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

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Abstract:
Movements in the value of corporate assets are justified by changes in expected future cash flow. The appropriate measure of cash flow for valuing assets is net payout, which is the sum of dividends, interest, and net repurchases of equity and debt. When discount rates are low and equity issuance is high, expected cash-flow growth is low because firms repurchase debt to offset equity issuance. A variance decomposition of the ratio of net payout reveals little transitory variation in discount rates that is not offset by common variation with expected cash-flow growth.

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Movements in stock price cannot be explained by changes in expected future dividends (LeRoy and Porter 1981, Shiller 1981). Panel A of Figure 1 shows the log real value of a stock price index together with the present value of future dividends discounted at a constant rate.[1] The wedge between the two time series represents variation in discount rates above and beyond the common variation with expected dividend growth. The stock price index wanders far away from the present value of future dividends. At the end of 2000, for example, the stock price index was approximately 100 percent higher than the present value of future dividends.

In contrast, we find that movements in the value of corporate assets (equity plus liabilities) can be explained by changes in expected future cash flow. The total cash outflow from the corporate sector is *net payout*, which is the sum of dividends, interest, equity repurchase net of issuance, and debt repurchase net of issuance. Panel B of Figure 1 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. The wedge between the two time series represents variation in discount rates above and beyond the common variation with expected net payout growth. Asset value moves in lockstep with the present value of future net payout; that is, almost every movement in discount rates is matched by an offsetting movement in expected cash flow growth.

The contrast between Panels A and B is best highlighted by comparing two distinct periods in U.S. history, 1945–1955 and 1990–2004. During the period 1945–1955, discount rates were high relative to expected dividend growth, causing stock price to be "too low" relative to expected future dividends. However, the postwar period experienced high investment financed by equity and debt issuance, so that expected net payout growth was much higher than expected dividend growth. Because high discount rates were matched by high expected cash flow growth, asset value was "just right" in relation to expected future cash flow. During the period 1990–2004, discount rates were low relative to expected dividend

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

growth, causing stock price to be “too high” relative to expected future dividends. However, firms distributed free cash flow through equity and debt repurchases, rather than dividends, so that expected net payout growth was much lower than expected dividend growth. Because low discount rates were matched by low expected cash flow growth, asset value was “just right” in relation to expected future cash flow.

Our basic finding can be stated more precisely in the language of cointegration. Asset value is the permanent (common) component in the cointegrating relationship between net payout and asset value. Therefore, the ratio of net payout to assets, or *net payout yield*, mostly predicts net payout growth rather than asset return, especially over long horizons. A variance decomposition of net payout yield shows that 12 percent of its variation is explained by asset returns, while 88 percent is explained by net payout growth. The hypothesis that none of the variation in net payout yield is explained by asset returns cannot be rejected. Our finding does not imply that returns are unpredictable or that discount rates are constant. Instead, we find that variation in discount rates *above and beyond* the common variation with expected cash flow growth plays little role in the present-value relationship between cash flow and asset value.

In summary, the key to understanding asset valuation is a comprehensive measure of cash flow. Our focus on net payout, rather than dividends, is partly motivated by the difference between the “portfolio view” and the “macro view” of investment. Dividends are the appropriate measure of cash flow for an “individual investor” who owns one share of a value-weighted portfolio (for example, the Center for Research in Securities Prices (CRSP) value-weighted index). The investor essentially follows a portfolio strategy in which dividends are received and net repurchases of equity are reinvested. In contrast, net payout is the appropriate measure of cash flow for a “representative investor” who owns the entire corporate sector. From a macroeconomic perspective, net repurchase of equity is a cash outflow from the corporate sector that (by definition) cannot be reinvested.

The primary motivation for focusing on net payout is 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). Because firms jointly determine all components of net payout, rather than dividends in isolation, a comprehensive measure of cash flow is necessary for understanding firm behavior. Firms tend to use dividends to distribute the permanent component of earnings because dividend policy requires financial commitment (Lintner 1956). Consequently, changes in dividends are slow and mostly independent of discount rates. In contrast, firms tend to use repurchases to distribute the transitory component of earnings because repurchase and issuance policy retains financial discretion. Consequently, changes in repurchases and issuances are cyclical and share a common component with discount rates (see Dittmar and Dittmar (2004), Guay and Harford (2000), and Jagannathan, Stephens and Weisbach (2000)).

This paper makes an indirect contribution to the corporate payout literature by documenting 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. 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 1980s, and the surge of equity repurchase activity in the last twenty years.

The rest of the paper is organized as follows. Section 1 sets the stage for our main results by explaining the role of equity repurchase and issuance in the valuation of total market 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 explains the variation in asset returns through the present-value model (Campbell 1991). Section 5 concludes by emphasizing the superiority of the macro view of asset prices for many applications over the portfolio view—which is a theme throughout the paper. The appendices contain details on the data and methodology.

1 Valuation of Market Equity

This section explains the role of equity repurchase and issuance in the valuation of total market equity. The relevant measure of cash flow for valuing market equity is *equity payout*, which is the sum of dividends and equity repurchase net of issuance. We focus first on cash flows to equity in isolation of cash flows to debt for two reasons. First, most of the literature on "excess volatility" since Shiller (1981) is about stock returns in relation to cash flows to equity. Second, an empirical understanding of equity payout will be useful in highlighting the unique role that debt payout plays in explaining the common variation between expected returns and expected cash-flow growth.

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 expression inside the brackets (that is, it 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,

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

where

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

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 who owns one share receives dividends as the cash outflow from the firm. An investor who 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 $(\mathrm{DIV}_t + \mathrm{REP}_t - \mathrm{ISS}_t)/\mathrm{ME}_t$ 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.

The difference between dividend yield and equity payout yield represents a subtle but important difference between a microeconomic and a macroeconomic perspective. This difference in perspective can be understood in terms of portfolio strategies. Dividend yield is the appropriate valuation ratio for an investor who 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 who 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 feasible only at the microeconomic level, while the portfolio strategy implicit in equity payout yield is feasible at both the microeconomic and the macroeconomic level.

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 complete 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 1988, Fama and French 1988). As shown in the second column, neither past equity return, dividend growth, nor 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 (1988), 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 complete description of the variance decomposition. We report the results in Panel A of Table 2.

At a one-year horizon, 10 percent of the variation in dividend yield is explained by future equity returns, none is explained by future dividend growth, and 90 percent 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 percent of the variation in dividend yield is explained by future equity returns, while only 17 percent is explained by future dividend growth. The variance decomposition shows that the transitory variation in discount rates is large relative to the transitory variation in expected dividend growth. Roughly speaking, the permanent component of dividend yield is dividends, while any deviation in stock price from dividends is transitory.

Instead of reporting the relative variation, the last row of Panel A of Table 2 reports the magnitude of variation in expected returns and expected dividend growth. The standard deviation of infinite-horizon expected returns is 35 percent, while the standard deviation of infinite-horizon expected dividend growth is 8 percent. In relation to Panel A of Figure 1, 35 percent is the standard deviation of the wedge between the stock price index and the present value of future dividends discounted at a constant rate. Because the variation in discount rates independent of expected dividend growth is large, stock price cannot be explained by changes in expected future dividends.

