	(0.004)	(0.013)
Investment (-2)	-0.027	-0.005	-0.003	-0.046
	(0.009)	(0.003)	(0.003)	(0.010)
Cash (-1)	0.112	0.115	0.070	0.127
	(0.020)	(0.014)	(0.009)	(0.017)
Cash (-2)	0.036	0.063	0.054	0.077
	(0.015)	(0.012)	(0.011)	(0.017)
Value (-1)	0.012	0.004	0.001	0.009
	(0.002)	(0.001)	(0.002)	(0.002)
Value (-2)	0.001	0.002	0.003	0.002
	(0.001)	(0.001)	(0.002)	(0.001)
Debt (-1)	-0.019	-0.019	-0.030	-0.005
	(0.008)	(0.006)	(0.006)	(0.010)
Debt (-2)	-0.001	-0.024	-0.011	-0.020
	(0.009)	(0.005)	(0.004)	(0.009)
Observations	7511	7507	7511	7507

Notes: All specifications estimated as Tobits, with year, industry, and size dummies.
Investment, Cash, Value, and Debt are divided by firm assets.
Robust standard errors are in parentheses.

Table 6. Further Sample Splits

Dependent Variable: Dividend/Assets Ratio
(Sample Period: 1985-98)

Sample:	New Issue Low (pr < .095)	New Issue Low (pr < .095)	New Issue Low (pr < .141)	New Issue High (pr > .141)
Independent Variable:	Analysts ≤ 15, or Rating < A+	Analysts > 15 & Rating ≥ A+	& Repurchase Low (pr < .097)	& Repurchase High (pr > .097)
Investment (-1)	-0.116	-0.041	-0.092	-0.055
	(0.014)	(0.010)	(0.016)	(0.011)
Investment (-2)	-0.045	-0.032	-0.043	-0.002
	(0.010)	(0.008)	(0.014)	(0.009)
Cash (-1)	0.131	0.057	0.150	0.125
	(0.018)	(0.015)	(0.026)	(0.022)
Cash (-2)	0.079	0.069	0.120	0.042
	(0.018)	(0.014)	(0.024)	(0.018)
Value (-1)	0.009	0.005	0.007	0.005
	(0.002)	(0.001)	(0.002)	(0.002)
Value (-2)	0.002	0.003	0.001	0.001
	(0.001)	(0.002)	(0.002)	(0.003)
Debt (-1)	-0.007	-0.013	0.009	-0.031
	(0.011)	(0.007)	(0.013)	(0.008)
Debt (-2)	-0.021	0.003	-0.041	-0.008
	(0.010)	(0.007)	(0.010)	(0.009)
Observations	6696	811	3575	3579

Notes: All specifications estimated as Tobits, with year, industry, and size dummies.
Investment, Cash, Value, and Debt are divided by firm assets.
Robust standard errors are in parentheses

Table 7. Time Series Regressions

Dependent Variable: Time Dummies from All-Mature-Firm Tobit
(Sample Period: 1985-98; 14 observations)

Independent Variable:				
Intercept	0.013 (0.001)	0.030 (0.011)	0.027 (0.015)	0.018 (0.009)
Time	-0.0008 (0.0001)	-0.0010 (0.0003)	-0.0009 (0.0001)	-0.0009 (0.0001)
Investment (-1)	--	-0.446 (0.169)	-0.432 (0.049)	-0.326 (0.095)
Investment (-2)	--	0.037 (0.091)	--	--
Cash (-1)	--	0.208 (0.103)	0.193 (0.046)	0.133 (0.064)
Cash (-2)	--	-0.014 (0.084)	--	--
Value (-1)	--	0.025 (0.018)	0.019 (0.008)	0.015 (0.009)
Value (-2)	--	-0.010 (0.014)	--	--
Debt (-1)	--	-0.029 (0.034)	-0.006 (0.008)	-0.012 (0.015)
Debt (-2)	--	0.017 (0.034)	--	--
$(1-q)/(1-c)$ (-1)	--	--	--	0.010 (0.008)
$\bar{R}^2$	.764	.969	.982	.983

