Dividend Smoothing and Predictability

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Abstract

Dividend policy is irrelevant for stock price variation, but crucial for dividend growth. Therefore, the lack of dividend growth predictability in the postwar period is not an indication that there is no cash flow news in price variations. Rather, we show that aggregate dividends are significantly more smoothed in the postwar period, which contributes to their lack of predictability. Sorting firms into portfolios based on how smooth their dividends are, dividend growth is predictable for firms that have not smoothed their dividends, but unpredictable for firms that have smoothed their dividends. In contrast, earnings growth is predictable for all portfolios. Our evidence suggests that there is significant cash flow news in price variations, and that when dividend policy leads to smoothed dividends, dividends do not represent well the outlook of future cash flows.

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1 Introduction

In their seminal paper, Miller and Modigliani (1961) argue forcefully that dividend policy is irrelevant: while corporate managers have large discretion over payout options, such discretion should be irrelevant for stock prices. Rather, stock prices should be driven by "real" behavior – the earnings power of corporate assets and investment policy – and, crucially, not by how the earnings power is distributed.[1]

The evolving history of dividend payout appears to be largely consistent with Miller and Modigliani's (1961) intuition. For example, Lintner's (1956) early analysis finds that corporations are loathe to cut dividends; dividends are smoothed and tied to long-term sustainable earnings. More recently there has been a dramatic shift in dividend payout: in 1973, 52.8% of publicly traded non-financial non-utility firms paid dividends; this number reached its peak at 66.5% in 1978 and dropped to only 20.8% in 1999 (Fama and French (2001)). The remaining dividend payers are content with maintaining past levels of dividends per share; after that the payout policy is of secondary importance (Brav, Graham, Harvey, and Michaely (2004)). With the declining tendency to pay dividends, stock repurchases emerged as an economically significant channel of payout in the early 1980s (Bagwell and Shoven (1989)) and are now of roughly the same magnitude as aggregate dividends (Skinner (2008)). In a nutshell, we have seen a wide range of dividend payout polices in the past 60 years.

Dividends might not be relevant for stock prices, but they are critical for economic analysis. Economists have long wondered why stock prices move around: is the movement driven mainly by investors' revised forecasts regarding future cash flows or by revisions to discount rates? The answer to this question is usually inferred from the predictability of cash flows relative to that of stock returns.[2] Since dividends are habitually seen as the cash flows to stockholders, "predictability

[1]While payout policy might be relevant to shareholders when the capital market is incomplete or imperfect (see the excellent survey paper by Allen and Michaely (2002) and the references therein), the intuition remains that the fundamental driver of a firm's cash flow, namely, its earnings power, is of the first order importance for firm's valuation.

[2]The idea is that, if cash flow growth rates and stock returns are predictable, the expected cash flow growth rates and the expected returns must be time-varying. Such variations must cause stock prices to change, and thus the

of dividends and/or returns form, in many ways, the rational paradigm to interpret asset price variation." (Bansal and Yaron (2007)).[3] The general conclusion of the extant literature is that the dividend-price ratio (i.e., dividend yield) can predict aggregate returns, but not dividend growth. This finding has led to the widely accepted view that almost all the variation in the dividend yield is driven by the variation in discount rates (Cochrane (1992, 2001, 2006) and Campbell and Ammer (1993)).

What role does dividend policy, for example, dividend smoothing and firms' decreasing propensity to pay dividends, play in shaping the conclusion on asset price variation? Dividend policy, being irrelevant, should not affect stock prices, but it affects dividend growth by definition (e.g., March and Merton (1986)). How much of the inability of the dividend yield to predict dividend growth stems from the fact that over any period of time dividends can be arbitrary and delinked from asset prices?

Chen (2008) shows that dividend growth is strongly predictable by the dividend yield in the period 1872-1945 but this predictability completely disappears in the postwar period. This finding raises an interesting paradox since any conclusions regarding asset price variations based on the relative dividend growth/return predictability findings would be the *opposite* for the pre- and postwar periods. What has caused such a dramatic change of predictability? Given the importance of this question to the understanding of price movements, it is natural to explore whether the change is due to the evolving dividend policy in the postwar period.

