Does Firm Value Move Too Much to be Justified by Subsequent Changes in Cash Flow?*

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Abstract

Through the flow of funds identity and the capital accumulation equation, we develop a present-value model that relates the market value of corporate assets to its expected future cash flow. The relevant measure of cash flow is net payout, which is the sum of dividends, interest, and net equity and debt repurchases. A variance decomposition of the ratio of net payout to assets shows that 12% of its variation is explained by asset returns, while 88% is explained by cash flow growth. The constant discount rate present-value model is adequate for valuing corporate assets, in contrast to its failure for valuing equity.

JEL classification: G12; G32; G35

Keywords: Asset valuation; Discount rate; Market timing; Payout policy

First draft: March 18, 2004

This draft: October 27, 2005

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*For comments and discussions, we thank Andrew Abel, John Campbell, Jonathan Lewellen, Craig MacKinlay, Michael Roberts, Robert Stambaugh, and seminar participants at Dartmouth, Federal Reserve Bank of Boston, Harvard, and Wharton. Maria Giduskova provided excellent research assistance. The views expressed in this paper are solely those of the authors and do not reflect official positions of the Federal Reserve Bank of Boston or the Federal Reserve System.

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Stock returns are predictable, implying that discount rates are time varying.[1] This fact should be of primary importance in the valuation of firms and projects, but classroom and business practice seems to suggest otherwise. In introductory finance classes, we teach students to discount expected future cash flow at a constant discount rate. In corporations, managers spend much effort in projecting future cash flow, but relatively little effort in justifying discount rates. One interpretation is that classroom and business practice lags academic research, partly because present-value calculations are more difficult with time-varying discount rates (see Ang and Liu (2004)). Another interpretation is that the value of firms is mostly driven by changes in expected cash flow, rather than by changes in discount rates. This paper confirms the second interpretation, that the constant discount rate present-value model is adequate for valuing corporate assets.

Figure 1 illustrates our main finding. Panel A shows the log real value of a stock price index together with the present value of future dividends discounted at a constant rate.[2] The figure highlights the relative importance of time-varying discount rates in the present-value relationship between dividends and stock price (LeRoy and Porter 1981, Shiller 1981). At the end of 2000, for example, stock price is approximately 100% higher than the present value of dividends discounted at a constant rate. Panel B shows the log real asset value of U.S. nonfinancial corporations together with the present value of future net payout discounted at a constant rate. *Net payout* is the total cash outflow from the corporate sector, which is the sum of dividends, interest, equity repurchase net of issuance, and debt repurchase net of issuance. Asset value moves in lockstep with the present value of net payout discounted at a constant rate.

A variance decomposition of the ratio of net payout to assets, or *net payout yield*, shows that 12% of its variation is explained by asset returns, while 88% is explained by net payout growth. The hypothesis that none of the variation in net payout yield is explained by asset

[1]See, for example, Campbell (1987), Campbell and Shiller (1988b), Fama and French (1988, 1989), Fama and Schwert (1977), and Keim and Stambaugh (1986).

[2]The figure replicates Campbell, Lo and MacKinlay (1997, Figure 7.2) for the period 1926–2004. Appendix C gives a full description of the estimation.

returns cannot be rejected. This is not to say that discount rates are literally constant, but that expected net payout growth plays a relatively important role in the present-value relationship between net payout and asset value. Our findings are similar when we focus on total market equity, excluding corporate liabilities from the analysis. The relevant measure of cash flow for valuing total market equity is *equity payout*, which is the sum of dividends and equity repurchase net of issuance. A variance decomposition of the ratio of equity payout to market equity, or *equity payout yield*, shows that 18% of its variation is explained by equity returns, while 82% is explained by equity payout growth.

This paper builds on the recent literature on corporate payout policy, which has broadened the scope of payout beyond ordinary dividends (see Allen and Michaely (2003) for a survey). Since the early 1980's, equity repurchase has become an increasingly important vehicle of payout to shareholders (Grullon and Michaely 2002). Firms tend to use dividends to distribute the permanent component of earnings because dividend policy requires financial commitment (Lintner 1956). In contrast, firms tend to use repurchases to distribute the transitory component of earnings because issuance and repurchase policy retains financial discretion. Consequently, net equity repurchase is much more volatile and mean reverting than dividends (see Dittmar and Dittmar (2004), Guay and Harford (2000), and Jagannathan, Stephens and Weisbach (2000)). This fact underlies our finding that the value of corporate assets is primarily driven by changes in expected cash flow, rather than by changes in discount rates.

This paper contributes to the payout literature by examining the sources of variation in corporate payout and issuance activity through the firm's intertemporal budget constraint (Campbell 1991). We quantify the relative importance of the two motives that affect payout and issuance activity, changes in discount rates and changes in expected future cash flow growth. The first motive is usually referred to as "market timing," the idea that (net) issuance is high when the cost of capital is low. We find that only 3% of the variation in equity payout and issuance activity is explained by changes in discount rates, while 79% is explained by changes in expected cash flow growth. (The rest is explained by the covariance between the two motives.) This is not to say that market timing is not a consideration in equity payout and issuance policy, but that changes in profitability is a relatively more important motivation.

A methodological contribution of this paper is to document the history of payout, issuance, and asset value for the U.S. nonfinancial corporate sector since 1926. Because the *Flow of Funds Accounts* are only available since 1946, we use data from original sources to construct consistent time series for the earlier period. We essentially extend the methodology in Wright (2004) to account for liabilities and its associated flows, in order to have a complete picture of the flow of funds identity. Our data allow us to quantify, from a macroeconomic perspective, the relative importance of historical events such as the tightening of bond markets during the Great Depression, the leveraged buyouts of the 1980's, and the surge of equity repurchase activity in the last twenty years.

The rest of the paper is organized as follows. Section 1 provides the main intuition behind our empirical findings by focusing on equity. Section 2 provides an analytical and empirical description of net payout yield in the context of the firm's intertemporal budget constraint. Section 3 contains our main empirical findings on the present-value relationship between net payout and asset value. Section 4 uses the firm's intertemporal budget constraint to analyze the motives behind corporate payout and issuance policy. Section 5 concludes. The appendices contain details on the data and methodology omitted in the main text.

1 Valuation of Market Equity

The purpose of this section is to describe our main empirical findings in the simplest possible example. In order to do so, we focus our attention on equity. The relevant notion of cash flow in the valuation of total market equity is equity payout, which is the sum of dividends and equity repurchase net of issuance. The intuition that we develop here will be useful in thinking about the valuation of total corporate assets, which is the main focus of this paper.

1.1 Dividend Yield versus Equity Payout Yield

Let P and D denote the price and dividend per share of equity. The return on equity for the holding period t to $t+1$ is

$$R_{t+1} = \frac{P_{t+1} + D_{t+1}}{P_t}. \tag{1}$$

Let $[\cdot]^+$ be an operator that takes the positive part of the number inside the brackets (i.e., takes the value zero if the number inside is negative). Multiplying the numerator and the denominator of equation (1) by the number of shares outstanding in period t,

$$R_{t+1} = \frac{\text{ME}_{t+1} + \text{DIV}_{t+1} + \text{REP}_{t+1} - \text{ISS}_{t+1}}{\text{ME}_t}, \tag{2}$$

where

$$\begin{aligned}
\text{ME}_t &= P_t \times \text{Shares}_t, \\
\text{DIV}_{t+1} &= D_{t+1} \times \text{Shares}_t, \\
\text{REP}_{t+1} &= P_{t+1}[\text{Shares}_t - \text{Shares}_{t+1}]^+, \\
\text{ISS}_{t+1} &= P_{t+1}[\text{Shares}_{t+1} - \text{Shares}_t]^+.
\end{aligned}$$

Equation (1) is the return on one share of equity, and equation (2) is the return on all outstanding shares of equity. Equity return is the *same* in both cases, but they have different implications for cash flow. An investor that owns one share receives dividends as the cash outflow from the firm. An investor that owns all outstanding shares receives dividends and equity repurchase as the cash outflow from the firm, but in addition, invests equity issuance as the cash inflow to the firm. We refer to the ratio D_t/P_t as the dividend yield, and the ratio $(\text{DIV}_t + \text{REP}_t - \text{ISS}_t)/\text{ME}_t$ as the equity payout yield. Dividend yield and equity payout yield coincide only in a world where the number of shares outstanding remains constant over time.

Figure 2 shows the time series of dividend yield and equity payout yield for all NYSE, AMEX, and NASDAQ stocks for the period 1926–2004. As in Boudoukh, Michaely, Richardson and Roberts (2004), we construct equity payout yield for a monthly rebalanced value-weighted portfolio using the CRSP Monthly Stock Database. We keep track of all the cash flows in equation (2) for individual stocks, including potentially important terminal cash distributions through CRSP's delisting data, then aggregate returns and cash flows across all stocks in the portfolio.

Dividend yield is less volatile and more persistent than equity payout yield. The high persistence of dividend yield has led Boudoukh et al. (2004) to question its stationarity, finding evidence for a structural break in 1984. Dividend yield is above equity payout yield for most of the sample period, indicating a net capital inflow to the market equity of U.S. corporations. Equity payout can be negative whenever issuance exceeds dividends plus repurchase. The two striking troughs in equity payout yield at the end of 1929 and 2000 are such episodes, which are interestingly at the end of stock market booms. This fact underlies Baker and Wurgler's (2000) finding that equity issuance predicts a subsequently low equity return.

1.2 Variance Decomposition of Dividend Yield

In Panel A of Table 1, we estimate the joint dynamics of equity return, dividend growth, and dividend yield through a vector autoregression (VAR). Appendix C gives a full description of the estimation. As shown in the first column, past equity return and dividend growth have little forecasting power for equity return; the coefficients are not significantly different from zero. However, high dividend yield predicts high equity return with a t-statistic of almost two (Campbell and Shiller 1988a, Fama and French 1988). As shown in the second column, neither past equity return, dividend growth, or dividend yield have forecasting power for dividend growth. As shown in the last column, dividend yield is essentially an autoregression with coefficient 0.93.

Using the VAR model, we examine the valuation of the stock price index in relation to dividends. The particular framework that we adopt is the log-linear present value model of Campbell and Shiller (1988a), which can be interpreted as a dynamic version of the Gordon growth model that allows for time variation in discount rates and expected cash flow growth. We decompose the variance of dividend yield into its covariance with future equity returns, future dividend growth, and future dividend yield (Cochrane 1992). Section 3 gives a full description of the variance decomposition. We report the results in Panel A of Table 2.

At a one-year horizon, 10% of the variation in dividend yield is explained by future equity returns, none is explained by future dividend growth, and 90% is explained by future dividend yield. At longer horizons, the variation in dividend yield is increasingly explained by future equity returns. In the infinite-horizon limit, 83% of the variation in dividend yield is explained by future equity returns, while only 17% is explained by future dividend growth. The standard errors for these estimates are somewhat large because the dividend yield is highly persistent. Because almost all of the variation in dividend yield is due to variation in discount rates, the stock price does not match the present value of future dividends discounted at a constant rate, which is demonstrated in Panel A of Figure 1.