Figure 1. New Share Issue Frequency, by Year

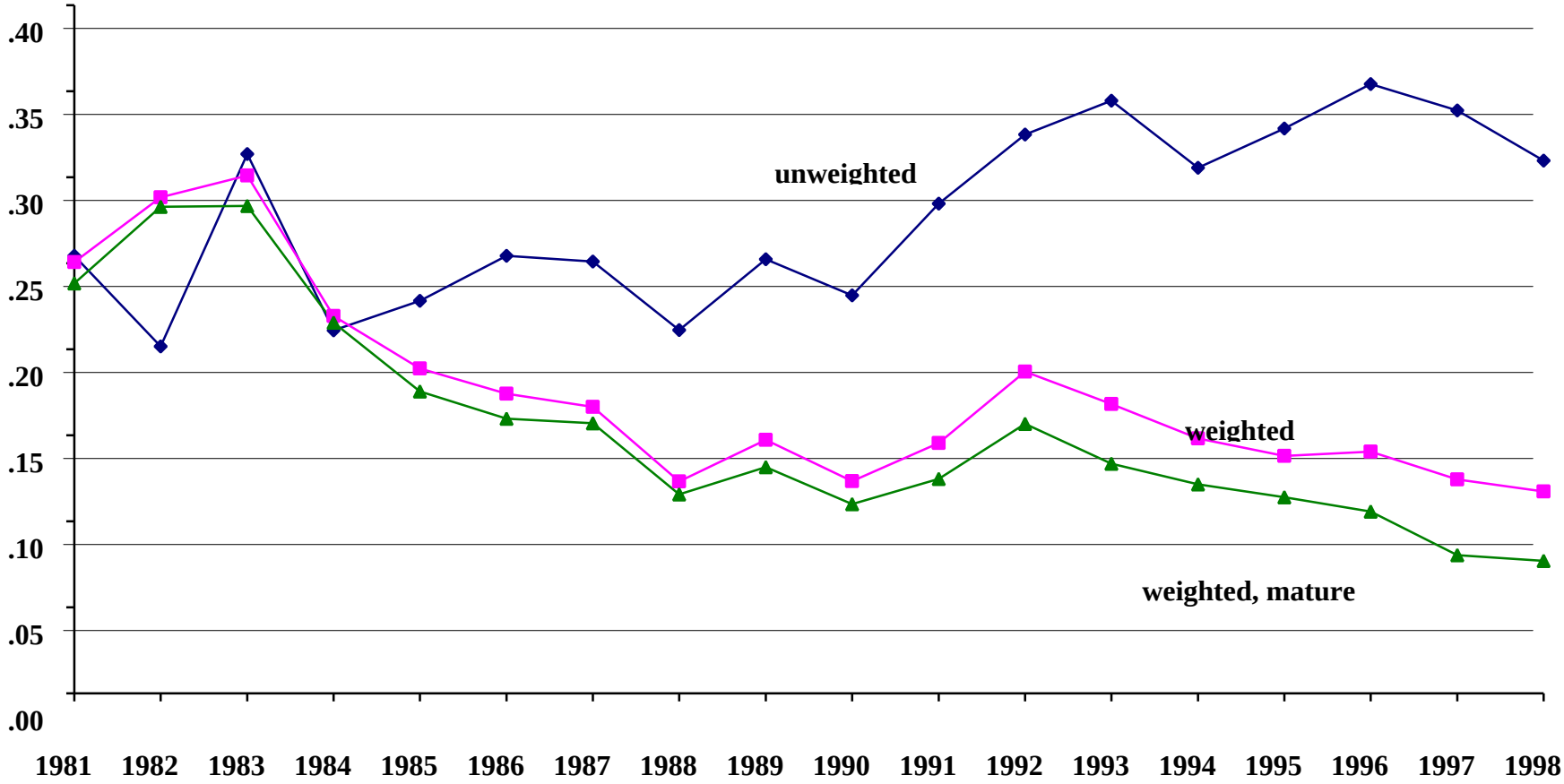

Figure 2. Repurchase Frequency, by Year

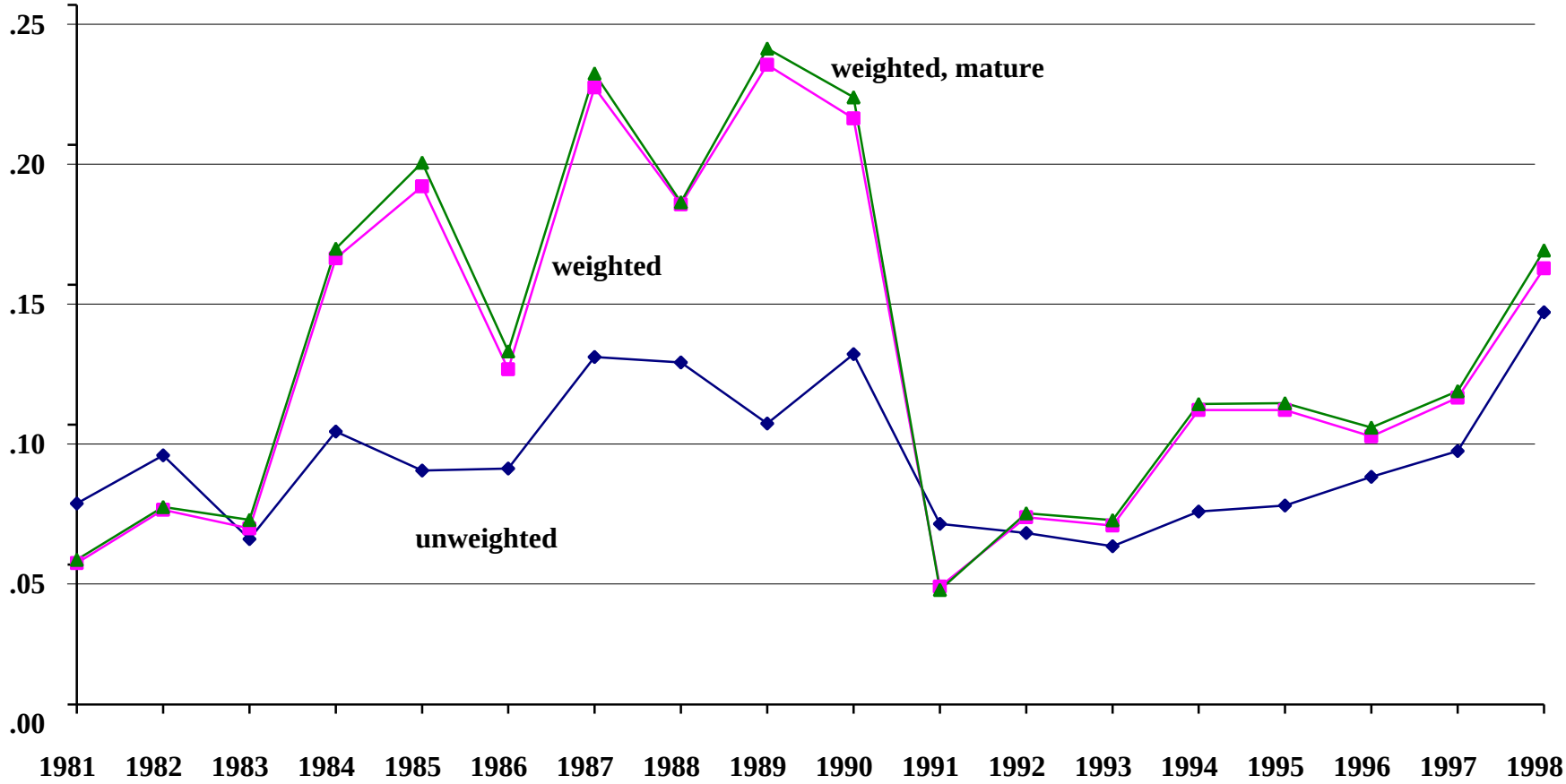