A major change in payout policy in the post war period has been the advent of repurchases. While including both dividends and repurchases as a measure of future cash flows seems a natural step, we note that Miller and Modigliani's (1961) intuition applies to all forms of payout, including both dividends and repurchase. Ultimately, stock prices reflect the present value of future earnings power; whether such earnings are distributed, and in what form of payout, can be arbitrary. For

relative predictability reveals which component is more important in driving price movements.

[3] For example, to explain the equity premium puzzle, Campbell and Cochrane (1999) focus on modeling the time-varying expected return while Bansal and Yaron (2004) model both expected return and dividend growth. As another example, see Ang and Liu (2004) for how to discount future cash flows using time-varying discount rates.

this reason, if one wants to understand whether price movements reflect cash flows, it is appropriate to examine whether earnings growth is predictable. The benefit of using earnings as the meaningful measure of cash flows is summarized by Miller and Modigliani (1961):

> We can follow the standard practice of the security analyst and think in terms of price per share, dividends per share, and the rate of growth of dividends per share; or we can think in terms of the total value of the enterprise, total earnings, and the rate of growth of total earnings. Our own preference happens to be for the second approach primarily because certain additional variables of interest — such as dividend policy, leverage, and size of firm – can be incorporated more easily and meaningfully into test equations in which the growth term is the growth of total earnings.

The above discussion reveals two unanswered questions which are fundamental to understanding stock price movements: first, has there been a significant change of dividend policy from the prewar to the postwar period that has caused the change in dividend growth predictability?; second, would the use of a more comprehensive measure of cash flow, such as earnings growth, improve the cash flow predictability in the postwar period?

This paper contributes to the literature by providing new evidence answering these two questions. We first document a significant change in dividend policy from the prewar to the postwar period. In particular, dividend payout at the aggregate level has become much more smoothed. For example, when running the standard Lintner's (1956) model for 1871-1945, the speed of adjustment to target is 0.37; the corresponding number for 1946-2006 is 0.09. In other words, in the postwar period dividends adjust to their earnings target at a speed about one fourth of that in the prewar period. As another example, if we regress dividend growth on its own lag, the coefficient is 0.20 for the prewar period and is statistically insignificant. The corresponding coefficient is 0.47 in the postwar period and statistically significant at the 1% level. Dividend policy has evolved in such a way that its own lag has become its best predictor in the postwar period, consistent with the survey by Brav, Graham, Harvey, and Michaely (2004).

Our evidence suggests that changing dividend policy played a critical role in the disappearance of dividend growth predictability. Intuitively, most of the variation of the dividend yield comes from stock prices. Since dividends grow mainly following their own lags rather than the outlook of future cash flows, stock price variation does not reflect expected dividend growth variation. Put differently, the fact that dividend yield does not predict dividend growth in the postwar period does not mean that there is no cash flow news in stock price variation; it simply means that the dividend growth is not representative of expected future cash flows.

Given the growing tendency of repurchases to substitute dividends, it is natural to suspect that the combined (dividends and repurchases) payout could represent cash flows appropriate for prices. However, our evidence shows that this is not the case: the combined payout growth remains unpredictable by the payout yield in the postwar period. This finding, however, is not surprising – Miller and Modigliani (1961) suggest that all payout policies are irrelevant for valuations.

The second contribution of the paper focuses on the predictability of earnings growth, returns, and the payout ratio. We show that the earnings-price ratio (i.e., earnings yield) strongly predicts earnings growth in the postwar period, from short to long horizons. We note that the dividend growth rate is equal to the earnings growth rate plus the payout ratio growth rate; the latter is defined as the growth rate of dividend/earnings ratio. Since dividend growth is not predictable but earnings growth is strongly predictable, the payout ratio growth rate must also be strongly predictable in the postwar period. We find this is indeed the case. This finding has an intuitive interpretation: stock price variation contains significant news about future earnings. However, since dividends are smoothed, they do not respond strongly to earnings. As a result, earnings predictability is equivalent to payout ratio growth predictability because payout ratio growth absorbs the variation of earnings growth.

In order to further highlight the role of dividend policy in cash flow predictability, we sort firms into three portfolios based on how smooth a firm's dividend payout is. Smoothness is defined as the standard deviation of dividend growth divided by the standard deviation of earnings growth;

a lower ratio suggests that the firm's dividend payout is more smoothed. Interestingly, in the post war period dividend growth is predictable by the dividend yield for the portfolio that is least smoothed, but not so for the portfolio that is most smoothed. This evidence further supports our hypothesis that dividend smoothing played a crucial role in the lack of dividend growth predictability. While there are clear variations in dividend growth predictability conditional on the smoothness of dividend payout, we find that earnings growth and payout ratio growth are predictable for both portfolios in the postwar period.