1.3 Variance Decomposition of Equity Payout Yield

In Panel B of Table 1, we estimate the joint dynamics of equity return, equity payout growth, and equity payout yield through a VAR.[3] As shown in the first column, high equity payout yield predicts high equity return with a t-statistic of four (Boudoukh et al. 2004, Robertson and Wright 2006). The R^2 of the regression is 8%, compared to 4% for the dividend yield regression in Panel A. Therefore, the evidence for predictability is stronger in the sense that there is greater variation in expected return implied by equity payout yield. As shown in the second column, high equity payout yield also predicts low equity payout growth with

[3] The fact that equity payout can be negative requires a technical (not conceptual) modification to the definition of equity payout growth, which is explained in Appendix D.

a t-statistic above two and R^2 of 29%. In contrast to dividends, there is strong mean reversion in equity payout. As shown in the last column, equity payout yield is essentially an autoregression with coefficient 0.81, which is less persistent than the dividend yield.

Panel B of Table 2 reports the variance decomposition of equity payout yield. At a one-year horizon, 4% of the variation in equity payout yield is explained by future equity returns, 21% is explained by future equity payout growth, and 74% is explained by future equity payout yield. At longer horizons, the variation in equity payout yield is increasingly explained by future equity payout growth. In the infinite-horizon limit, only 18% of the variation in equity payout yield is explained by future equity returns, while 82% is explained by future equity payout growth. However, we reject the hypothesis that the discount rate is constant. Our finding parallels that of Ackert and Smith (1993) for the Toronto Stock Exchange. They find that a variance-bound test does not reject the constant discount rate hypothesis when cash flows include equity repurchases and merger distributions.

Figure 3 is a graphical illustration of the variance decomposition for equity payout yield. The figure shows log real market equity of CRSP stocks together with the present value of future equity payout discounted at a constant rate. There is some evidence for failure of the constant discount rate model. At the end of 2000, for example, market equity is approximately 50% higher than the present value of equity payout discounted at a constant rate. However, the gap between market equity and equity payout in Figure 3 is much smaller than the gap between the stock price index and dividends in Panel A of Figure 1.

At a mechanical level, the difference between dividend yield and equity payout yield is explained by the accounting of net equity repurchase. In dividend yield, net repurchase is in the denominator, accounted for as part of the invested capital. In equity payout yield, net repurchase is in the numerator, accounted for as part of the distributed cash flow. Since equity return is the same in both cases, the dramatic reversal in the variance decomposition from Panel A to B of Table 2 does not arise from differences in return predictability. In fact, the evidence for return predictability is stronger for equity payout yield. The reversal therefore arises from differences in cash flow predictability. Changes in equity repurchase and issuance are highly predictable, while changes in dividends are not. In terms of the Gordon growth model, time variation in expected cash flow growth plays a more important role than discount rates in the valuation of total market equity.

The shift from dividend yield to equity payout yield represents a subtle but important shift from a microeconomic to a macroeconomic perspective. This shift in perspective can be understood in terms of portfolio strategies. Dividend yield is the appropriate valuation ratio for an investor that owns one share of equity; this investor receives dividends, reinvests repurchases, and never invests additional capital. Equity payout yield is the appropriate valuation ratio for an investor that owns all outstanding shares of equity; this investor receives dividends, receives repurchases, and invests issuances as additional capital. At the macroeconomic level, net repurchase of equity is an outflow from the corporate sector that (by definition) cannot be reinvested. Therefore, the portfolio strategy implicit in dividend yield is only feasible at the microeconomic level, while the portfolio strategy implicit in equity payout yield is also feasible at the macroeconomic level.

Since the purpose of this paper is to examine the valuation of corporate assets in relation to cash flow, equity payout is an incomplete account of the relevant cash flows for two reasons. First, equity issuance, as measured by changes in shares outstanding, may represent transfer of ownership rather than actual cash flow. Important examples of such transactions are equity-financed mergers and equity issued as part of executive compensation. In 2000, equity issued through mergers (executive compensation) was 4.31% (1.23%) of the assets of S&P 100 firms (Fama and French 2005, Table 7). This fact explains why, in Figure 2, equity payout yield dips in 2000. Second, equity repurchase and issuance may not represent cash flow from outside the corporate sector, depending on whether or not there are offsetting transactions in debt. In order to account for all the cash flows, we now build a present-value model starting with the flow of funds identity for the corporate sector.

2 Description of Net Payout Yield

2.1 A Firm's Intertemporal Budget Constraint

In order to develop the firm's intertemporal budget constraint, we introduce the following relevant quantities.

- Y_t: Earnings net of taxes and depreciation in period t.
- C_t: Net payout, or the net cash outflow from the firm, in period t. It is composed of dividends, equity repurchase net of issuance, interest, and debt repurchase net of issuance.
- I_t: Investment net of depreciation in period t.
- A_t: Market value of assets at the end of period t.
- C_t/A_t: Net payout yield at the end of period t.
- $R_{t+1} = 1 + Y_{t+1}/A_t$: Return on assets in period $t+1$.

Investment includes both capital expenditures (on property, plant, and equipment) and financial investment. Since we are interested in the market value of assets, the relevant notion of depreciation is economic rather than accounting. Economic depreciation includes capital gains and losses from changes in the market value of assets.

The flow of funds identity states that the sources of funds must equal the uses of funds,

$$Y_t = C_t + I_t. \tag{3}$$

The capital accumulation equation is

$$A_{t+1} = A_t + I_{t+1}. \tag{4}$$

Equations (3) and (4) together imply that

$$A_{t+1} + C_{t+1} = R_{t+1} A_t. \tag{5}$$

This equation can be thought of as the firm's intertemporal budget constraint. It is analogous to a household's intertemporal budget constraint: C is consumption, A is wealth, and R is the return on wealth. It is also analogous to the formula for return on equity: C is dividends, A is the ex-dividend price, and R is the gross rate of return.

2.2 Data on Payout, Issuance, and Asset Value

Our primary data source is the *Flow of Funds Accounts of the United States* (Board of Governors of the Federal Reserve System 2005). The data are available at annual frequency for the period 1946–2004. We collect data from original sources to extend the sample back to 1926. We construct net payout and the market value of assets for the nonfarm, nonfinancial corporate sector as described in Appendix A.

Our secondary data source is Compustat. The data are available at annual frequency for the period 1971–2004 (since our construction requires the statement of cash flows). We construct net payout and the market value of assets for publicly traded nonfinancial firms by aggregating firm-level data as described in Appendix B. One advantage of Compustat is that repurchase and issuance are separately observed. Another advantage is that the market value of equity and the maturity structure of long-term debt are directly imputed, resulting in an arguably better measure of the market value of assets. The disadvantages of Compustat are the short sample period and the lack of coverage of private corporations. We therefore view the Flow of Funds as our main results, while Compustat provides supporting evidence. In an average year during 1971–2004, firms in Compustat represent 54% of the assets in the Flow of Funds.

2.3 Description of Payout, Issuance, and Asset Value

Table 3 reports summary statistics of the main variables. In the Flow of Funds, net payout is 1.7% of assets on average with a standard deviation of 1%. Dividends are the largest component of net payout. Net equity and debt repurchases represent a smaller component of net payout on average, but they are as volatile as dividends. The autocorrelation of net payout yield is 0.81, and its components are also persistent. The Compustat sample paints a similar picture. *Net* repurchases of both equity and debt are smaller than dividends. However, equity repurchase and issuance are comparable to dividends on average, while long-term debt repurchase and issuance represent a larger fraction of assets.

Figure 4 shows the time series of net payout yield (Panel A) and its components (Panel B) in the Flow of Funds. Net payout has been positive in every year since 1926, which has been cited as evidence that the U.S. economy is dynamically efficient (Abel, Mankiw, Summers and Zeckhauser 1989). The 1930's and the 1980's are periods of high net payout relative to other decades. These two peaks are driven by different forces. The 1930's is a decade of high dividends and high debt repurchase, which is explained by the difficulty that firms had in issuing new debt during the Great Depression (Hickman 1952). In contrast, the 1980's is a decade of high equity repurchase and low debt repurchase. The high equity repurchase is partly explained by merger activity in the 1980's (see Andrade, Mitchell and Stafford (2001) and Baker and Wurgler (2000)). Allen and Michaely (2003) argue that cash distributions related to merger activity are an important, and often neglected, source of payout to shareholders.

Panel B shows that dividends have fallen relative to asset value throughout the sample period. The downward trend is explained by the fact that earnings have fallen relative to asset value, although dividends have not fallen relative to earnings (DeAngelo, DeAngelo and Skinner 2004, Fama and French 2001). Equity repurchase has increased recently, particularly after the adoption of Securities and Exchange Commission Rule 10b-18 in 1982 (Grullon and Michaely 2002). In the most recent decade, dividends are clearly low relative to asset value, but net payout is not unusually low when put into historical perspective.

As shown in Panel A of Figure 5, net payout in Compustat is on average a higher fraction of assets than in the Flow of Funds. This fact can be explained by firms that go private, which disappear from Compustat, but that remain in the corporate sector as defined by the Flow of Funds. In Compustat, the terminal cash flow (as equity repurchase) from a firm that goes private is recorded as an outflow from the publicly traded sector. The Flow of Funds nets out such transactions between public and private corporations. For example, the leveraged buyouts of the 1980's can explain why the net payout yield peaks at 6% in Compustat and only at 3% in the Flow of Funds during the same period. Kaplan (1991) reports that 62% of large leveraged buyouts during the period 1979–1986 remain privately owned in 1990.

Figure 5 identifies "hot markets" for equity (Panel B) and debt (Panel C) issuances during the period 1971–2004. Equity issuance, as fraction of assets, peaked in 1983. Equity issuance again peaked in 2000 at the height of the stock market boom of the 1990's. The market for long-term debt was particularly depressed in 1983, which interestingly coincides with the hot equity market. Debt issuance rises throughout the rest of the 1980's and peaks in 1992.

Table 4 performs a simple accounting decomposition that summarizes the sources of time variation in net payout yield. By definition, the variance of net payout yield is equal to the sum of the covariances of net payout yield with its components. The covariances, scaled by the variance of net payout yield, represent the fraction of the time variation in net payout yield explained by each of its components. In the Flow of Funds, each of the four components (dividends, interest, net equity repurchase, and net debt repurchase) account for a similar fraction of the variation in net payout yield, between 20% and 30%. In the Compustat sample, net equity repurchase plays a more prominent role, accounting for 45% of the variation in net payout yield, while net debt repurchase accounts for only 5% of the variation. Most of the variation in the net equity flow is explained by repurchase (47%)

rather than issuance (-2%).

Panel A of Figure 6 shows the time series of real asset return, together with real equity return, for the period 1926–2004. The correlation between asset return and equity return is 0.97. Asset return has mean 5.4% and standard deviation 12.2% (see Table 3 and also Fama and French (1999, Table V)). Panel B shows the time series of real net payout growth, together with real dividend growth, for the period 1926–2004. The correlation between net payout growth and dividend growth is 0.01. Net payout growth has mean 3.8% and standard deviation 38.4% (see Table 3), which is much more volatile than dividend growth.