Figure 3. Dividends and Investment with Adjustment Costs

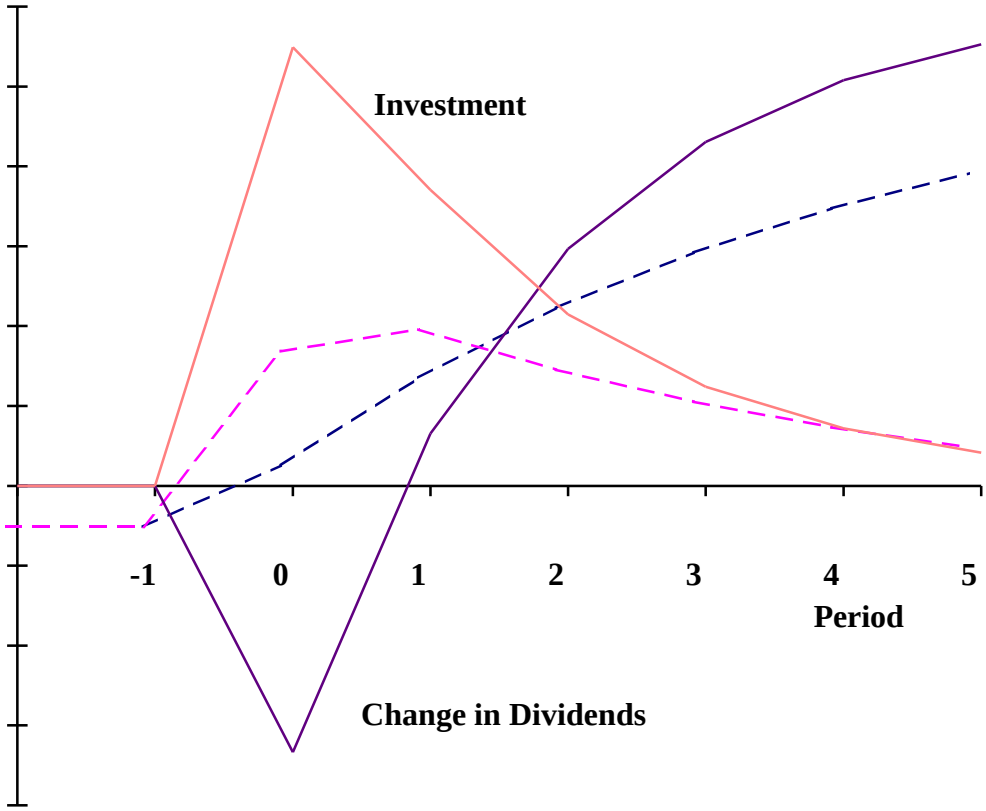

Figure 4. The Decision to Enter the Equity Market