The findings in this paper are consistent with those in Brav, Graham, Harvey, and Michaely (2004) who show that, during the postwar period, dividends appear to be more smoothed after the 1980s. Marsh and Merton (1987) also examine the dividend behavior of the aggregate stock market. However, to our best knowledge, our paper is the first that documents a dramatic change of dividend policy from the prewar to the postwar period. Moreover, this paper is the first to link this change to the dynamics of dividend growth predictability. In addition, Brav, Graham, Harvey, and Michaely (2004) and Skinner (2008) only conduct analysis at either the firm level or across firms, while we conduct pure time series analysis for aggregate portfolios. Since the lack of cash flow predictability is usually found at the level of the market portfolio, to link this to dividend policy, it is important to document the dividend smoothness for the market portfolio.

It is crucial to understand the relative importance of cash flow news and discount rate news in stock price variations. Shiller (1981) suggests that stock prices are too volatile to be justified by subsequent changes in dividends. Marsh and Merton (1986) argue that stock prices may appear too volatile when dividends are smoothed. Shiller (1986) criticizes the non-stationarity assumption of dividend growth in Marsh and Merton (1986). Campbell and Shiller (1988) then decompose the dividend yield into expected future dividend growth and expected discount rates. The relative importance of dividends and discount rates comes down to their predictability.

It is generally found that dividend growth is not predictable in the postwar period (see, for example, Campbell and Shiller (1988, 1998), Cochrane (1992, 2001, 2006), Ang (2002), Goyal and

Welch (2003), Lettau and Nieuwerburgh (2006), Ang and Bekaert (2007), and Chen (2008); for an exception see Binsbergen and Koijen (2007)).[4] Our empirical findings are consistent with this literature, but we differ by pointing out that the lack of dividend growth predictability by the dividend yield does not mean there is no cash flow news in price variations; rather, it could simply mean that there is a lot of cash flow news in the price variations, which is not reflected in dividends. Such a conclusion supports the intuition behind Marsh and Merton (1986). Notably, Lettau and Ludvigson (2005) point out another reason, different from dividend smoothing, of why the dividend growth might not be predicted by dividend yield.

A separate literature tries to incorporate more forms of payout in addition to dividends when running predictive regressions of returns (e.g., Vuolteenaho (2000), Bansal, Khatchatrian, and Yaron (2005), Boudoukh, Michaely, Richardson, and Roberts (2007), Larrain and Yogo (2008), Bansal and Yaron (2007), Ang and Bekaert (2007), and Hansen, Heaton, and Li (2008)). Our paper is in spirit close to this literature. However, we focus on a simple goal: we use dividend smoothing to explain the dramatic reversal of dividend growth predictability. We further show that simply adding repurchase to dividends does not lead to predictability of dividend growth. In contrast, earnings growth is predictable, consistent with the intuition that expected future earnings, not payouts, are relevant to price variations.

The remainder of the paper is organized as follows. Section 2 provides a theoretical motivation for use of earnings growth rather than dividend growth as a measure of cash flow. In section 3 we provide empirical evidence regarding the dividend behavior of firms in the pre and post war periods. The predictability of dividend growth, earnings growth, returns, and the payout ratio is assessed in section 4. A number of robustness checks are carried out in section 5. Section 6 concludes.

[4] There is also a separate literature that focuses on return predictability. This literature includes, among others, Rozeff (1984), Keim and Stambaugh (1986), Fama and French (1988), Harvey (1989), Campbell and Shiller (1988, 1998), Ferson and Harvey (1991), Cochrane (1992, 2006), Pesaran and Timmermann (1995), Kothari and Shanken (1997), Pontiff and Schall (1998), Lettau and Ludvigson (2001), Lewellen (2004), Campbell and Ammer (1993), Campbell and Yogo (2005), Goyal and Welch (2005), Campbell and Thompson (2005), Lettau and Nieuwerburgh (2006), and Chen and Zhao (2008).