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.[2] 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 percent, compared to 4 percent for the dividend yield regression in Panel A. Therefore, the evidence for predictability is stronger at the one-year horizon, in the sense that the expected return implied by equity payout yield has greater variation. As shown in the second column, high equity payout yield also

[2] 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.

predicts low equity payout growth with a t-statistic above two and R^2 of 29 percent. 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 percent of the variation in equity payout yield is explained by future equity returns, 20 percent is explained by future equity payout growth, and 76 percent 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 16 percent of the variation in equity payout yield is explained by future equity returns, while 84 percent is explained by future equity payout growth. The variance decomposition shows that the transitory variation in discount rates is small relative to the transitory variation in expected equity payout growth. Changes in equity repurchase and issuance are highly predictable, while changes in dividends are not.

Figure 3 shows log real market equity of NYSE, AMEX, and NASDAQ stocks together with the present value of future equity payout discounted at a constant rate. The wedge between the two time series represents variation in discount rates above and beyond the common variation with expected equity payout growth. The figure shows that movements in market equity cannot be explained entirely by changes in expected future cash flow. At the end of 2000, for example, market equity was approximately 50 percent higher than the present value of future equity payout. However, the wedge between the two time series in Figure 3 is smaller than the wedge between the two time series in Panel A of Figure 1. As reported in Panel B of Table 2, the standard deviation of infinite-horizon expected returns implied by equity payout yield is 25 percent, which is smaller than the 35 percent implied by dividend yield. Because equity payout yield is less persistent than the dividend yield, it implies less long-horizon variation in expected returns. Our finding parallels that of Ackert and Smith (1993) for the Toronto Stock Exchange.

To make the empirical link between dividends and equity payout more explicit, we estimate in Table 3 a VAR in equity return, equity payout growth, equity payout-dividend ratio, and dividend yield. Because equity payout yield is the sum of the equity payout-dividend ratio and the dividend yield in logs, Table 3 can be interpreted as an unconstrained version of the VAR in Panel B of Table 3. We loosely refer to the log equity payout-dividend ratio as "net equity repurchase" since equity payout minus dividends is equal to net equity repurchase in levels.

On the one hand, high net equity repurchase predicts high equity return, implying that expected return is low when equity issuance is high (Baker and Wurgler 2002). On the other hand, high net equity repurchase predicts low equity payout growth. Therefore, net equity repurchase captures the independent variation in expected returns and expected equity payout growth. High dividend yield predicts both high equity return and high equity payout growth. Therefore, the dividend yield captures the common variation in expected returns and expected equity payout growth. In the ratio of equity payout to market equity, the type of persistent variation in discount rates that leads to excess volatility gets offset by variation in expected equity payout growth.

1.4 Limitations of Equity Payout

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 percent (1.23 percent) 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 to a historical low in 2000. Second, equity repurchase and issuance does not represent cash flow if there are offsetting transactions in debt. Since firms tend to offset equity issuance through debt repurchase, equity payout can understate the total cash outflow from the corporate sector during periods of high equity issuance. In fact, as shown in Section 3, debt repurchase is responsible for the wedge between market equity and expected future equity payout in Figure 2. 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 interpreted as the firm's intertemporal budget constraint. It is analogous to a household's intertemporal budget constraint: C represents consumption, A represents wealth, and R represents the return on wealth. It is also analogous to the formula for return on equity: C represents dividends, A represents the ex-dividend price, and R represents 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, which we extend back to 1926 using data from original sources. We construct net payout and the market value of assets for the nonfarm, nonfinancial corporate sector as described in Appendix A. Although all of the reported results are for the full sample, the results are essentially the same for the postwar sample 1946–2004.

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 data are the short sample period and the lack of coverage of private corporations. We therefore view the Flow-of-Funds Accounts as our main source, while Compustat provides supporting evidence. In an average year during 1971–2004, firms in Compustat represent 54 percent of the assets in the Flow-of-Funds Accounts.

2.3 Description of Payout, Issuance, and Asset Value

Table 4 reports summary statistics of the main variables. In the Flow-of-Funds Accounts, net payout is 1.7 percent of assets on average with a standard deviation of 1 percent. 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 Accounts. Net payout has been positive in every year since 1926, and this has been cited as evidence that the U.S. economy is dynamically efficient (Abel, Mankiw, Summers and Zeckhauser 1989). The 1930s and the 1980s are periods of high net payout relative to other decades. These two peaks are driven by different forces. The 1930s is a decade of high dividends and high debt repurchase; this is explained by the difficulty that firms had in issuing new debt during the Great Depression (Hickman 1952). In contrast, the 1980s is a decade of high equity repurchase and low debt repurchase. The high equity repurchase is partly explained by merger activity in the 1980s (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 source of payout to shareholders (one that is often neglected by researchers).

Panel B of Figure 4 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). As reported in Panel A of Table 4, the correlation between dividends and net equity repurchase, both as fractions of assets, is -0.469. 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. Panel B of Figure 4 also shows that periods of high net equity repurchase tend to be periods of low net debt repurchase. As reported in Panel A of Table 4, the correlation between net equity and debt repurchase, both as fractions of assets, is -0.257.

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 Accounts. This can be explained by the fact that firms that go private disappear from Compustat, but remain in the corporate sector as defined by the Flow-of-Funds Accounts. In the Compustat data, 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 Accounts net out such transactions between public and private corporations. For example, the leveraged buyouts of the 1980s explains why the net payout yield peaks at 6 percent in Compustat and only at 3 percent in the Flow of Funds during the same period. As reported in Panel B of Table 4, the correlation between equity repurchase and long-term debt issuance, both as fractions of assets, is 0.344 for the Compustat sample. Kaplan (1991) reports that 62 percent of large leveraged buyouts during the period 1979–1986 remained 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 peaked again in 2000 at the height of the stock market boom of the 1990s. The market for long-term debt was particularly depressed in 1983, interestingly coinciding with the hot equity market. Debt issuance rose throughout the rest of the 1980s and peaked in 1992.

Table 5 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 component. In the Flow-of-Funds Accounts, each of the four components (dividends, interest, net equity repurchase, and net debt repurchase) accounts for a similar fraction of the variation in net payout yield, between 20 percent and 30 percent. In the Compustat sample, net equity repurchase plays a more prominent role, accounting for 45 percent of the variation in net payout yield, while net debt repurchase accounts for only 5 percent of the variation. Most of the variation in the net equity flow is explained by repurchase (47 percent) rather than issuance (-2 percent).

Panel A of Figure 6 shows the time series of real asset returns, together with real equity returns, for the period 1926–2004. The correlation between asset return and equity return is 0.97. Asset return has mean of 5.4 percent and standard deviation of 12.2 percent (see Table 4 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 of 3.8 percent and standard deviation of 38.4 percent (see Table 4), and this 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 by 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, through mean reversion, to that of asset return in the long run. 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, through mean reversion, to that of dividend growth in the long run.

3 Valuation of Corporate Assets

3.1 Present-Value Relationship between Net Payout and Asset Value

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 1988). 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 de-meaned) 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) also holds ex ante as a present-value formula

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

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). Equation (9) says that net payout yield is high when expected asset returns are high or expected net payout growth is low. If movements in discount rates are perfectly offset by movements in expected cash flow growth, net payout yield will be constant. Therefore, net payout yield must forecast independent (as opposed to common) variation in asset returns or net payout growth.

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. The last term on the right side can be interpreted as deviation from the constant discount rate present-value model. If we condition down the information set to net payout yield, the last term on the right side captures variation in discount rates above and beyond its common variation with expected cash flow growth. Equation (10) can therefore be used to assess whether changes in expected future cash flow justify movements in asset value.