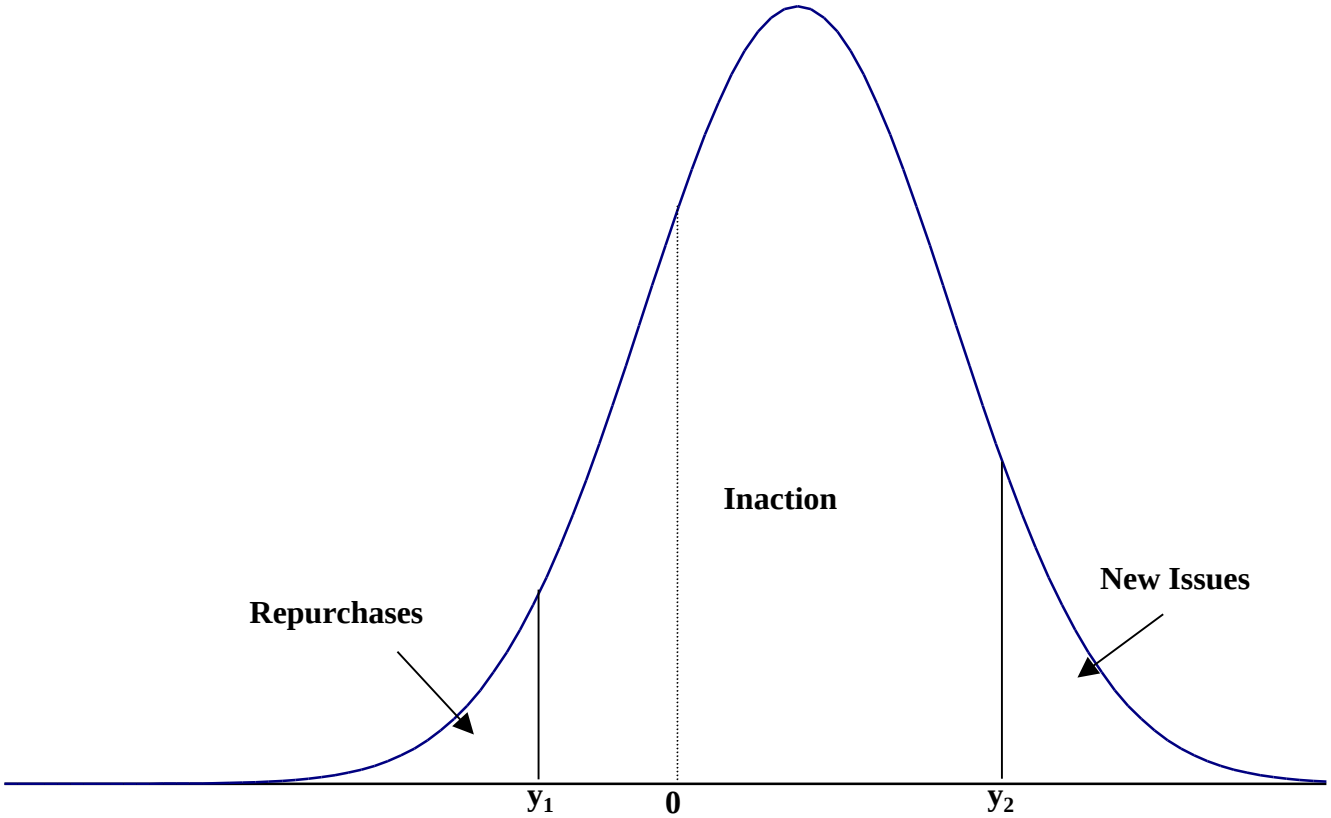

Figure 5. Effects of Bond Rating on New Issue and Repurchase Activity

(relative to no bond rating)