A key empirical finding of this paper, documented in the next section, is that the variation in net payout yield is mostly explained by future net payout growth, rather than future asset returns. Figure 6 provides a simple intuition for our finding. Net payout growth is more volatile than asset return in the short run. If net payout yield is stationary, the volatility of net payout growth must fall to that of asset return in the long run through mean reversion. In contrast, equity return is more volatile than dividend growth in the short run. If the dividend yield is stationary, the volatility of equity return must fall to that of dividend growth in the long run through mean reversion.

3 Present-Value Relationship between Net Payout and Firm Value

3.1 Log-Linear Present-Value Formula

Under the assumption that net payout yield is stationary, the market value of assets can be approximated through a log-linear present-value formula (Campbell and Shiller 1988a). Let lowercase letters denote the log of the corresponding uppercase variables, and let Δ denote the first-difference operator. Let $v_t = \log(C_t/A_t)$ denote the log of net payout yield.

Log-linear approximation of equation (5) leads to a difference equation for net payout yield

$$v_t \approx r_{t+1} - \Delta c_{t+1} + \rho v_{t+1}, \tag{6}$$

where $\rho = 1/(1 + \exp\{\mathbf{E}[v_t]\})$. The constant in the approximation is suppressed, or equivalently all the variables are assumed to be demeaned, to simplify notation here and throughout the paper.

Solving equation (6) forward H periods,

$$v_t = r_t(H) - \Delta c_t(H) + v_t(H), \tag{7}$$

where

$$\begin{aligned} r_t(H) &= \sum_{s=1}^{H} \rho^{s-1} r_{t+s}, \\ \Delta c_t(H) &= \sum_{s=1}^{H} \rho^{s-1} \Delta c_{t+s}, \\ v_t(H) &= \rho^H v_{t+H}. \end{aligned}$$

In the infinite-horizon limit, equation (7) becomes

$$v_t = \sum_{s=1}^{\infty} \rho^{s-1} (r_{t+s} - \Delta c_{t+s}), \tag{8}$$

where convergence of the sum is assured by the stationarity of net payout yield. Equation (8) says that current net payout yield is high if future asset returns are high or future net payout growth is low.

Equation (8) also holds ex ante as a present-value formula

$$v_t = \mathbf{E}_t \sum_{s=1}^{\infty} \rho^{s-1} (r_{t+s} - \Delta c_{t+s}). \tag{9}$$

A high net payout yield must forecast either high future asset returns or low future net payout growth. Net payout yield summarizes a firm's expectations about future changes in asset value and cash flow, just as the consumption-wealth ratio summarizes a household's expectations about future changes in wealth and consumption (Campbell and Mankiw 1989). Rearranging equation (9),

$$a_t = c_t + \mathbf{E}_t \sum_{s=1}^{\infty} \rho^{s-1} \Delta c_{t+s} - \mathbf{E}_t \sum_{s=1}^{\infty} \rho^{s-1} r_{t+s}. \tag{10}$$

The first two terms on the right side of this equation can be interpreted as the present value of net payout under a constant discount rate.

3.2 Variance Decomposition of Net Payout Yield

In Table 5, we estimate the joint dynamics of asset return, net payout growth, and net payout yield through a VAR. Appendix C gives a full description of the estimation. Panel A reports results for the full sample 1926–2004, Panel B reports results for the postwar sample 1946–2004, and Panel C reports results for the Compustat sample 1971–2004.

As shown in the first column, past asset return and past net payout growth have little forecasting power for asset return; the coefficients are not significantly different from zero. However, high net payout yield predicts high asset return. The evidence for predictability is the strongest in the Compustat sample with a t-statistic of two and R^2 of 9%. As shown in the second column, past asset return and past net payout growth have little forecasting power for net payout growth. However, high net payout yield strongly predicts low net payout growth. The evidence for predictability is the strongest in the postwar sample with a t-statistic of four and R^2 of 21%. Simply put, there is strong mean reversion in net payout. As shown in the last column, net payout yield is essentially an autoregression, with coefficient 0.78 in the full sample. Although net payout yield is persistent, it is not as persistent as the dividend yield.

The intertemporal budget constraint (7) implies a variance decomposition of net payout yield

$$\operatorname{Var}(v_t) = \operatorname{Cov}(r_t(H), v_t) + \operatorname{Cov}(-\Delta c_t(H), v_t) + \operatorname{Cov}(v_t(H), v_t). \tag{11}$$

Table 6 reports this variance decomposition, which is estimated through the VAR model in Table 5. See Appendix C for a full description of the estimation. At a one-year horizon, 2% of the variation in net payout yield is explained by future asset returns, 21% is explained by future net payout growth, and 76% is explained by future net payout yield. At longer horizons, the variation in net payout yield is increasingly explained by future net payout growth. In the infinite-horizon limit, 12% of the variation is explained by future asset returns, while 88% is explained by future net payout growth. Since the 12% attributed to future asset returns is within one standard error of 0%, the hypothesis that asset value is equal to future net payout discounted at a constant rate cannot be rejected.

Panel B of Figure 1 is a graphical illustration of the variance decomposition for net payout yield. The present value of future net payout is the sample analog of the first two terms in equation (10), which are the current level and expected growth rate of net payout. Because future asset returns account for little of the variation in net payout yield, asset value closely corresponds to the present value of future net payout discounted at a constant rate.

In Panel C of Table 6, we report the variance decomposition of net payout yield for the Compustat sample. The results are similar to the Flow of Funds, although the shorter sample results in somewhat larger standard errors. In the infinite-horizon limit, 31% of the variation in net payout yield is explained by future asset returns, while 69% is explained by future net payout growth. The hypothesis that asset value is equal to future net payout discounted at a constant rate cannot be rejected.

The variance decomposition in Table 6 can be summarized in the language of cointegration. The value of corporate assets and net payout (i.e., the cash outflow from the firm) are cointegrated. When net payout yield deviates from its long-run mean, either asset value or net payout must revert to the common trend to restore the long-run equilibrium. Net payout plays a major role in the error correction, while asset value plays a negligible role. Simply put, the permanent component of net payout yield is asset value, while any deviation in net payout from asset value is transitory.

3.3 Portfolio View versus Macro View

Recent work finds evidence for predictability of cash flow growth, particularly with the earnings-price ratio (see Ang and Bekaert (2005) and Bansal, Khatchatrian and Yaron (2005b)). However, the dividend yield does not predict dividend growth. Lettau and Ludvigson (2005) and Menzly, Santos and Veronesi (2004) offer an explanation that reconciles these findings. The predictable component of dividend growth is the common (i.e., permanent) component in stock return and dividend growth, which offset each other in the ratio of dividends to stock price. Therefore, movements in stock price cannot be explained by changes in expected dividends alone (Panel A of Figure 1). In contrast, we find that net payout yield predicts the independent (i.e., transitory) component in net payout growth. Therefore, movements in asset value can be explained almost entirely by changes in expected net payout (Panel B of Figure 1).

The difference between dividend yield and net payout yield is fundamentally a difference between two world views. Dividend yield, which represents a portfolio view, is the appropriate valuation ratio for a "small investor" that owns one share of a value-weighted portfolio. Net payout yield, which represents a macro view, is the appropriate valuation ratio for a "representative household" that owns the entire corporate sector. The proper perspective, of course, depends on the economic application of interest. Net payout yield has applications in macroeconomics and corporate finance. In capital accumulation and economic growth, the total value of the corporate sector, not the equity price index, is related to the underlying quantity of capital (Abel et al. 1989, Hall 2001). In payout policy, firms jointly determine all components of net payout, not dividends alone (Allen and Michaely 2003).

4 Payout, Issuance, and the Cost of Capital

The last section focused on the variation in the ratio of net payout to assets. This section examines the variation in net payout and asset value separately. Changes in asset value allow us to answer, what causes the market to reassess the value of a firm? Changes in net payout allow us to answer, what motivates a firm to change its payout and issuance policy?

4.1 Variance Decomposition of Return

Our empirical framework is based on the firm's intertemporal budget constraint. Subtracting the expectation at time t of equation (8) from its expectation at time $t+1$,

$$r_{t+1} - \mathbf{E}_t r_{t+1} = -(\mathbf{E}_{t+1} - \mathbf{E}_t) \sum_{s=2}^{\infty} \rho^{s-1} r_{t+s} + (\mathbf{E}_{t+1} - \mathbf{E}_t) \sum_{s=1}^{\infty} \rho^{s-1} \Delta c_{t+s}. \tag{12}$$

Asset return is unexpectedly high when expected future asset returns fall or expected future cash flow growth rises. An analogous decomposition applies for equity return. This equation takes the view of an investor who rationalizes realized asset returns through changes in discount rates and expected cash flow growth.

Panel A of Table 7 essentially replicates the variance decomposition of equity return in Campbell (1991). By equation (12), the variance of unexpected equity return must equal the variance of changes in discount rates, plus variance of changes in expected dividend growth, minus twice the covariance between the two terms. Appendix C gives a full description of the estimation. Holding constant discount rates, only 38% of the variation in equity return is explained by dividends.

Panel B also reports a variance decomposition of unexpected equity return, but we use equity payout instead of dividends as the cash flow (see Appendix D). Holding constant discount rates, 55% of the variation in equity return is explained by equity payout. Expected cash flow growth explains more than half the variation in equity return because equity payout, unlike dividends, is highly transitory. However, the remaining variation must be explained by discount rates, which still plays an important role.

Table 8 reports the variance decomposition of unexpected asset return. Holding constant discount rates, 124% of the variation in asset return is explained by net payout in the 1926–2004 sample. Changes in discount rates tend to offset changes in expected cash flow growth since they are positively correlated. This correlation explains why unexpected asset return is 24% less volatile than changes in expected cash flow growth. Our findings are similar for both the 1946–2004 sub-sample and the Compustat sample.

Because the standard errors are somewhat large, we do not want to overemphasize the fact that asset returns appear to be driven entirely by expected cash flows. However, our findings are broadly consistent with previous empirical evidence. Campbell and Ammer (1993) find that bond returns are mostly driven by inflation expectations, rather than discount rates. Since nominal payments are fixed for pure-discount bonds, a change in expected inflation is effectively a change in real cash flows. Since net payout includes the cash flows for debt, changes in expected cash flows become a relatively more important part of the variation in asset returns.

4.2 Variance Decomposition of Payout and Issuance

We can reverse the viewpoint implicit in equation (12) by rearranging the equation as

$$\Delta c_{t+1} - \mathbf{E}_t \Delta c_{t+1} = (\mathbf{E}_{t+1} - \mathbf{E}_t) \sum_{s=1}^{\infty} \rho^{s-1} r_{t+s} - (\mathbf{E}_{t+1} - \mathbf{E}_t) \sum_{s=2}^{\infty} \rho^{s-1} \Delta c_{t+s}. \tag{13}$$

Net payout is unexpectedly high when expected future asset returns rise or expected future cash flow growth falls. An analogous decomposition applies for equity payout. This equation takes the view of a firm whose current payout and issuance activity reflects changes in the cost of capital and expected cash flow growth. There are essentially two motives that affect payout and issuance decisions.