3.2 Variance Decomposition of Net Payout Yield

In Table 6, we estimate the joint dynamics of asset return, net payout growth, and net payout yield through a VAR. Panel A reports results for the Flow-of-Funds Accounts, and Panel B reports results for Compustat. Appendix C gives a complete description of the estimation. 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 stronger with the Compustat data with a t-statistic of two and an R^2 of 9 percent. 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 stronger in the Flow-of-Funds Accounts with a t-statistic of three and an R^2 of 15 percent. 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 Flow-of-Funds Accounts. Net payout yield is less persistent than both dividend yield and equity payout yield.

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

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

Panel A of Table 7 reports this variance decomposition for the Flow-of-Funds Accounts, which is estimated through the VAR model in Table 6. See Appendix C for a complete description of the estimation. At a one-year horizon, 2 percent of the variation in net payout yield is explained by future asset returns, 21 percent is explained by future net payout growth, and 76 percent 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 percent of the variation is explained by future asset returns, while 88 percent is explained by future net payout growth. The hypothesis that none of the variation in net payout yield is explained by future asset returns cannot be rejected. The results are similar for the Compustat version as shown in Panel B of Table 7, although the shorter sample leads to somewhat larger standard errors.

The variance decomposition in Table 7 can be summarized in the language of cointegration. Net payout (that is, the cash outflow from the corporate sector) and the value of corporate assets are cointegrated. When net payout yield deviates from its long-run mean, either net payout or asset value 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.

The dynamics of net payout yield, revealed by the variance decomposition, has important implications for the present-value relationship between net payout and asset value. The solid line in Panel B of Figure 1 is the log real asset value of nonfinancial corporations in the Flow-of-Funds Accounts. The dashed line is the present value of future net payout discounted at a constant rate, which corresponds to the sample analog of the first two terms in equation (10). The figure reveals little variation in discount rates above and beyond the common variation with expected cash flow growth. As reported in Table 7, the standard deviation of infinite-horizon expected returns, which corresponds to the last term in equation (10), is only 8 percent and within one standard error of zero. In other words, net payout yield implies considerably less long-horizon variation in expected returns than the dividend yield. Our finding does not imply that returns are unpredictable or that discount rates are constant.

Instead, we find that persistent variation in discount rates, captured by the dividend yield, is a common component of long-horizon expected returns and expected cash flow growth.

The contrast between Panel B of Figure 1 and Figure 3 is best highlighted by comparing the period 1990–2004. This period experienced high equity issuance, presumably because firms were taking advantage of low discount rates. Consequently, discount rates were low relative to expected equity payout growth, causing market equity to be "too high" relative to expected future equity payout. However, equity payout for the CRSP value-weighted portfolio understates the total cash outflow from the corporate sector for two reasons. First, much of equity issuance during this period was due to equity-financed mergers and executive compensation, which are not part of cash transactions recorded in the Flow-of-Funds Accounts (see Section 1). Second, and more importantly, net debt repurchase was high during this period as firms repurchased debt to offset equity issuance. Therefore, expected net payout growth was much lower than expected equity payout growth. Because low discount rates are matched by low expected cash flow growth, asset value was "just right" in relation to expected future cash flow.

To make the empirical link between equity payout and net payout more explicit, we estimate a VAR in asset return, net payout growth, net payout/equity payout ratio, and equity payout/assets ratio. Because net payout yield is the sum of the net payout/equity payout ratio and the equity payout/assets ratio in logs, Table 8 can be interpreted as an unconstrained version of the VAR in Table 6. We loosely refer to the log net payout/equity payout ratio as "debt payout" (that is, interest plus net debt repurchase), since net payout minus equity payout is equal to debt payout in levels.

Consistent with our findings in Panel B of Table 1, a high equity payout/assets ratio predicts high asset return, implying that expected return is low when equity issuance is high. At the same time, low debt payout predicts high asset returns, implying that expected returns are low when debt repurchase is high. Because high equity issuance offsets high debt repurchase, net payout does not fall as much as equity payout when expected returns are low. In comparison with equity payout yield, net payout yield therefore reveals less variation in expected returns that is independent of offsetting variation in expected cash-flow growth.

4 Explaining Asset Returns through the Present-Value Model

4.1 Empirical Framework

This section explains the variation in asset returns through the present-value relationship between net payout and asset value. Our empirical framework is based on the firm's intertemporal budget constraint (Campbell 1991). Subtracting the expectation of equation (8) at time t from its expectation at time $t+1$,

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

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

4.2 Variance Decomposition of Equity Return

Panel A of Table 9 reports a variance decomposition of equity return for an investor who owns one share of equity and receives dividends as the cash flow. By equation (12), the variance of unexpected equity return must equal the variance of changes in discount rates, plus the variance of changes in expected dividend growth, minus twice the covariance between the two terms. Appendix C gives a complete description of the estimation. Holding constant discount rates, only 38 percent of the variation in equity return is explained by dividends.

Panel B reports a variance decomposition of equity return for an investor who owns all outstanding shares of equity and receives equity payout as the cash flow (see Appendix D). The first estimate is based on the VAR in Table 1, in which the main predictor variable is equity payout yield. The second estimate is based on the VAR in Table 3, in which the main predictor variables are equity payout-dividend ratio and dividend yield. Holding constant discount rates, at most 61 percent of the variation in equity return can be explained by equity payout. The rest must be explained variation in discount rates, implying excess volatility of equity returns. The covariance between changes in expected returns and expected equity payout growth accounts for 20 percent of the variation in equity return. That is, good news about expected returns are related to good news about expected cash-flow growth. This is consistent with our finding in Table 2 that there is common variation in expected returns and expected equity payout growth.

4.3 Variance Decomposition of Asset Return

Table 10 reports a variance decomposition of unexpected asset return. Panel A reports results for the Flow of Funds, and Panel B reports results for Compustat. In each panel, the first estimate is based on the VAR in Table 6, in which the main predictor variable is net payout yield. The second estimate is based on the VAR in Table 8, in which the main predictor variables are net payout-equity payout ratio and equity payout-assets ratio. Since the results are similar, we focus our discussion on the first estimate in Panel A.

Holding constant discount rates, 124 percent of the variation in asset return is explained by net payout. The covariance between changes in expected returns and expected net payout growth accounts for 38 percent of the variation in asset return. That is, good news about expected returns are related to good news about expected cash flow growth. This correlation explains why unexpected asset return is 24 percent less volatile than changes in expected cash-flow growth. In contrast to equity returns, asset returns are not excessively volatile for two reasons. First, asset returns are less volatile than equity returns (see Table 4), so there is less volatility to explain. Second, and more importantly, changes in expected cash-flow growth are more volatile when debt payout is included. 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 debt payout, changes in expected cash flows become a relatively more important part of the variation in asset returns.

5 Portfolio View versus Macro View

The dividend yield predicts stock returns, rather than dividend growth, especially over long horizons. Yet recent work finds evidence for predictability of dividend growth, in particular with the earnings-price ratio (see Ang and Bekaert (2005) and Bansal, Khatchatrian and Yaron (2005)). Lettau and Ludvigson (2005) and Menzly, Santos and Veronesi (2004) offer an explanation that reconciles these findings. The predictable component of dividend growth is a common component of stock return and dividend growth, which offset each other in the ratio of dividends to stock price. Because the dividend yield implies large independent variation in discount rates, movements in stock price cannot be explained by changes in expected future dividends (Panel A of Figure 1).

In contrast, this paper finds that net payout yield predicts net payout growth, rather than asset returns, especially over long horizons. The predictable component of returns, for instance captured by the dividend yield, is a common component of asset return and net payout growth, which offset each other in the ratio of net payout to assets. Because net payout yield implies little independent variation in discount rates, movements in asset value can be explained almost entirely by changes in expected future cash flow (Panel B of Figure 1).