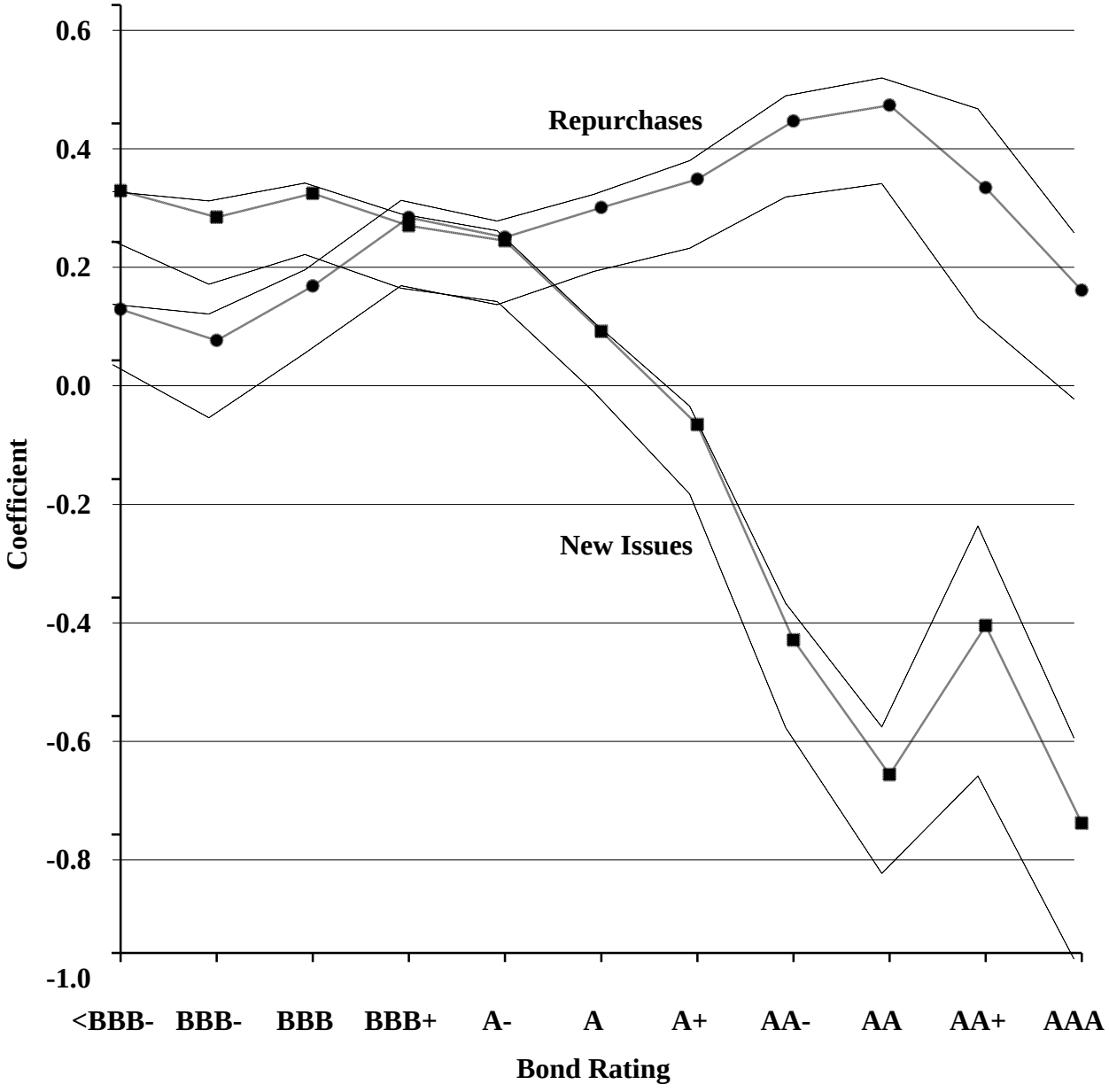

Figure 6. Effects of Analysts on New Issue and Repurchase Activity