2 Theoretical motivation

Campbell and Shiller (1988) show that the log dividend yield, suppressing a constant, can be approximated as

$$d_t - p_t = E_t \left[\sum_{j=0}^{\infty} \rho^j r_{t+1+j} \right] - E_t \left[\sum_{j=0}^{\infty} \rho^j \Delta d_{t+1+j} \right], \tag{1}$$

where d_t is log dividend, p_t is log price, r_{t+1+j} is log return, and Δd_{t+1+j} is log dividend growth. Equation (1) says that the log dividend yield is the difference between expected future returns and expected future dividend growth. It follows that the variation of the dividend yield must predict the revisions in the two expectation components.

This identity has inspired economists to examine whether expected return or expected dividend growth is more predictable by the dividend yield. In doing so, the key interest is to understand why stock prices vary (see Bansal and Yaron (2007) for discussion). Intuitively, stock price variation could reflect either a revised outlook on future cash flows or revisions to discount rates. The predictive regression reveals which component is being revised in prices.

Dividend policy completely determines dividend growth. On the other hand, dividend policy is irrelevant in valuation (Miller and Modigliani (1961) and Marsh and Merton (1986)). This creates a potentially large wedge between price variation and future dividend growth variation. When economists run predictive regressions, they hope to figure out whether price variation contains news about future cash flows. But if dividends do not vary according to the outlook of future cash flows, then it deems the exercise of predictive regressions futile. In the language of Miller and Modigliani (1961), the nature of the problem is that price has nothing to do with how future cash flows are distributed, but dividend growth has everything to do with it.

The counterargument is that the aggregate dividend yield seems to be historically stationary in the sense that it does not reach zero or explode. In other words, since dividend growth does seem to keep pace with price in the long run, dividend policy cannot be too wild. The difficulty comes down to identifying how long is the "long run." For example, dividend growth is only unpredictable by the dividend yield in the postwar period (Chen (2008)), a period that also seems to have experienced a large change in dividend policy. How much has this contributed to the lack of predictability?

In addition, imagine that the firm lets dividends grow at the constant long-term capital gain rate plus a noise. For such a dividend policy, the dividend yield will be stationary, and yet its variation is completely uninformative about revisions of future cash flows. In other words, it is quite possible to find that the dividend yield is stationary and does not predict future dividend growth. However, this finding would say nothing about whether stock price variation contains news about future cash flows.

The above discussion applies not only to dividends but also other forms of payout. In particular, redefining dividend by including share repurchase does not solve this problem since share repurchases are also a choice variable by the firm. In contrast, using actual earnings does get around this problem since earnings are determined by firm's fundamentals. As Miller and Modigliani (1961) point out, stock prices are determined by the earnings power of corporate assets and investment opportunities. Regardless of the payout policy, stock prices will change if the outlook on future earnings is revised. It follows that, in order to understand stock price variations, it is natural to examine the relative predictability of earnings growth and returns by the earnings-price ratio (i.e., earnings yield). This approach addresses the crux of the relative predictability issue since such an exercise is not affected by the payout policy.

In order to clearly understand the potential problems that payout policy can have on predictability we illustrate what happens to the predictive regression of dividend growth if dividends are smoothed. Consider the Lintner (1956) partial adjustment model in log form:

$$\Delta d_{t+1} = \alpha_0 + \alpha_1 e_{t+1} + \alpha_2 d_t + u_{t+1}, \tag{2}$$

where e_{t+1} is earnings and u_{t+1} is an error term. Rewrite (2) in terms of differences:

$$\Delta d_{t+1} - \Delta d_t = \alpha_1 \Delta e_{t+1} + \alpha_2 \Delta d_t + \Delta u_{t+1}, \tag{3}$$

or

$$\Delta d_{t+1} = \alpha_1 \Delta e_{t+1} + (1+\alpha_2)\Delta d_t + \Delta u_{t+1}. \tag{4}$$

Dividends are most smoothed if $\alpha_1 = 0$ and $\alpha_2 = 0$, in which case dividends grow at a constant rate plus some noise.