The difference between dividend yield and net payout yield is fundamentally a difference between two views of investment. Dividend yield, which represents the portfolio view, is the appropriate valuation ratio for an individual investor who owns one share of a value-weighted portfolio. Net payout yield, which represents the macro view, is the appropriate valuation ratio for a representative household that owns the entire corporate sector. The macro view is appropriate for many economic applications of interest. For example, in payout policy, firms jointly determine all components of net payout, rather than dividends in isolation (Allen and Michaely 2003). In capital accumulation and economic growth, the total value of the corporate sector, rather than the stock price index, is related to the underlying quantity of capital (Abel et al. 1989, Hall 2001). In household consumption and saving, the value of corporate assets, rather the stock price index, enters the representative household's intertemporal budget constraint.

By taking a macro view of asset prices, this paper can be related to recent work on the empirical link between aggregate consumption and wealth. Lettau and Ludvigson (2004) find that changes in asset wealth are transitory in the cointegrating relationship between consumption, labor income, and asset wealth. We find that the changes in asset wealth are driven mostly by changes in expected future net payout. Since net payout from the corporate sector is capital income to the household sector, our finding implies large transitory variation in capital income (Cochrane 1994). However, consumption does not respond to transitory variation in capital income, and there are two potential explanations for this. First, Lustig and Van Nieuwerburgh (2005) find that changes in expected future labor income are negatively related to changes in expected future capital income. Second, we suspect 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 household consumption.

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 refer to Wright (2004) for a related construction that focuses on equity. 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). All nominal quantities are deflated by the Consumer Price Index (CPI) in December from the Bureau of Labor Statistics.

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 11 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

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

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

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

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 (1988), the joint dynamics of the variables are modeled by the VAR

$$x_{t+1} = \Phi x_t + \epsilon_{t+1}, \tag{13}$$

where $\mathbf{E}[\epsilon_t] = 0$ and $\mathbf{E}[\epsilon_t \epsilon_t'] = \Sigma$. The first two rows of model (13) 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

$$\mathbf{E}[(x_{t+1} - \Phi x_t) \otimes x_t] = 0. \tag{14}$$

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

$$(e_1' - e_2' + \rho e_3')\Phi = e_3'. \tag{15}$$

Therefore, the VAR model (14) 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

$$a_t = c_t + e_2'\Phi(I - \rho\Phi)^{-1}x_t - e_1'\Phi(I - \rho\Phi)^{-1}x_t. \tag{16}$$

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., Boudoukh, Richardson and Whitelaw (2005), Hodrick (1992), and Valkanov (2003)). We therefore estimate long-horizon covariances from the VAR model (see Ang (2002) for a similar approach). Let

$$\Gamma = \mathbf{E}[x_t x_t'] = \text{vec}^{-1}[(I - \Phi \otimes \Phi)^{-1}\text{vec}(\Sigma)].$$

The VAR model implies that

$$\begin{aligned}
\text{Var}(v_t) &= e_3'\Gamma e_3, & (17)\\
\text{Cov}(r_t(H), v_t) &= e_1'\Phi[I - (\rho\Phi)^H](I - \rho\Phi)^{-1}\Gamma e_3 \to e_1'\Phi(I - \rho\Phi)^{-1}\Gamma e_3, & (18)\\
\text{Cov}(-\Delta c_t(H), v_t) &= -e_2'\Phi[I - (\rho\Phi)^H](I - \rho\Phi)^{-1}\Gamma e_3 \to -e_2'\Phi(I - \rho\Phi)^{-1}\Gamma e_3, & (19)\\
\text{Cov}(v_t(H), v_t) &= e_3'(\rho\Phi)^H\Gamma e_3 \to 0, & (20)
\end{aligned}$$

where the limits are as $H \to \infty$. In Table 7, 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 equation (12) can written as

$$e_1'\epsilon_{t+1} = -e_1'\rho\Phi(I - \rho\Phi)^{-1}\epsilon_{t+1} + e_2'(I - \rho\Phi)^{-1}\epsilon_{t+1}. \qquad (21)$$

The variance of unexpected asset return is therefore

$$\begin{aligned}
e_1'\Sigma e_1 &= e_1'\rho\Phi(I - \rho\Phi)^{-1}\Sigma(I - \rho\Phi)^{-1\prime}\rho\Phi' e_1 + e_2'(I - \rho\Phi)^{-1}\Sigma(I - \rho\Phi)^{-1\prime}e_2\\
&\quad -2e_1'\rho\Phi(I - \rho\Phi)^{-1}\Sigma(I - \rho\Phi)^{-1\prime}e_2. \qquad (22)
\end{aligned}$$

In Table 10, 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

$$A_{t+1} + D_{t+1} - E_{t+1} = R_{t+1}A_t. \tag{23}$$

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

$$v_t = \theta d_t - (\theta - 1)e_t - a_t. \tag{24}$$

This is essentially the log of equity payout yield, C_t/A_t. The outflow and inflow must be treated separately in equation (24) since equity payout can be negative.

Rewrite equation (23) 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

$$v_t \approx r_{t+1} - \theta\Delta d_{t+1} + (\theta - 1)\Delta e_{t+1} + \phi v_{t+1}, \tag{25}$$

up to an additive constant. Solving equation (25) forward H periods,

$$v_t = r_t(H) - \Delta d_t(H) + \Delta e_t(H) + v_t(H), \tag{26}$$

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 (13), 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: Cash Flow = Dividend		
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: Cash Flow = Equity Payout		
Equity Return	0.13	-1.79	-1.96
	(0.13)	(0.73)	(0.79)
Equity Payout Growth	0.02	-0.26	-0.29
	(0.02)	(0.13)	(0.14)
Equity Payout Yield	0.04	-0.17	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 last line of each panel reports the standard deviation of expected equity returns and expected cash flow growth in the infinite-horizon present-value model. 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: Cash Flow = Dividend					
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		
Infinite: Std Dev	**0.35**	0.19	**0.08**	0.15		
	Panel B: Cash Flow = Equity Payout					
1	**0.04**	0.02	**0.20**	0.06	**0.76**	0.07
2	**0.07**	0.03	**0.35**	0.10	**0.59**	0.11
5	**0.12**	0.05	**0.61**	0.13	**0.28**	0.14
10	**0.15**	0.06	**0.77**	0.09	**0.08**	0.08
Infinite	**0.16**	0.06	**0.84**	0.06		
Infinite: Std Dev	**0.25**	0.10	**1.27**	0.19		

Table 3: Decomposing the VAR in Equity Return, Equity Payout Growth, and Equity Payout Yield

The table reports estimates of a VAR in real equity return, real equity payout growth, log equity payout-dividend ratio, and log dividend 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	Equity Payout Growth	Equity Payout − Dividends	Dividend Yield
Equity Return	0.13	-1.74	-1.56	-0.35
	(0.13)	(0.70)	(0.74)	(0.12)
Equity Payout Growth	0.02	-0.19	-0.19	-0.03
	(0.02)	(0.14)	(0.14)	(0.02)
Equity Payout − Dividends	0.05	-0.34	0.63	-0.01
	(0.02)	(0.11)	(0.11)	(0.02)
Dividend Yield	0.01	0.31	0.35	0.98
	(0.06)	(0.20)	(0.22)	(0.04)
R^2	0.08	0.31	0.61	0.89

Table 4: 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.