The first term in equation (13) captures the "market timing" motive in repurchase and issuance activity. By market timing, we simply refer to the response of repurchase and issuance to time variation in the cost of capital. We do not take a stance on whether or not the time variation in expected returns is a consequence of market inefficiency. Firms issue securities as the cost of capital falls because some projects become positive net present value and hence require financing. The converse applies for repurchases in response to a rise in the cost of capital. Since our empirical framework includes financial assets as part of total assets, "projects" can include investment in working capital and other liquid securities.

The second term in equation (13) captures the "profitability" motive in repurchase and issuance activity. Firms issue securities when expected future cash flows rise because investment becomes more profitable. The converse applies for repurchases in response to a fall in expected future cash flows.

Panel B of Table 7 reports the variance decomposition of equity payout. By equation (13), the variance of unexpected equity payout must equal the variance of changes in discount rates, plus the variance of changes in expected cash flow growth, minus twice the covariance between the two terms. Only 3% of the variation in equity payout is explained by the cost of capital, while 79% of the variation is explained by expected cash flow growth. The covariance accounts for 16% of the variation, which suggests that a fall in the cost of capital is amplified by a rise in profitability.

Table 8 reports the variance decomposition of net payout, which accounts for equity flows together with debt flows. In the 1926–2004 sample, 14% of the variation in net payout is explained by the cost of capital, while 87% of the variation is explained by expected cash flow growth. The covariance accounts for little of the variation. Our findings are similar for both the 1946–2004 sub-sample and the Compustat sample.

Previous tests of payout and issuance motives have focused on the market timing hypothesis in isolation of the profitability motive. Our findings are consistent with previous work in that we cannot reject the hypothesis that payout and issuance are affected by the cost of capital. That is, we find evidence for the market timing motive. Our contribution is merely to quantify the importance of the market timing motive relative to the profitability motive. The evidence suggests that payout and issuance decisions are mostly driven by investment in response to changes in profitability, rather than changes in the cost of capital.

We recognize that our estimates are not necessarily informative about or comparable to the previous literature on market timing (see Ritter (2003) for a survey). The literature examines issuances and repurchases of different securities in isolation, even distinguishing between initial and seasoned offerings. In contrast, we summarize all payout and issuance decisions of firms in one variable, which allows us to impose the discipline of the intertemporal budget constraint. We find a small role for market timing in the average corporate transaction. However, our findings do not rule out an important role for market timing in less frequent transactions or extreme events, such as the internet IPO's in the late 1990's. At the very least, our findings suggest that the features of these less frequent transactions do not generalize to all corporate flows.

Another potential shortcoming of our analysis is that we have isolated only movements in the aggregate cost of capital. In principle, a firm can respond to movements in the firm-specific component of the cost of capital. If the cost of capital for two firms move in oppositive directions, aggregate flows can miss potentially important payout and issuance activity at the firm level. We believe that this scenario is not a major shortcoming of our analysis for two reasons. First, all firms should respond to common variation in the aggregate cost of capital, even in a world with firm-specific variation in the cost of capital. Second, existing empirical evidence has not revealed much firm-specific variation in the cost of capital (e.g., see Bansal, Fang and Yaron (2005a)), which questions the relevance of market timing at the firm level.

5 Conclusion

This paper adopts a macro view, rather than a portfolio view, to study the valuation of corporate assets in relation to net payout (i.e., the sum of dividends, interest, and net equity and debt repurchases). In the short run, the variance of net payout growth is higher than that of asset returns. In the long run, the variance of net payout growth falls to that of asset returns through mean reversion in net payout. A practical implication of our findings is that the constant discount rate present-value model is adequate for valuing corporations.

The strength of our empirical approach is that the variance decompositions are based on the firm's intertemporal budget constraint, which must hold in any economy. The weakness is that we remain silent on whether the empirical facts are consistent with optimal firm behavior. At a superficial level, any behavior for net payout is consistent with Modigliani and Miller's (1961) "anything goes" theorem. At a deeper level, we do not yet have an explanation for why equity repurchase and issuance are highly volatile and mean reverting, especially compared to dividends (see Allen and Michaely (2003)). We find that equity payout (net of issuance) is primarily driven by changes in expected future cash flow, rather than changes in the cost of capital. Although firms do issue and repurchase equity to exploit changes in the cost of capital, the primarily motive is investment in response to changes in future profitability.

Net payout yield for firms is analogous to the consumption-wealth ratio for households. In fact, they are equivalent in an economy where consumption is equal to capital income minus investment (Lucas 1978). Therefore, the stark contrast between the behavior of net payout yield and that of the consumption-wealth ratio is a future challenge for macroeconomics and finance.[4] A possible explanation is that labor income is negatively correlated with capital income (Lustig and Van Nieuwerburgh 2005). We speculate that institutions such as financial intermediaries, government, and foreign countries play an important role in driving a wedge between the cash outflow from the corporate sector and the consumption of households.

[4] See Cochrane (1994) and Lettau and Ludvigson (2004) for facts about the consumption-wealth ratio.

Appendix A Flow of Funds Data

For the period 1946–2004, our primary data source is the Board of Governors of the Federal Reserve System (2005). We obtain the book value of liabilities and net worth from Table B.102 (Balance Sheet of Nonfarm Nonfinancial Corporate Business). We obtain net dividends, net new equity issues, net increase in commercial paper, and net increase in corporate bonds from Table F.102 (Nonfarm Nonfinancial Corporate Business). We obtain net interest payments from National Income and Product Accounts (NIPA) Table 1.14 (Gross Value Added of Nonfinancial Domestic Corporate Business).

For the period 1926–1945, we collect data from original sources, following the Federal Reserve Board's basic methodology. We obtain the book value of liabilities and net worth from various volumes of the U.S. Treasury Department (1950, Table 4). Liabilities are the sum of accounts payable; bonds, notes, and mortgages payable; and other liabilities. Net worth is the difference of assets and liabilities. From the total for all industrial groups, we subtract the liabilities and net worth for "agriculture, forestry, and fishery" and "finance, insurance, real estate, and lessors of real property". We obtain net issues of equity and corporate bonds (Table V-14) from Goldsmith (1955). Net issues of equity are the sum of net issues of common stock (Table V-19) and preferred stock (Tables V-17 and V-18). We aggregate net issues over industrials, utilities, railroads, the Bell system, and new incorporations. For the period 1926–1928, we obtain dividends and interest payments, excluding the agriculture and finance sectors, from Kuznets (1941, Tables 54 and 55). For the period 1929–1945, these data are from NIPA Table 1.14.

In order to compute the market value of net worth, we first compute the book-to-market equity ratio for all NYSE, AMEX, and NASDAQ stocks. Following Davis, Fama and French (2000), we compute book equity for Compustat firms and merge it with historical data from Moody's Manuals, available through Kenneth French's webpage. We then merge the book equity data with the CRSP Monthly Stock Database to compute the aggregate book-to-market ratio at the end of each calendar year. We exclude the SIC codes 100–979 and

6000–6799 to focus on nonfarm nonfinancial firms. The market value of net worth is the book value of net worth divided by the aggregate book-to-market ratio.

Net payout is the sum of dividends and interest payments minus the sum of net equity and corporate debt issues. The market value of assets is the sum of book value of liabilities and the market value of net worth. The return on assets is computed from the market value of assets and net payout through equation (5).

Appendix B Compustat Data

We construct our data set by merging the Compustat Annual Industrial Database with the CRSP Monthly Stock Database. We exclude the SIC codes 6000–6799 to focus on nonfinancial firms. Table 10 lists the relevant variables from Compustat.

We construct payout and securities issuance from the statement of cash flows as

$$\begin{aligned} D &= \mathrm{DIV} + \mathrm{EQ\_REP} + \mathrm{INT} + \mathrm{LTD\_REP} + [-\mathrm{DEBT\_NET}]^{+}, \\ E &= \mathrm{EQ\_ISS} + \mathrm{LTD\_ISS} + [\mathrm{DEBT\_NET}]^{+}. \end{aligned}$$

See Richardson and Sloan (2003) for a similar construction. In order to account for equity repurchases that occur during mergers, acquisitions, and liquidations, we use CRSP's delisting data. The terminal cash outflow D from the firm is the delisting amount times the number of shares outstanding (from CRSP) whenever the delisting code is 233, 261, 262, 333, 361, 362, or 450.

We construct the market value of each firm as the sum of the market value of its common stock, preferred stock, long-term debt, and other liabilities. We follow the conventional procedure in the literature except in the treatment of other liabilities, to be consistent with the definition of assets for our application (e.g., Bernanke and Campbell (1988), Brainard, Shoven and Weiss (1980), and Hall, Cummins, Laderman and Mundy (1988)). The market value of common stock is the price of common stock times the number of shares outstanding at the end of calendar year. The market value of preferred stock is DIV_PREF divided by Moody's medium-grade preferred dividend yield at the end of calendar year. Other liabilities consists of LIAB_CUR, and if available, LIAB_OTH, TAX, and MINORITY.

The market value of long-term debt is computed by first imputing the maturity structure of bonds for each firm. All long-term bonds are assumed to be issued at par at the end of calender year, with semiannual coupons payments, and with maturity of 20 years. For a firm that exists in Compustat in 1958, its initial maturity structure is given by Hall et al. (1988, Table 2.3). For a firm that enters Compustat in subsequent years, its initial maturity structure is given by the global maturity structure for existing Compustat firms in that year. For a given firm, let LTD_t^i be the book value of bonds with i years to maturity at the end of year t. For each maturity $i = 1, \ldots, 19$, the book value of bonds is updated from year t to $t+1$ through the formula

$$\text{LTD}_{t+1}^i = \begin{cases} \text{LTD}_t^{i+1} & \text{if } \text{LTD}_{t+1} - \text{LTD}_t + \text{LTD}_t^1 > 0 \\ \text{LTD}_t^{i+1} \frac{\text{LTD}_{t+1}}{\text{LTD}_t - \text{LTD}_t^1} & \text{otherwise} \end{cases} .$$

New issues of 20-year bonds is given by the formula

$$\text{LTD}_{t+1}^{20} = [\text{LTD}_{t+1} - \text{LTD}_t + \text{LTD}_t^1]^+.$$

The market value of long-term debt is the book value of bonds multiplied by the respective price, summed across all maturities. The price of bonds at each maturity is computed from Moody's seasoned Baa corporate bond yield, assuming a flat term structure.

Appendix C VAR Estimation and Variance Decompositions

Let $x_t = (r_t, \Delta c_t, v_t)'$ be a column vector consisting of asset return, net payout growth, and net payout yield. To simply notation, assume that the variables are demeaned so that $\mathbf{E}[x_t] = 0$. Following Campbell and Shiller (1988a), the joint dynamics of the variables are modeled by the VAR

$$x_{t+1} = \Phi x_t + \epsilon_{t+1}, \tag{14}$$

where $\mathbf{E}[\epsilon_{t+1}] = 0$ and $\mathbf{E}[\epsilon_{t+1}\epsilon_{t+1}'] = \Sigma$. The first two rows of model (14) have the interpretation of a vector error correction model under the maintained assumption that net payout yield is stationary (i.e., net payout and asset value are cointegrated). The model is identified by the moment restriction

$$\mathbf{E}[(x_{t+1} - \Phi x_t) \otimes x_t] = 0. \tag{15}$$

Let I denote an identity matrix of dimension three, and let e_i denote the ith column of the identity matrix. The present-value model, that is the expectation of equation (6) in period t, requires that the coefficients satisfy the linear restrictions

$$(e_1' - e_2' + \rho e_3')\Phi = e_3'. \tag{16}$$

Therefore, the VAR model (15) is overidentified. The model is estimated by constrained maximum likelihood (i.e., continuous updating generalized method of moments).