(relative to no analysts)

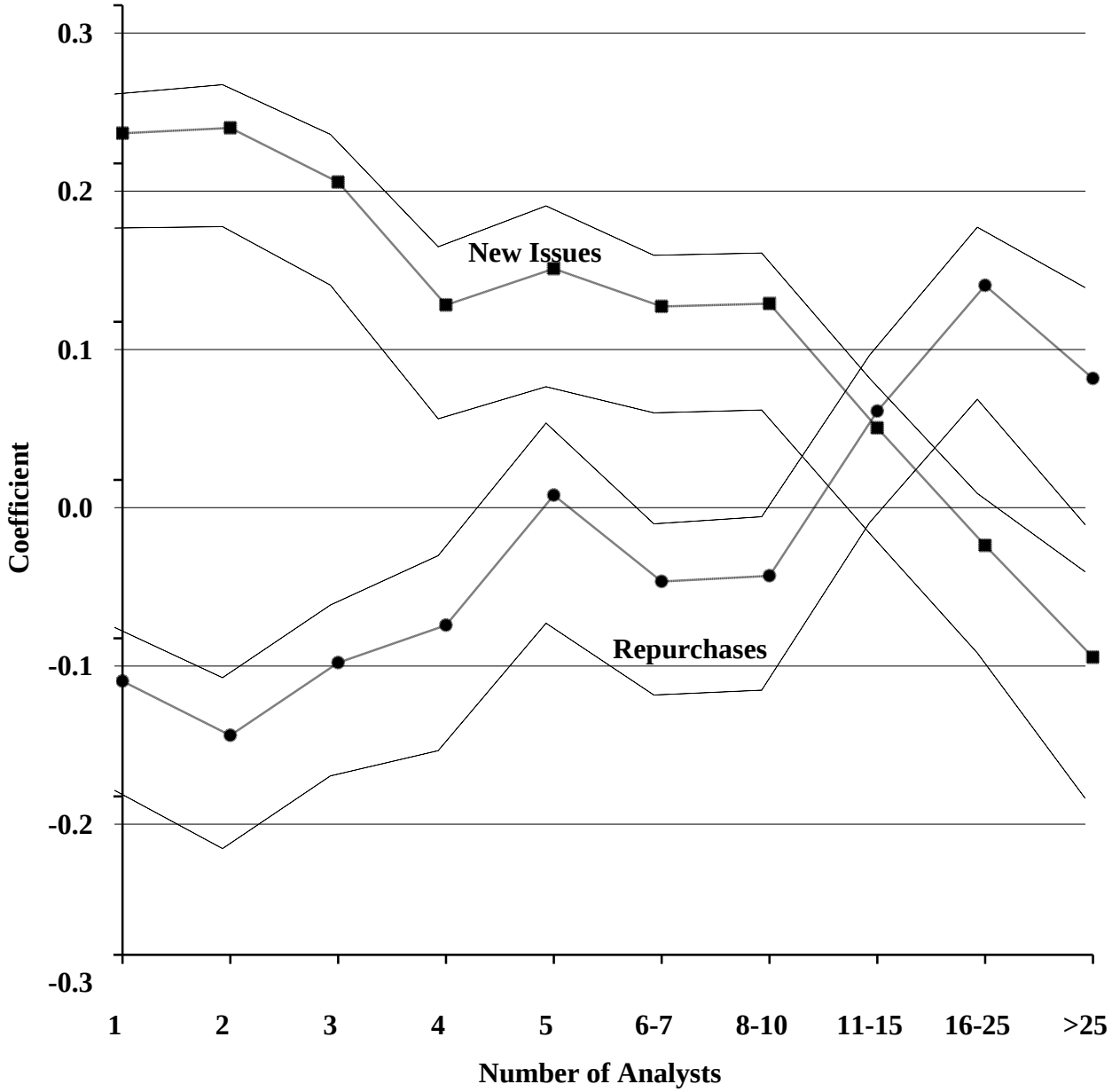

Figure 7. Time Dummies, New Shares and Repurchases

(1985 = 0)