As Fraction of Assets	Mean	Std Dev	Autocorrel	Correlation (As Fraction of Assets)								
				Dividends	Net Equity Repurchase	Equity Repurchase	Equity Issuance	Interest	Net Debt Repurchase	LTD Repurchase	LTD Issuance	Net STD Repurchase
Panel A: Flow of Funds 1926-2004												
Net Payout	0.017	0.010	0.814	0.455	0.337			0.526	0.553			
Dividends	0.015	0.006	0.843		-0.469			-0.133	0.367			
Net Equity Repurchase	-0.001	0.006	0.780					0.383	-0.257			
Interest	0.008	0.004	0.927						-0.128			
Net Debt Repurchase	-0.006	0.005	0.719									
Asset Return	0.054	0.122	0.086									
Net Payout Growth	0.038	0.384	-0.044									
Panel B: Compustat 1971-2004												
Net Payout	0.027	0.012	0.729	0.425	0.573	0.645	0.079	0.506	0.076	0.137	0.095	-0.023
Dividends	0.017	0.006	0.924		-0.295	-0.178	0.410	0.921	-0.566	-0.553	-0.162	0.006
Net Equity Repurchase	0.003	0.010	0.571			0.948	-0.381	-0.183	0.054	0.329	0.303	-0.232
Equity Repurchase	0.013	0.009	0.666				-0.068	-0.011	-0.011	0.319	0.344	-0.262
Equity Issuance	0.010	0.003	0.544					0.543	-0.202	-0.106	0.048	-0.035
Interest	0.018	0.007	0.869						-0.581	-0.381	0.070	-0.002
Net Debt Repurchase	-0.012	0.008	0.623							0.576	-0.153	0.246
LTD Repurchase	0.032	0.010	0.840								0.691	-0.126
LTD Issuance	0.044	0.008	0.499									-0.110
Net STD Repurchase	0.000	0.002	0.397									
Asset Return	0.064	0.108	0.037									
Net Payout Growth	0.067	0.258	-0.032									

Table 5: 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 6: 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: 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 7: 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 last line of each panel reports the standard deviation of expected asset returns and expected net payout growth in the infinite-horizon present-value model. The log-linearization parameter is $\rho = 0.98$. Estimation is through the VAR reported in Table 6. 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		
Infinite: Std Dev	**0.08**	0.09	**0.53**	0.11		
	Panel B: 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		
Infinite: Std Dev	**0.13**	0.09	**0.30**	0.09		

Table 8: Decomposing the 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, log net payout-equity payout ratio, and log equity payout-assets ratio. Estimation is by constrained maximum likelihood, and heteroskedasticity-consistent standard errors are in parentheses.

Lagged Regressor	Asset Return	Net Payout Growth	Net Payout − Equity Payout	Equity Payout − Assets
	Panel A: Flow of Funds 1926-2004			
Asset Return	0.12	0.48	0.26	0.11
	(0.12)	(0.31)	(0.30)	(0.32)
Net Payout Growth	0.00	0.05	0.11	-0.06
	(0.04)	(0.12)	(0.11)	(0.09)
Net Payout − Equity Payout	-0.04	-0.21	0.67	0.18
	(0.03)	(0.12)	(0.09)	(0.10)
Equity Payout − Assets	0.07	-0.23	0.03	0.68
	(0.03)	(0.08)	(0.09)	(0.11)
R^2	0.10	0.15	0.49	0.48
	Panel B: Compustat 1971-2004			
Asset Return	0.06	0.21	-0.84	0.99
	(0.18)	(0.40)	(0.50)	(0.44)
Net Payout Growth	-0.02	0.05	-0.17	0.24
	(0.08)	(0.14)	(0.12)	(0.19)
Net Payout − Equity Payout	0.06	-0.03	0.64	0.28
	(0.05)	(0.12)	(0.14)	(0.21)
Equity Payout − Assets	0.08	-0.29	0.05	0.59
	(0.04)	(0.09)	(0.08)	(0.13)
R^2	0.10	0.23	0.44	0.38

Table 9: Variance Decomposition of Equity Return

In Panel A (Panel B), the variance of unexpected equity return is decomposed into changes in expected equity returns, changes in expected dividend (equity payout) growth, and minus two times the covariance between the changes. 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 Tables 1 and 3. Heteroskedasticity-consistent standard errors are in parentheses.

	Fraction of Variance Explained by Changes in Expected		
VAR Model	Equity Returns	Cash Flow Growth	$-2 \times$ Covariance
	Panel A: Cash Flow = Dividend		
Table 1A	0.49	0.38	0.14
	(0.41)	(0.13)	(0.31)
	Panel B: Cash Flow = Equity Payout		
Table 1B	0.58	0.61	-0.20
	(0.39)	(0.14)	(0.38)
Table 3	0.93	0.31	-0.25
	(0.64)	(0.06)	(0.63)

Table 10: Variance Decomposition of Asset Return

In each panel, the variance of unexpected asset return is decomposed into changes in expected asset returns, changes in expected net payout growth, and minus two times the covariance between the changes. The sum need not equal one because of log-linear approximation error. Estimation is through the VAR reported in Tables 6 and 8. Heteroskedasticity-consistent standard errors are in parentheses.

	Fraction of Variance Explained by Changes in Expected		
VAR Model	Asset Returns	Net Payout Growth	$-2 \times$ Covariance
	Panel A: Flow of Funds 1926-2004		
Table 6A	0.14	1.24	-0.38
	(0.28)	(0.40)	(0.63)
Table 8A	0.40	1.14	-0.54
	(0.34)	(0.34)	(0.63)
	Panel B: Compustat 1971-2004		
Table 6B	0.65	1.12	-0.66
	(0.65)	(0.47)	(1.11)
Table 8B	0.54	0.92	-0.34
	(0.46)	(0.26)	(0.68)