The summation of dividend growth is

$$\begin{aligned}
\sum_{j=0}^{\infty} \rho^j \Delta d_{t+1+j} &= \alpha_0 + \alpha_1 \Delta e_{t+1} + (1+\alpha_2)\,\Delta d_t + u_{t+1} + \rho\alpha_0 + \rho\alpha_1 \Delta e_{t+2} + \rho\,(1+\alpha_2)\,\Delta d_{t+1} \\
&\quad + \rho u_{t+2} + \rho^2 \alpha_0 + \rho^2 \alpha_1 \Delta e_{t+3} + \rho^2\,(1+\alpha_2)\,\Delta d_{t+2} + \rho^2 u_{t+3} + \ldots \qquad (5) \\
&= \text{constant} + \frac{(1+\alpha_2)}{1-(1+\alpha_2)\,\rho}\Delta d_t + \frac{\alpha_1}{1-(1+\alpha_2)\,\rho}\sum_{j=0}^{\infty}\rho^j \Delta e_{t+1+j} \\
&\quad + \frac{1}{1-(1+\alpha_2)\,\rho}\sum_{j=0}^{\infty}\rho^j u_{t+1+j}. \qquad (6)
\end{aligned}$$

Suppressing the constant, the dividend yield can then be written as

$$\begin{aligned}
d_t - p_t &= E_t\left[\sum_{j=0}^{\infty}\rho^j r_{t+1+j}\right] - E_t\left[\sum_{j=0}^{\infty}\rho^j \Delta d_{t+1+j}\right] \qquad (7) \\
&= E_t\left[\sum_{j=0}^{\infty}\rho^j r_{t+1+j}\right] - \left[\frac{(1+\alpha_2)}{1-(1+\alpha_2)\,\rho}\Delta d_t + \frac{\alpha_1}{1-(1+\alpha_2)\,\rho}E_t\left(\sum_{j=0}^{\infty}\rho^j \Delta e_{t+1+j}\right)\right] \qquad (8) \\
&= \text{Discount rate component} - \text{Cash flow component} \qquad (9) \\
&= \text{Discount rate component} - [\text{Smoothing component} + \text{Earnings component}], \qquad (10)
\end{aligned}$$

where

$$\begin{aligned}
\text{Discount rate component} &= E_t\left[\sum_{j=0}^{\infty}\rho^j r_{t+1+j}\right], \qquad (11) \\
\text{Cash flow component} &= \text{Smoothing component} + \text{Earnings component}, \qquad (12) \\
\text{Smoothing component} &= \frac{(1+\alpha_2)}{1-(1+\alpha_2)\,\rho}\Delta d_t, \qquad (13) \\
\text{Earnings component} &= \frac{\alpha_1}{1-(1+\alpha_2)\,\rho}E_t\left(\sum_{j=0}^{\infty}\rho^j \Delta e_{t+1+j}\right). \qquad (14)
\end{aligned}$$

The intuition is as follows. The variation of the dividend yield must reflect the variation of either the discount rate component or the cash flow component. Within the cash flow component, the smoothing component is deterministic as it is known at time t. Given Δd_t, one knows precisely its contribution to future dividend payout as a result of dividend smoothing. For the purpose of understanding price variation, the earnings component is important because its variation represents cash flow news. The smoothing component is not important because it is a function of dividend smoothing and has little impact on the price.

If dividends are very smoothed (i.e., both α_1 and α_2 are close to zero), the variation of dividend growth is not informative of future cash flows. In addition, imagine that the firm decides to increase dividend payout when the outlook of future cash flows goes down, probably in an effort to "boost stock price." The financial market is not fooled, so the price goes down while the current dividends go up, leading to a higher dividend yield. However, since dividends are smoothed, future dividends will be higher for a while. That is, the higher dividend yield will be associated with higher dividend growth for a while, contrary to the usual predicted negative relation. This problem arises because price contains information of all future cash flows, but dividends might say nothing about future cash flows.

The bottom line is that the smoothing component is never informative about future cash flows. Rather, it impedes finding the empirical relation between price movements and cash flow news. The more dividends are smoothed, the more severe the problem is likely to be. Therefore, before undertaking any predictability analysis of cash flows as proxied by dividends, it is essential that dividend payout patterns are examined.

3 Dividend smoothing

Dividend growth is strongly predictable in the prewar period, but this predictability completely disappears in the postwar period (Chen (2008)). To understand the cause of the change of predictability, we examine first whether there is a significant change of dividend policy from the prewar to the postwar period.