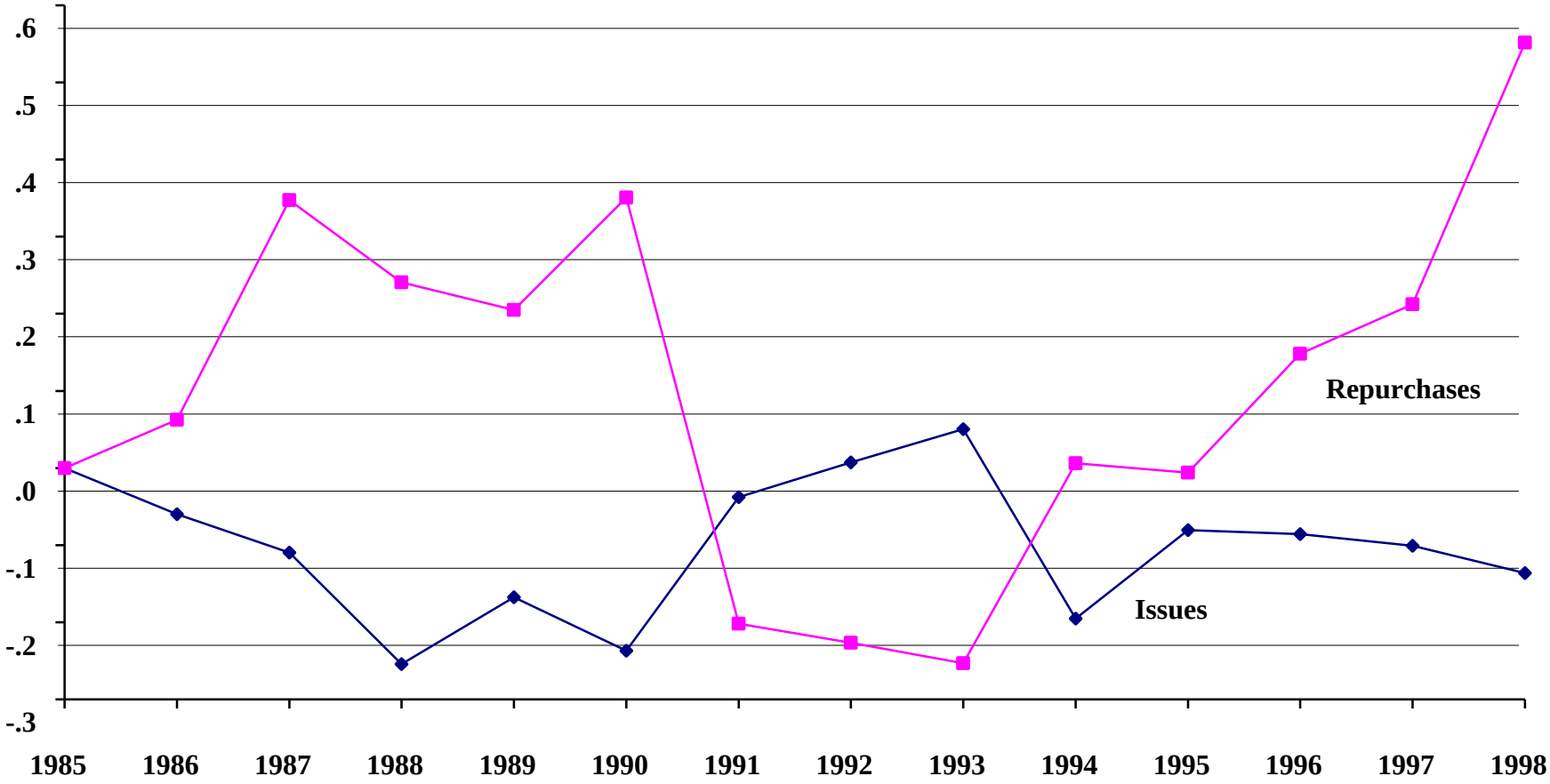

Figure 8. Dividend vs. Investment Residuals, Time Series Regression