The VAR model implies that the present-value formula (10) can be written as

$$a_t = c_t + e_2'\Phi(I - \rho\Phi)^{-1}x_t - e_1'\Phi(I - \rho\Phi)^{-1}x_t. \tag{17}$$

In Figure 1, the present value of net payout under a constant discount rate is the sample analog of the first two terms on the right side.

The variance decomposition (11) requires estimates of long-horizon covariances. As well documented in the literature, long-horizon regressions have poor finite-sample properties (e.g., Hodrick (1992), Richardson and Stock (1989), and Valkanov (2003)). We therefore estimate long-horizon covariances from the VAR model (see Ang (2002) for a similar approach). Let

$$\Gamma = \mathbf{E}[x_{t+1}x'_{t+1}] = \text{vec}^{-1}[(I - \Phi \otimes \Phi)^{-1}\text{vec}(\Sigma)].$$

The VAR model implies that

$$\begin{aligned}
\text{Var}(v_t) &= e_3'\Gamma e_3, && (18)\\
\text{Cov}(r_t(H), v_t) &= e_1'\Phi[I - (\rho\Phi)^H](I - \rho\Phi)^{-1}\Gamma e_3 \to e_1'\Phi(I - \rho\Phi)^{-1}\Gamma e_3, && (19)\\
\text{Cov}(-\Delta c_t(H), v_t) &= -e_2'\Phi[I - (\rho\Phi)^H](I - \rho\Phi)^{-1}\Gamma e_3 \to -e_2'\Phi(I - \rho\Phi)^{-1}\Gamma e_3, && (20)\\
\text{Cov}(v_t(H), v_t) &= e_3'(\rho\Phi)^H\Gamma e_3 \to 0, && (21)
\end{aligned}$$

where the limits are as $H \to \infty$. In Table 6, the point estimates are sample analogs of these population moments, and the standard errors are estimated through the delta method using numerical gradients.

The VAR model implies that equations (12) and (13) can written as

$$\begin{aligned}
e_1'\epsilon_{t+1} &= -e_1'\rho\Phi(I - \rho\Phi)^{-1}\epsilon_{t+1} + e_2'(I - \rho\Phi)^{-1}\epsilon_{t+1}, && (22)\\
e_2'\epsilon_{t+1} &= e_1'(I - \rho\Phi)^{-1}\epsilon_{t+1} - e_2'\rho\Phi(I - \rho\Phi)^{-1}\epsilon_{t+1}. && (23)
\end{aligned}$$

The variance of unexpected asset return and net payout growth are therefore

$$\begin{aligned}
e_1'\Sigma e_1 &= e_1'\rho\Phi(I - \rho\Phi)^{-1}\Sigma(I - \rho\Phi)^{-1\prime}\rho\Phi' e_1 + e_2'(I - \rho\Phi)^{-1}\Sigma(I - \rho\Phi)^{-1\prime}e_2\\
&\quad -2e_1'\rho\Phi(I - \rho\Phi)^{-1}\Sigma(I - \rho\Phi)^{-1\prime}e_2, && (24)\\
e_2'\Sigma e_2 &= e_1'(I - \rho\Phi)^{-1}\Sigma(I - \rho\Phi)^{-1\prime}e_1 + e_2'\rho\Phi(I - \rho\Phi)^{-1}\Sigma(I - \rho\Phi)^{-1\prime}\rho\Phi' e_2\\
&\quad -2e_1'(I - \rho\Phi)^{-1}\Sigma(I - \rho\Phi)^{-1\prime}\rho\Phi' e_2. && (25)
\end{aligned}$$

In Table 8, the point estimates are sample analogs of these population moments, and the standard errors are estimated through the delta method using numerical gradients.

Appendix D Log-Linear Present-Value Formula for Equity Payout Yield

The return on equity (2) takes the same form as the return on assets (5). However, equation (7) does not apply directly to equity payout yield since equity payout can be negative (see Figure 2). This appendix describes a technical (not conceptual) modification to equation (7) that handles this problem.

To make the connection to net payout yield explicit, we adopt the following notation in this appendix.

- D_t: Dividends plus equity repurchase in period t.
- E_t: Equity issuance in period t.
- $C_t = D_t - E_t$: Equity payout in period t.
- A_t: Market equity at the end of period t.

In this notation, equation (2) is

$$A_{t+1} + D_{t+1} - E_{t+1} = R_{t+1} A_t. \tag{26}$$

Let lowercase letters denote the log of the corresponding uppercase variables. Assume that $d_t - a_t$ and $e_t - a_t$ are stationary, and define the parameters

$$\begin{aligned} \phi &= \frac{1}{1 + \exp\{\mathbf{E}[d_t - a_t]\} - \exp\{\mathbf{E}[e_t - a_t]\}}, \\ \theta &= \frac{\exp\{\mathbf{E}[d_t - a_t]\}}{\exp\{\mathbf{E}[d_t - a_t]\} - \exp\{\mathbf{E}[e_t - a_t]\}}. \end{aligned}$$

Empirically relevant values are $\phi < 1$ and $\theta > 1$ since $\mathbf{E}[d_t - a_t] > \mathbf{E}[e_t - a_t]$. Define the variable

$$v_t = \theta d_t - (\theta - 1)e_t - a_t. \tag{27}$$

This is essentially the log of equity payout yield, C_t/A_t. The outflow and inflow must be treated separately in equation (27) since equity payout can be negative.

Rewrite equation (26) as

$$\log[1 + \exp(d_{t+1} - a_{t+1}) - \exp(e_{t+1} - a_{t+1})] = r_{t+1} - \Delta a_{t+1}.$$

First-order Taylor approximation of the left side of this equation leads to a difference equation for equity payout yield

$$v_t \approx r_{t+1} - \theta \Delta d_{t+1} + (\theta - 1)\Delta e_{t+1} + \phi v_{t+1}, \tag{28}$$

up to an additive constant. Solving equation (28) forward H periods,

$$v_t = r_t(H) - \Delta d_t(H) + \Delta e_t(H) + v_t(H), \tag{29}$$

where

$$\begin{aligned} r_t(H) &= \sum_{s=1}^{H} \phi^{s-1} r_{t+s}, \\ \Delta d_t(H) &= \sum_{s=1}^{H} \phi^{s-1} \theta \Delta d_{t+s}, \\ \Delta e_t(H) &= \sum_{s=1}^{H} \phi^{s-1} (\theta - 1) \Delta e_{t+s}, \\ v_t(H) &= \phi^H v_{t+H}. \end{aligned}$$

The joint dynamics of equity return, equity payout growth, and equity payout yield are estimated through the VAR (14), where $x_t = (r_t, \theta\Delta d_t - (\theta - 1)\Delta e_t, v_t)'$. The variance decompositions of equity payout yield, unexpected equity return, and unexpected equity payout growth are based on the VAR as described in Appendix C.

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Table 1: VAR in Equity Return, Cash Flow Growth, and Cash Flow Yield

Panel A reports estimates of a VAR in real equity return, real dividend growth, and log dividend yield. Panel B reports estimates of a VAR in real equity return, real equity payout growth, and log equity payout yield. The sample period is 1926–2004. Estimation is by constrained maximum likelihood, and heteroskedasticity-consistent standard errors are in parentheses.

Lagged Regressor	Equity Return	Cash Flow Growth	Cash Flow Yield
	Panel A: Dividends		
Equity Return	-0.02	-0.15	-0.13
	(0.15)	(0.09)	(0.10)
Dividend Growth	0.14	0.00	-0.15
	(0.18)	(0.14)	(0.14)
Dividend Yield	0.09	-0.01	0.93
	(0.05)	(0.04)	(0.04)
R^2	0.04	0.05	0.88
	Panel B: Equity Payout		
Equity Return	0.13	-2.09	-2.26
	(0.13)	(0.73)	(0.80)
Equity Payout Growth	0.01	-0.28	-0.30
	(0.02)	(0.13)	(0.14)
Equity Payout Yield	0.04	-0.16	0.81
	(0.01)	(0.07)	(0.07)
R^2	0.08	0.29	0.69

Table 2: Variance Decomposition of Dividend Yield and Equity Payout Yield

In Panel A, the variance of log dividend yield is decomposed into future equity returns, future dividend growth, and future dividend yield. The log-linearization parameter is $\rho = 0.97$. In Panel B, the variance of log equity payout yield is decomposed into future equity returns, future equity payout growth, and future equity payout yield. The log-linearization parameters are $\phi = 0.98$ and $\theta = 2.5$. The sample period is 1926–2004. Estimation is through the VAR reported in Table 1. Point estimates are in bold, and heteroskedasticity-consistent standard errors are in normal text.

	Fraction of Variance in Cash Flow Yield Explained by Future					
Horizon (Years)	Equity Returns		Cash Flow Growth		Cash Flow Yield	
			Panel A: Dividends			
1	**0.10**	0.05	**0.00**	0.04	**0.90**	0.04
2	**0.18**	0.10	**0.02**	0.07	**0.80**	0.07
5	**0.37**	0.21	**0.07**	0.16	**0.57**	0.14
10	**0.57**	0.30	**0.11**	0.26	**0.32**	0.16
Infinite	**0.83**	0.38	**0.17**	0.38	**0.00**	0.00
			Panel B: Equity Payout			
1	**0.04**	0.01	**0.21**	0.05	**0.74**	0.06
2	**0.08**	0.03	**0.37**	0.10	**0.55**	0.11
5	**0.14**	0.04	**0.64**	0.13	**0.21**	0.14
10	**0.18**	0.05	**0.78**	0.07	**0.04**	0.06
Infinite	**0.18**	0.05	**0.82**	0.05	**0.00**	0.00

Table 3: Summary Statistics for Net Payout and Asset Value

The table reports summary statistics for net payout and its components as fractions of the market value of assets. It also reports summary statistics for asset return and net payout growth, which are both in logs and deflated by the CPI.

	Panel A: Flow of Funds 1926-2004			Panel B: Compustat 1971-2004		
As Fraction of Assets	Mean	Std Dev	Autocorrel	Mean	Std Dev	Autocorrel
Net Payout	0.017	0.010	0.814	0.027	0.012	0.729
Dividends	0.015	0.006	0.843	0.017	0.006	0.924
Net Equity Repurchase	-0.001	0.006	0.780	0.003	0.010	0.571
Equity Repurchase				0.013	0.009	0.666
Equity Issuance				0.010	0.003	0.544
Interest	0.008	0.004	0.927	0.018	0.007	0.869
Net Debt Repurchase	-0.006	0.005	0.719	-0.012	0.008	0.623
LTD Repurchase				0.032	0.010	0.840
LTD Issuance				0.044	0.008	0.499
Net STD Repurchase				0.000	0.002	0.397
Asset Return	0.054	0.122	0.086	0.064	0.108	0.037
Net Payout Growth	0.038	0.384	-0.044	0.067	0.258	-0.032

Table 4: Accounting for Time Variation in Net Payout Yield

The table reports fraction of the variance in net payout yield explained by each of the components of net payout. Robust standard errors are in parentheses.