Table 11: 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

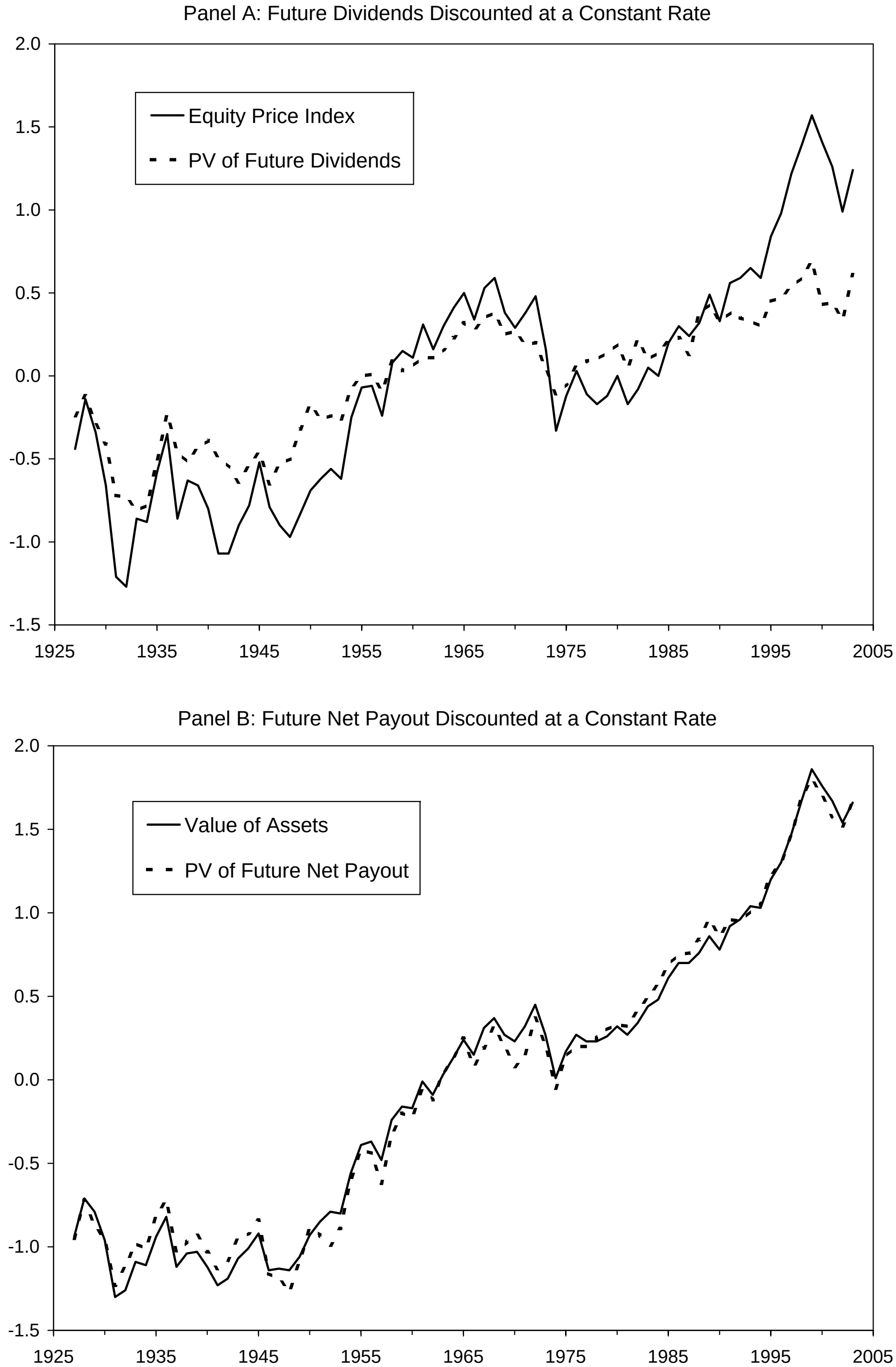


Figure 1: Present Value of Future Dividends and Net Payout

Panel A shows the real value of the CRSP value-weighted index for NYSE, AMEX, and NASDAQ stocks. A VAR in real equity return, real dividend growth, and log dividend yield (reported in Table 1) 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 (reported in Table 6) 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.

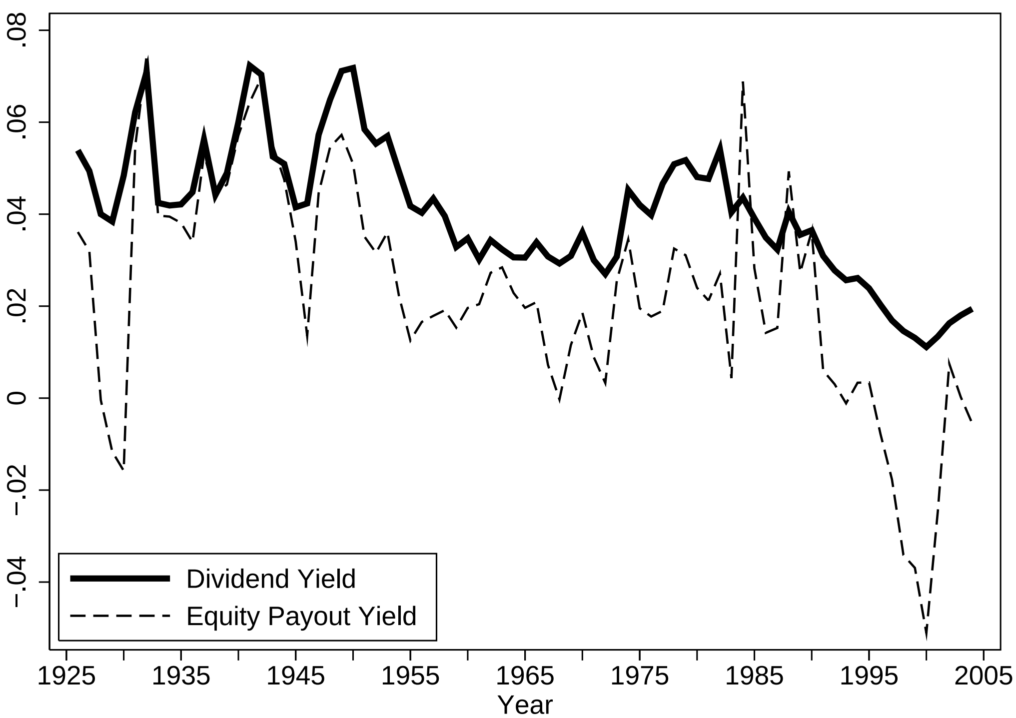


Figure 2: Dividend Yield and Equity Payout Yield

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.

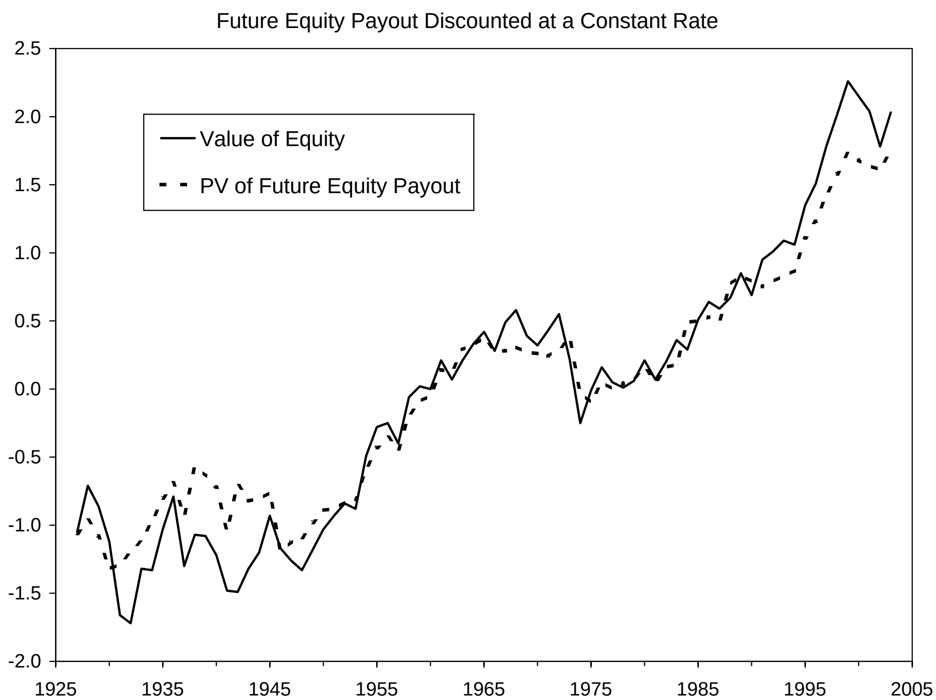


Figure 3: Present Value of Equity Payout
The figure shows the real market equity of NYSE, AMEX, and NASDAQ stocks. A VAR in real equity return, real equity payout growth, and log equity payout yield is used to estimate the present value of equity payout under a constant discount rate. All series are deflated by the CPI and reported in demeaned log units.

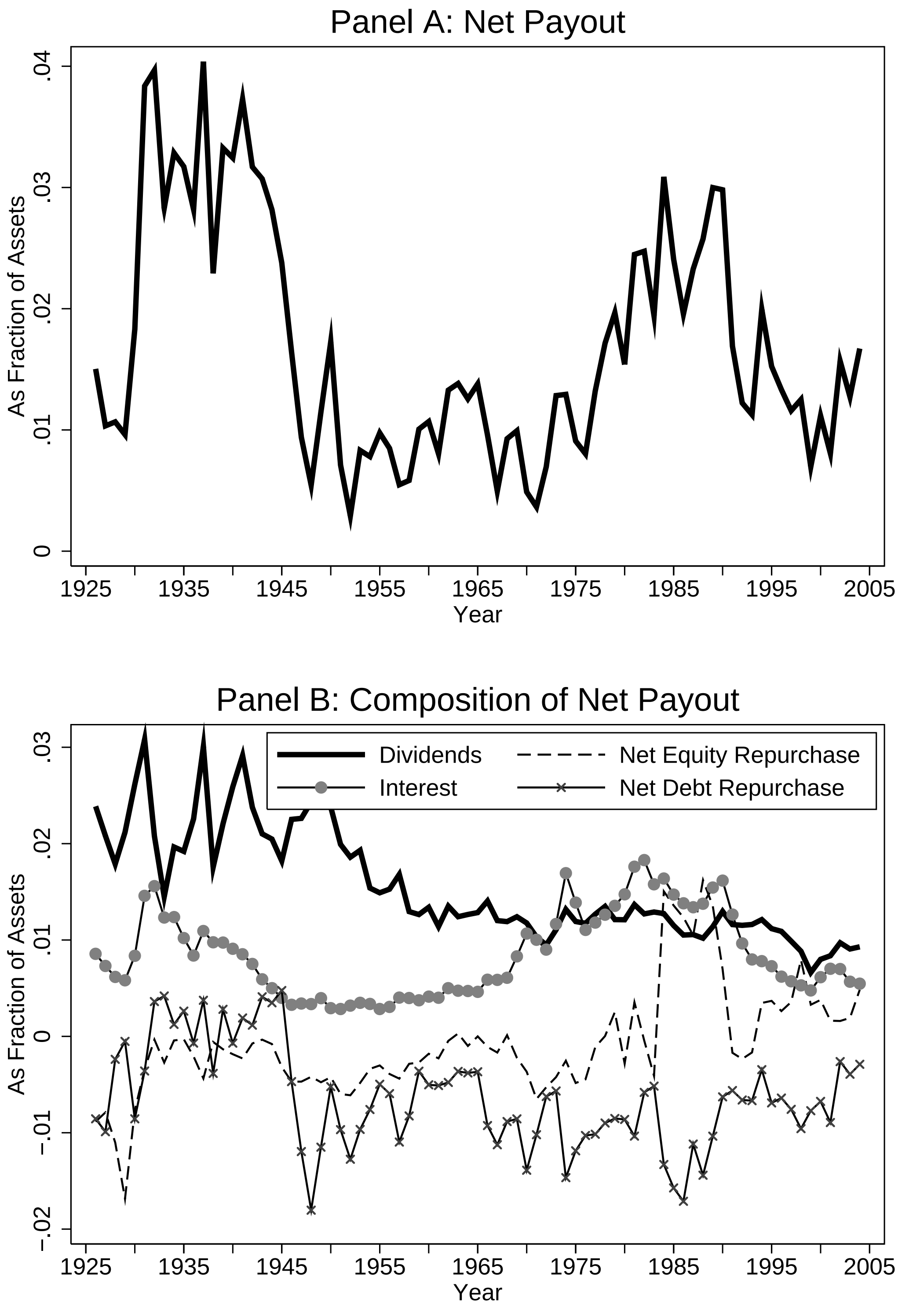
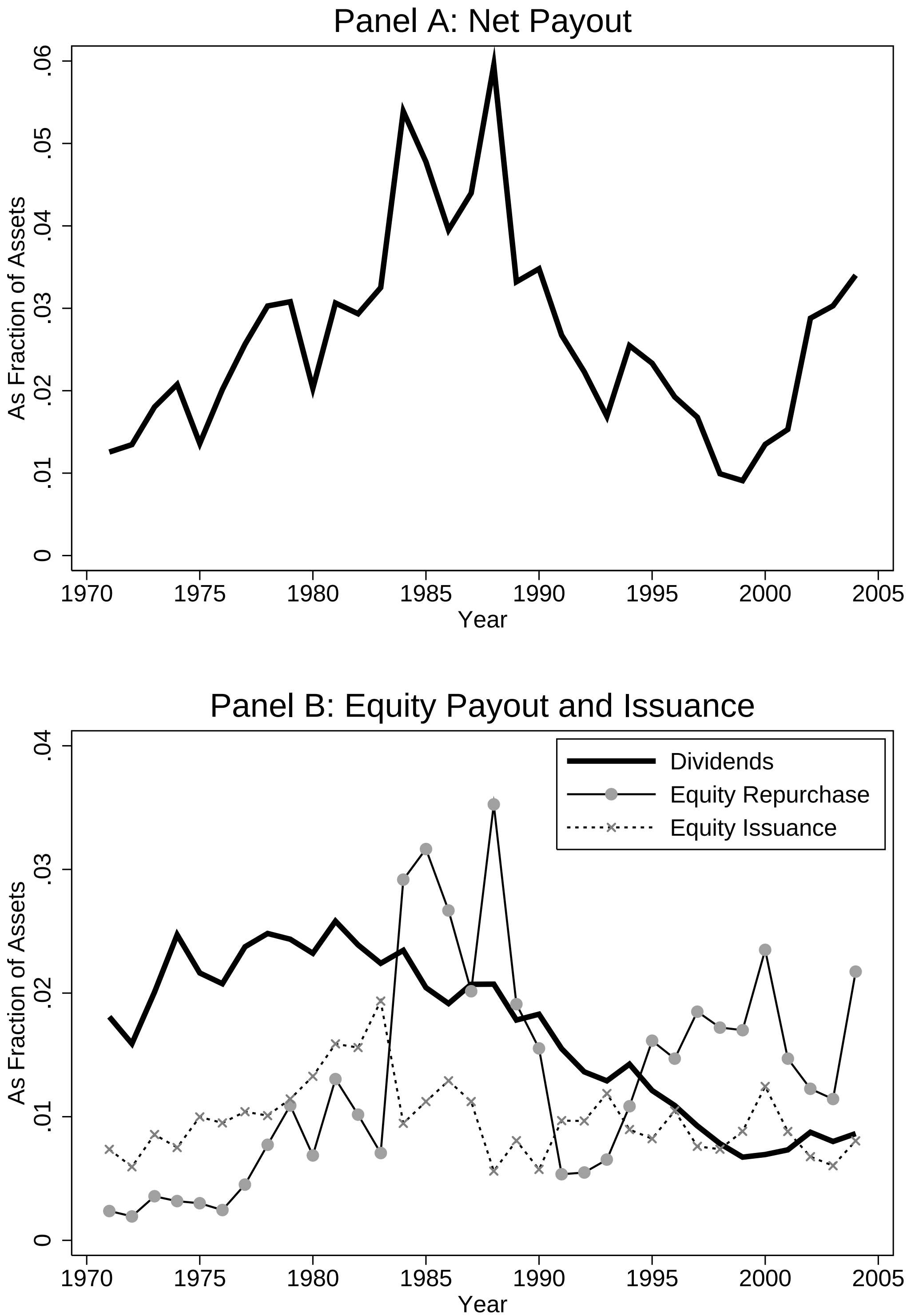


Figure 4: Net Payout Yield in the Flow of Funds

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.