Fraction of Var Explained by	Flow of Funds 1926-2004	Compustat 1971-2004
Dividends	0.27	0.22
	(0.08)	(0.08)
Net Equity Repurchase	0.20	0.45
	(0.08)	(0.15)
Equity Repurchase		0.47
		(0.14)
Equity Issuance		-0.02
		(0.04)
Interest	0.24	0.28
	(0.05)	(0.07)
Net Debt Repurchase	0.30	0.05
	(0.06)	(0.09)
LTD Repurchase		0.12
		(0.14)
LTD Issuance		-0.06
		(0.12)
Net STD Repurchase		0.00
		(0.03)

Table 5: VAR in Asset Return, Net Payout Growth, and Net Payout Yield

The table reports estimates of a VAR in real asset return, real net payout growth, and log net payout yield. Estimation is by constrained maximum likelihood, and heteroskedasticity-consistent standard errors are in parentheses.

Lagged Regressor	Asset Return	Net Payout Growth	Net Payout Yield
	Panel A: Flow of Funds 1926-2004		
Asset Return	0.10	0.49	0.39
	(0.13)	(0.31)	(0.35)
Net Payout Growth	-0.01	0.05	0.06
	(0.04)	(0.13)	(0.14)
Net Payout Yield	0.03	-0.21	0.78
	(0.02)	(0.07)	(0.07)
R^2	0.01	0.15	0.61
	Panel B: Flow of Funds 1946-2004		
Asset Return	0.05	0.83	0.79
	(0.17)	(0.39)	(0.41)
Net Payout Growth	-0.01	0.09	0.10
	(0.05)	(0.13)	(0.14)
Net Payout Yield	0.05	-0.32	0.65
	(0.03)	(0.08)	(0.09)
R^2	0.02	0.21	0.48
	Panel C: Compustat 1971-2004		
Asset Return	0.07	0.21	0.15
	(0.18)	(0.42)	(0.51)
Net Payout Growth	-0.02	0.07	0.09
	(0.08)	(0.12)	(0.16)
Net Payout Yield	0.08	-0.19	0.75
	(0.04)	(0.09)	(0.11)
R^2	0.09	0.12	0.60

Table 6: Variance Decomposition of Net Payout Yield

The variance of log net payout yield is decomposed into future asset returns, future net payout growth, and future net payout yield. The log-linearization parameter is $\rho = 0.98$. Estimation is through the VAR reported in Table 5. Point estimates are in bold, and heteroskedasticity-consistent standard errors are in normal text.

	Fraction of Variance in Net Payout Yield Explained by Future					
Horizon (Years)	Asset Returns		Net Payout Growth		Net Payout Yield	
	Panel A: Flow of Funds 1926-2004					
1	**0.02**	0.02	**0.21**	0.08	**0.76**	0.07
2	**0.05**	0.05	**0.38**	0.11	**0.58**	0.11
5	**0.09**	0.10	**0.66**	0.16	**0.25**	0.12
10	**0.12**	0.13	**0.82**	0.15	**0.06**	0.06
Infinite	**0.12**	0.14	**0.88**	0.14	**0.00**	0.00
	Panel B: Flow of Funds 1946-2004					
1	**0.04**	0.02	**0.29**	0.10	**0.66**	0.10
2	**0.08**	0.05	**0.50**	0.14	**0.42**	0.12
5	**0.13**	0.10	**0.76**	0.16	**0.12**	0.10
10	**0.14**	0.12	**0.84**	0.13	**0.01**	0.02
Infinite	**0.14**	0.13	**0.86**	0.12	**0.00**	0.00
	Panel C: Compustat 1971-2004					
1	**0.07**	0.04	**0.18**	0.10	**0.75**	0.10
2	**0.13**	0.07	**0.32**	0.15	**0.54**	0.16
5	**0.24**	0.12	**0.55**	0.20	**0.21**	0.17
10	**0.29**	0.16	**0.66**	0.20	**0.04**	0.07
Infinite	**0.31**	0.17	**0.69**	0.19	**0.00**	0.00

Table 7: Variance Decomposition of Equity Return and Cash Flow Growth
In Panel A, the variance of unexpected equity return (dividend growth) is decomposed into changes in expected equity returns, changes in expected dividend growth, and minus two times the covariance between them. In Panel B, the variance of unexpected equity return (equity payout growth) is decomposed into changes in expected equity returns, changes in expected equity payout growth, and minus two times the covariance between them. The sum need not equal one because of log-linear approximation error. The sample period is 1926–2004. Estimation is through the VAR reported in Table 1. Heteroskedasticity-consistent standard errors are in parentheses.

	Fraction of Variance Explained by Changes in Expected		
Unexpected	Equity Returns	Cash Flow Growth	−2 × Covariance
	Panel A: Dividends		
Equity Return	0.49	0.38	0.14
	(0.41)	(0.13)	(0.31)
Dividend Growth	0.79	0.02	0.21
	(0.25)	(0.03)	(0.26)
	Panel B: Equity Payout		
Equity Return	0.73	0.55	-0.36
	(0.38)	(0.11)	(0.42)
Equity Payout Growth	0.03	0.79	0.16
	(0.01)	(0.08)	(0.08)

Table 8: Variance Decomposition of Asset Return and Net Payout Growth

In each panel, the variance of unexpected asset return (net payout growth) is decomposed into changes in expected asset returns, changes in expected net payout growth, and minus two times the covariance between them. The sum need not equal one because of log-linear approximation error. Estimation is through the VAR reported in Table 5. Heteroskedasticity-consistent standard errors are in parentheses.

	Fraction of Variance Explained by Changes in Expected		
Unexpected	Asset Returns	Net Payout Growth	−2 × Covariance
	Panel A: Flow of Funds 1926-2004		
Asset Return	0.14	1.24	-0.38
	(0.28)	(0.40)	(0.63)
Net Payout Growth	0.14	0.87	-0.02
	(0.04)	(0.22)	(0.20)
	Panel B: Flow of Funds 1946-2004		
Asset Return	0.26	1.41	-0.68
	(0.39)	(0.69)	(1.04)
Net Payout Growth	0.11	0.76	0.11
	(0.05)	(0.17)	(0.14)
	Panel C: Compustat 1971-2004		
Asset Return	0.65	1.12	-0.66
	(0.65)	(0.47)	(1.11)
Net Payout Growth	0.19	0.65	0.18
	(0.08)	(0.30)	(0.20)

Table 9: Compustat Variables

Variable	Data Item	Item Number
DEBT_NET	Changes in Current Debt	301
DIV	Cash Dividends	127
DIV_PREF	Dividends – Preferred	19
EQ_ISS	Sale of Common and Preferred Stock	108
EQ_REP	Purchase of Common and Preferred Stock	115
INT	Interest Expense	15
LIAB_CUR	Current Liabilities – Total	5
LIAB_OTH	Liabilities – Other	75
LTD	Long-Term Debt – Total	9
LTD_ISS	Long-Term Debt – Issuance	111
LTD_REP	Long-Term Debt – Reduction	114
MINORITY	Minority Interest	38
TAX	Deferred Taxes and Investment Tax Credit	35

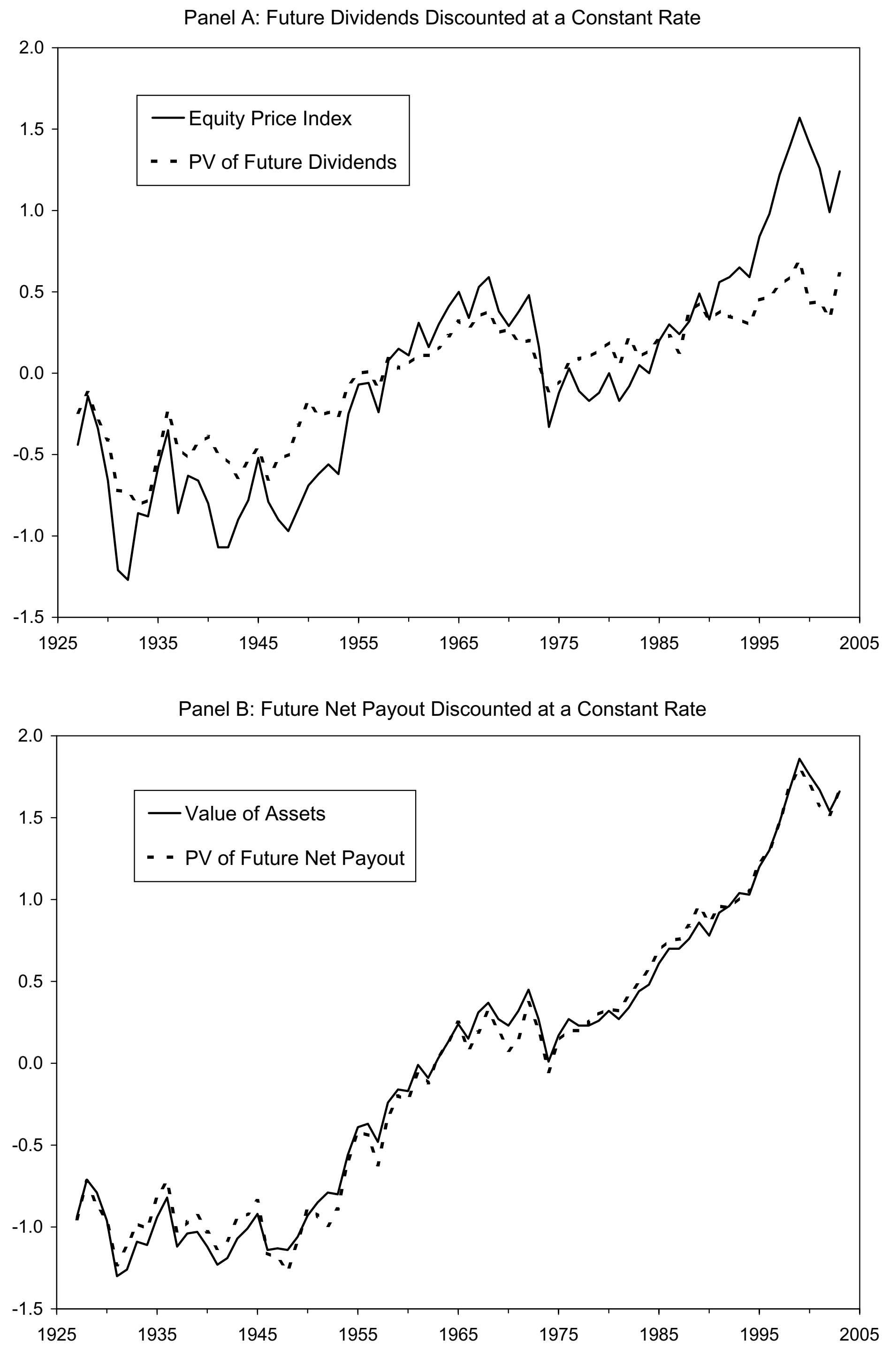


Figure 1: Present Value of Future Dividends and Net Payout

Panel A shows the real value of the Center for Research in Securities Prices (CRSP) value-weighted index for NYSE, AMEX, and NASDAQ stocks. A VAR in real equity return, real dividend growth, and log dividend yield is used to estimate the present value of dividends under a constant discount rate. Panel B shows the real market value of assets for U.S. nonfinancial corporations. A VAR in real asset return, real net payout growth, and log net payout yield is used to estimate the present value of net payout under a constant discount rate. All series are deflated by the CPI and reported in demeaned log units.