[**Figure 5 continued on the next page**]

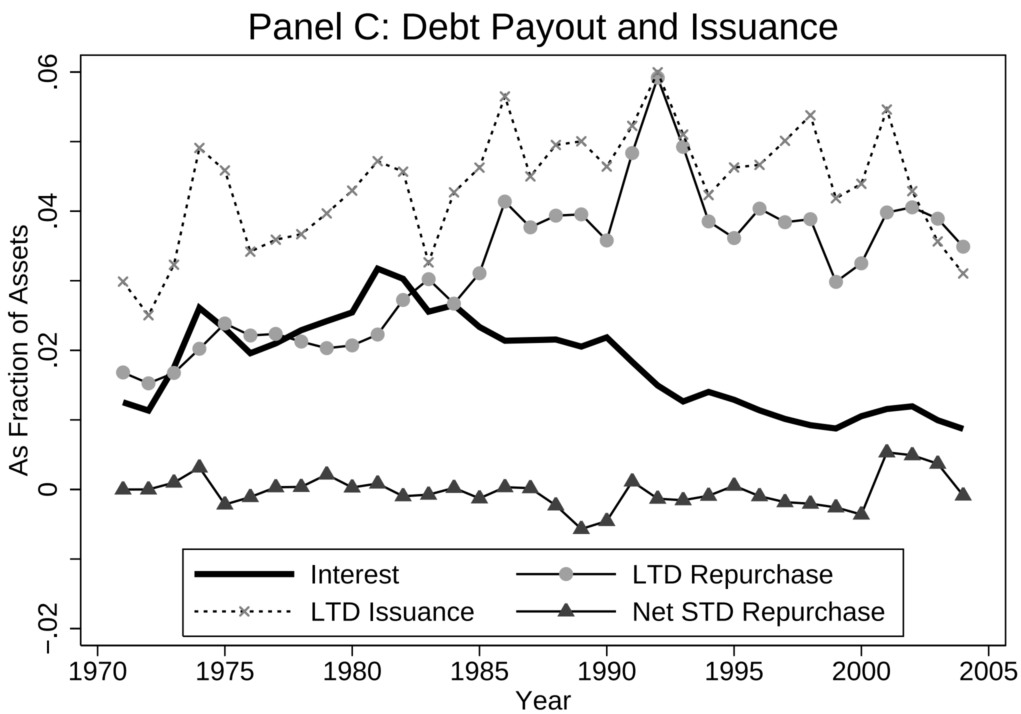
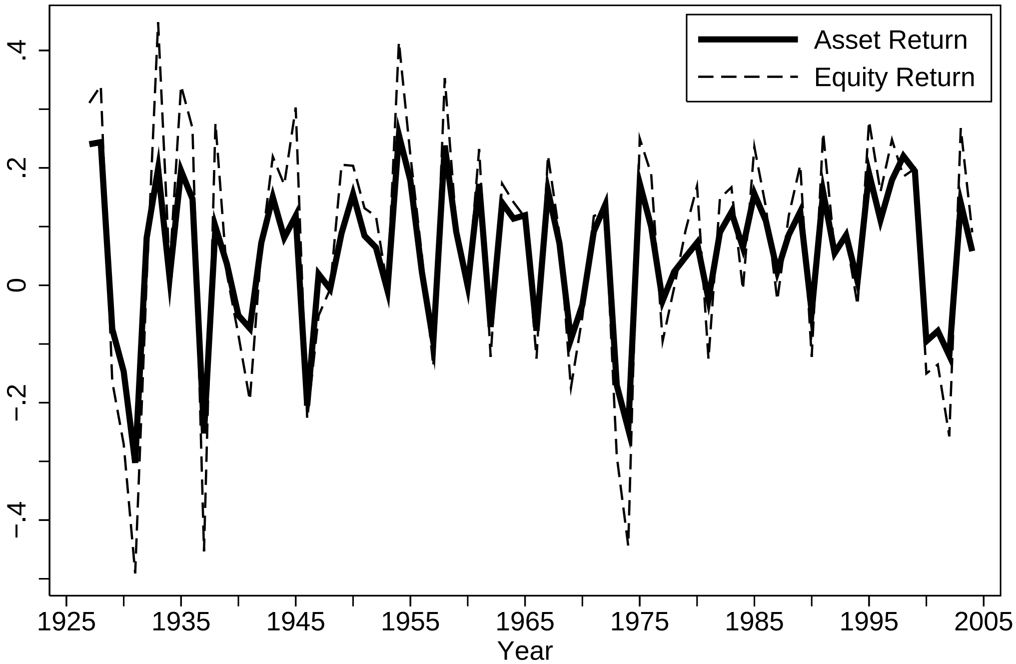


Figure 5: Net Payout Yield in Compustat
Net payout in Panel A is the sum of Panel B (dividends plus equity repurchase minus equity issuance) and Panel C (interest plus long-term debt repurchase minus long-term debt issuance plus net short-term debt repurchase). The data represent nonfinancial firms in Compustat for the period 1971–2004.

Panel A: Asset Return vs. Equity Return



Panel B: Net Payout Growth vs. Dividend Growth

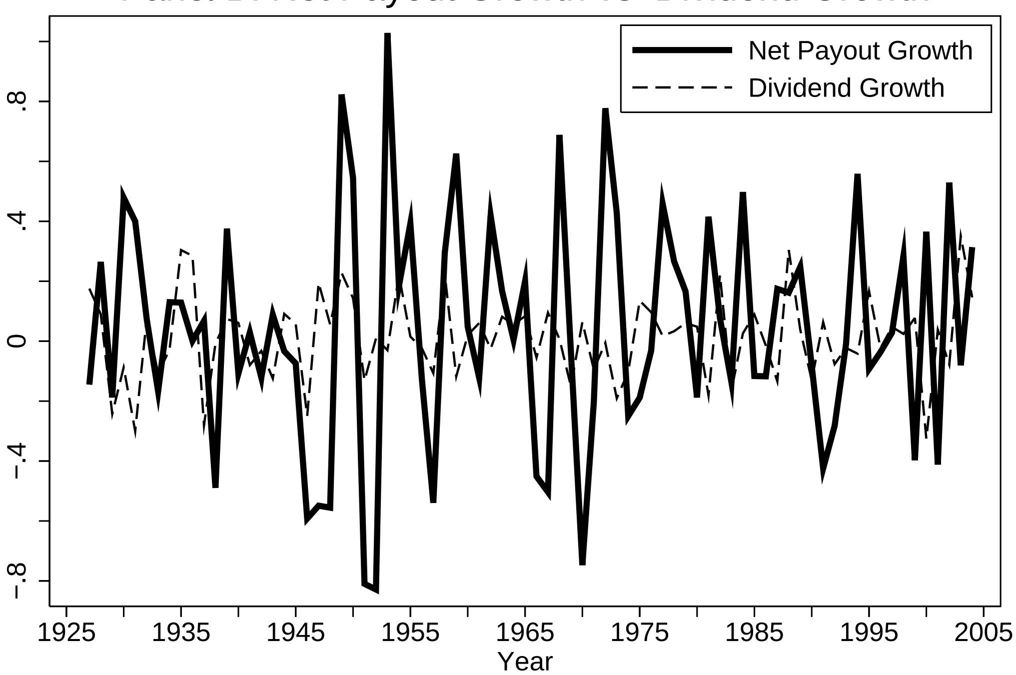


Figure 6: A Comparison of Returns and Cash Flow Growth
Asset return and net payout growth are for nonfinancial corporations in the Flow of Funds. Equity return and dividend growth are for the CRSP value-weighted index.