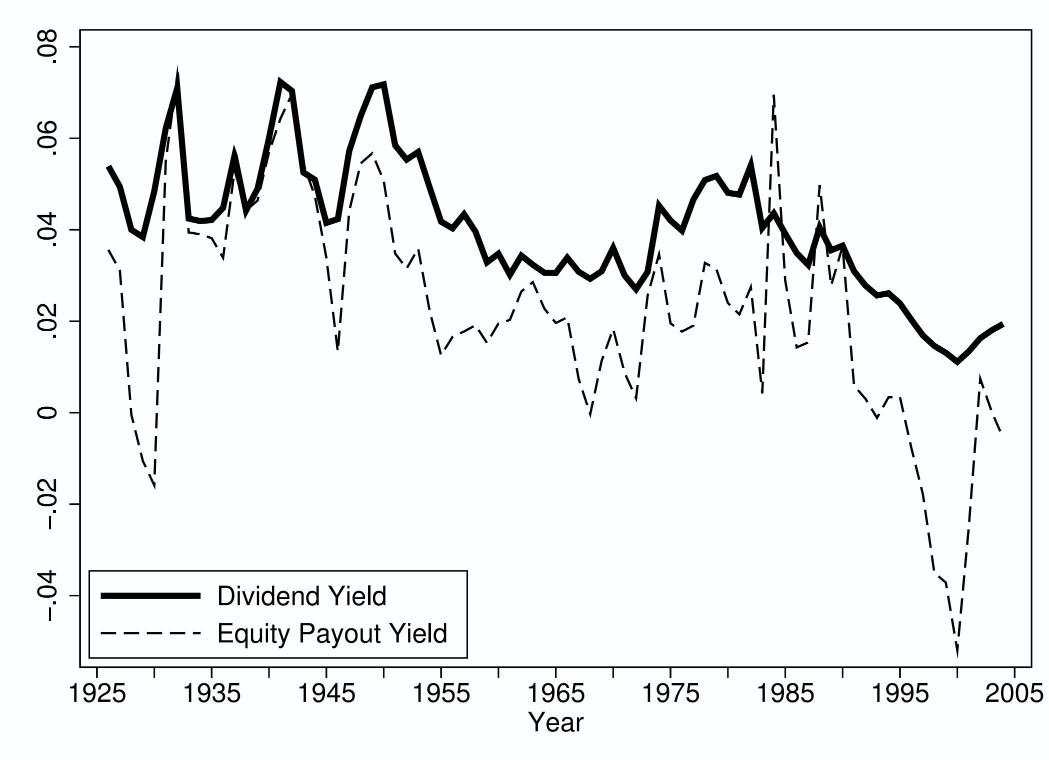


Figure 2: Dividend Yield and Equity Payout Yield

Dividend yield is dividends divided by the CRSP value-weighted index. Equity payout yield is equity payout (i.e., dividends plus equity repurchase minus equity issuance) divided by the market equity of NYSE, AMEX, and NASDAQ stocks.

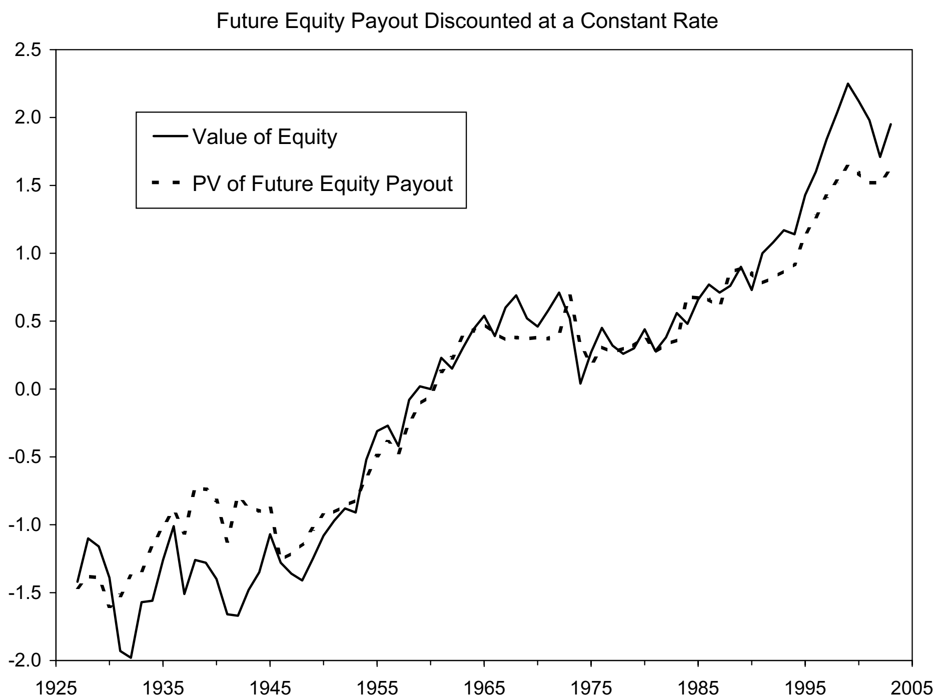


Figure 3: Present Value of Equity Payout

The figure shows the real market equity of CRSP (NYSE, AMEX, and NASDAQ) stocks. A VAR in real equity return, real equity payout growth, and log equity payout yield is used to estimate the present value of equity payout under a constant discount rate. All series are deflated by the CPI and reported in demeaned log units.

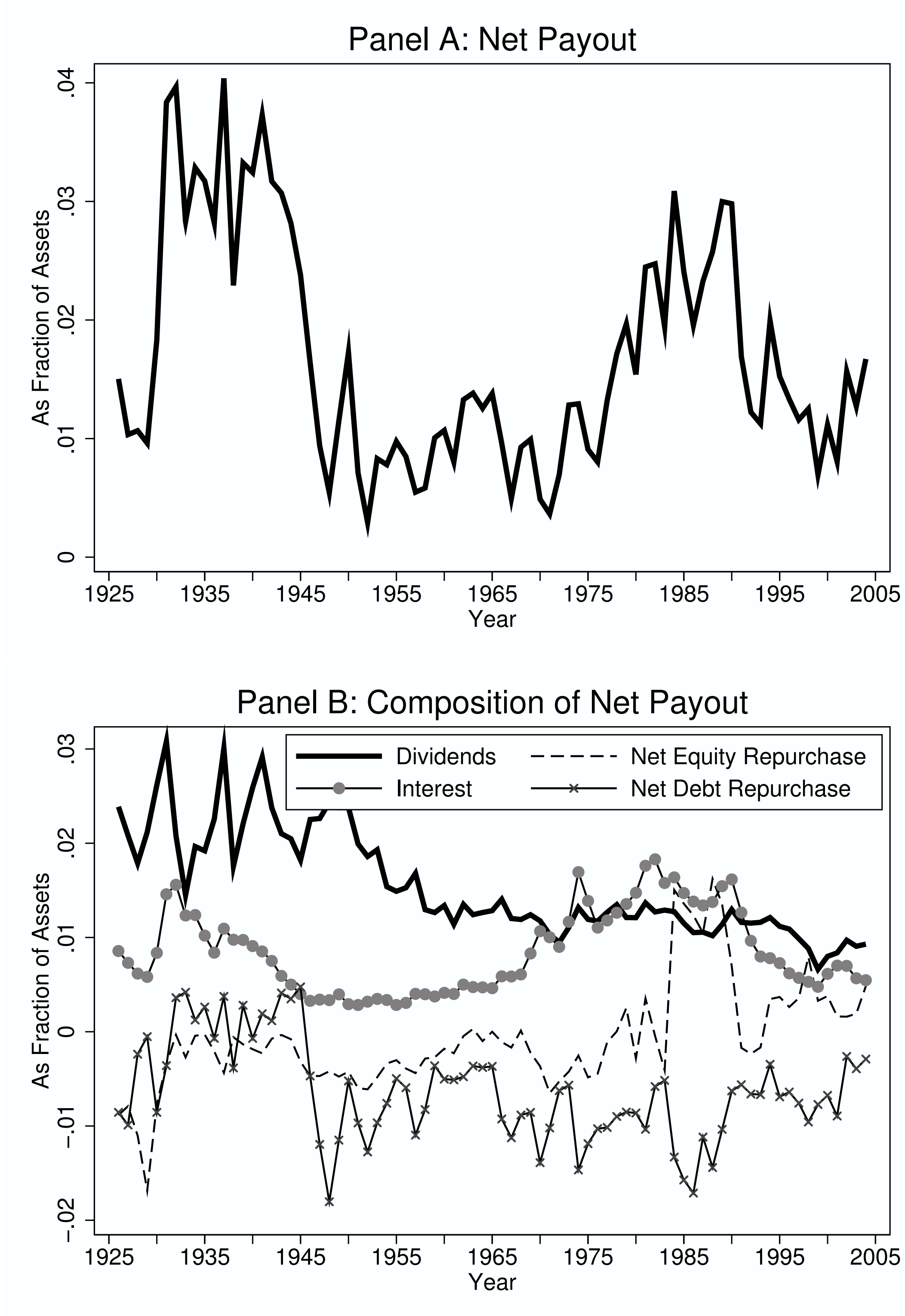
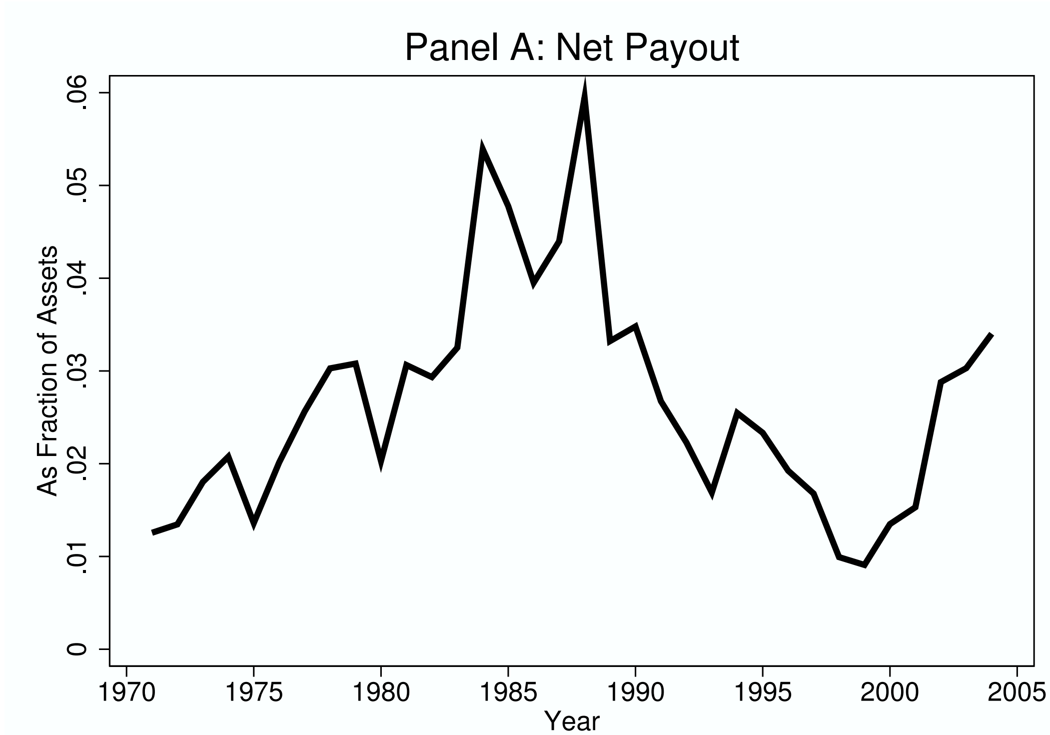
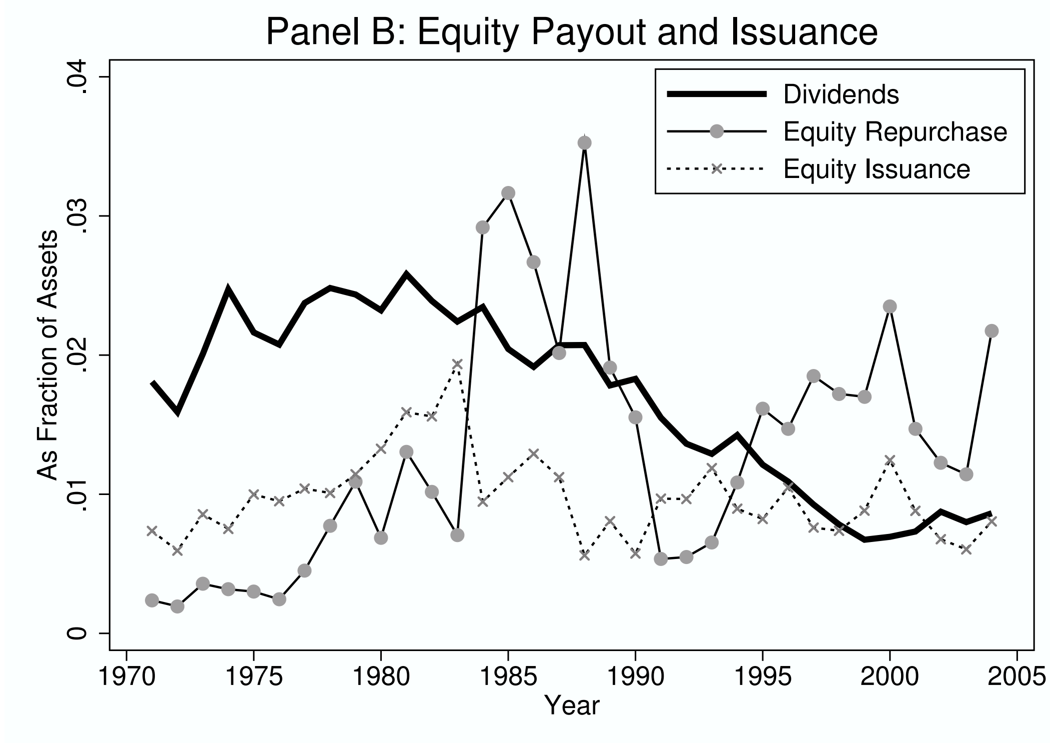


Figure 4: Net Payout Yield in the Flow of Funds

Net payout in Panel A is the sum of dividends, net equity repurchase, interest, and net debt repurchase in Panel B. The data represent nonfinancial corporations in the Flow of Funds for the period 1926–2004.





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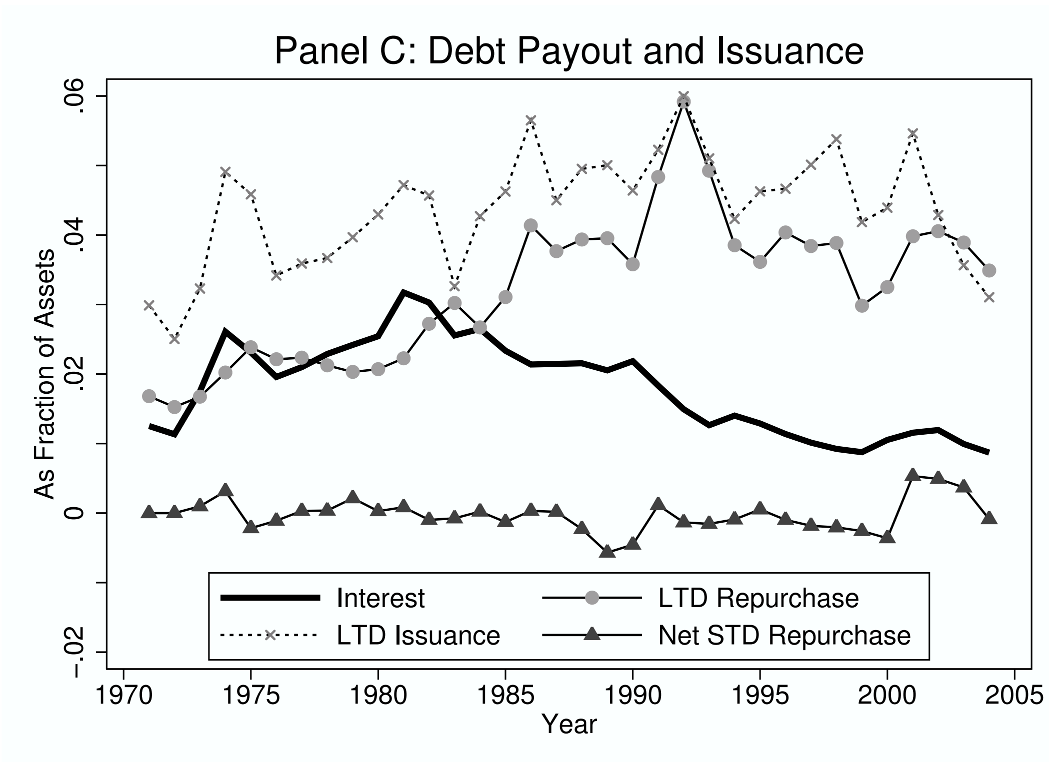

Figure 5: Net Payout Yield in Compustat

Net payout in Panel A is the sum of Panel B (dividends plus equity repurchase minus equity issuance) and Panel C (interest plus long-term debt repurchase minus long-term debt issuance plus net short-term debt repurchase). The data represent nonfinancial firms in Compustat for the period 1971–2004.

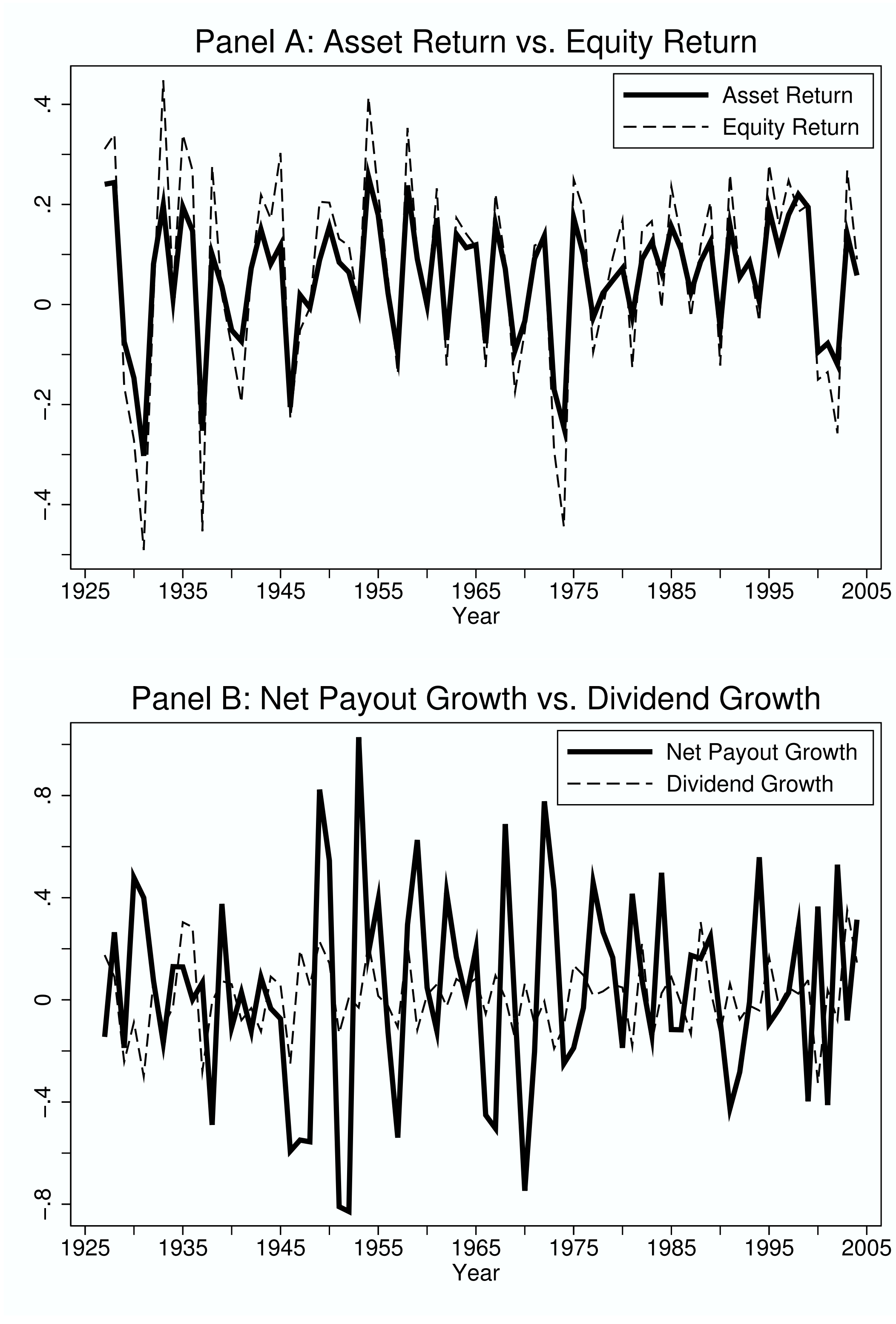

Figure 6: A Comparison of Returns and Cash Flow Growth
Asset return and net payout growth are for nonfinancial corporations in the Flow of Funds. Equity return and dividend growth are for the CRSP value-weighted index.