3.1 Dividend policy models

Based on interviews with managers, Lintner (1956) established the following stylized facts about dividend-setting behavior:

1. There is a long-run target dividend payout ratio to which managers adjust actual dividends gradually.

2. The focus is on changes in dividends rather than the level of dividends.

3. Managers will change dividends in response to a permanent change in earnings.

4. Managers are reluctant to make dividend changes that will have to be reversed at a later date.

From these stylized facts, Lintner's (1956) seminal partial adjustment model of the dividend-setting behavior is written as:

$$\Delta D_t = \alpha_0 + \alpha_1 E_t + \alpha_2 D_{t-1} + u_t \tag{15}$$

where ΔD_t is the change of the level of dividends, E_t is earnings and u_t is an error term. In this equation $-\alpha_1/\alpha_2$ is the target payout ratio (TPR) and $-\alpha_2$ is the speed of adjustment (SOA) to the target. Equation (15) is the first dividend policy model we will test.

As shown in the theoretical section above, if we take the first difference of equation (15), we obtain the second testable model:[5]

$$\Delta D_t = \beta_0 + \beta_1 \times \Delta E_t + \beta_2 \times \Delta D_{t-1} + \varepsilon_t. \tag{16}$$

The advantage of equation (16) is that the variables on the right hand side are not persistent. In this equation $1 - \beta_2$ is the speed of adjustment and thus β_2 measures the degree of smoothness.

[5]For equation (15) to be fully consistent with equation (16), β_0 should be zero. We find that whether β_0 is zero or not makes little difference on other parameters and, consequently, leave it there.

In a third variation of the dividend policy model we test

$$\Delta D_t = \gamma_0 + \gamma_1 E_t + \gamma_2 \times \Delta D_{t-1} + \upsilon_t. \tag{17}$$

Equation (17) is the same as equation (15) except that the lagged change of dividends is used as the regressor. Since this deviates from the Linter's model, our focus is to interpret the persistence parameter γ_2. The higher γ_2 is, the more dividend payout depends on its own lag, and thus the more smoothed is the dividend payout. Finally, We run a simple autoregressive regression:

$$\Delta D_t = \delta_0 + \delta_1 \times t + \delta_2 \times \Delta D_{t-1} + \nu_t. \tag{18}$$

Equation (18) takes additional control of the time trend and test whether dividends have significant autocorrelation. The interpretation of δ_2 is the same as γ_2.

We will test these four versions of dividend policy models. In addition, we can also replace D_t and E_t by their log form d_t and e_t. We will examine all these versions to ensure robustness.

3.2 Level of dividends

We use the annual S&P index data, obtained from Robert Shiller's website, to conduct the dividend policy tests. The data cover 1871-2006. The 1871-1925 sample mainly comes from Cowles (1939), which presumably covers all stocks traded on NYSE during the period; the 1926-2006 sample includes the S&P index firms. The Cowles data have been used by many studies (e.g., Campbell and Shiller (1988, 1998), Wilson and Jones (1987), Schwert (1989, 1990), Goetzmann (1993), Goetzmann and Jorion (1995), Lundblad (2006), and Chen (2008)).

Table 1 reports the summary statistics of the sample. We call 1872-1945 the prewar period and 1946-2006 the postwar period. The average log dividend growth in the prewar period is 1.3% with a standard deviation of 16%; the corresponding growth rate is 5.9% with a standard deviation of 5%. Therefore, the average dividend growth rate has largely increased while the volatility has largely decreased. We find the same pattern for earnings growth: the average earnings growth is 1.2% in the prewar period, with a standard deviation of 29%; it is 7.3% with a standard deviation of 18%.

The average payout ratio, defined as the ratio of dividends to earnings, is 71.9% in the prewar period and 49.7% in the postwar period. Consistent with previous studies (e.g., Fama and French (2001)), the payout ratio has declined in the postwar period. A t-test shows that the reduction of the payout ratio of 22.2% is significant at the 1% level.

Of particular interest is the reduction of dividend volatility compared to the reduction of earnings volatility. If dividends are more smoothed in the postwar period, the reduction of dividend volatility should be larger than the reduction of earnings volatility. To this end, we define the smoothness parameter as

$$S = \frac{\sigma\left(\Delta d\right)}{\sigma\left(\Delta e\right)}, \tag{19}$$

where $\sigma\left(\Delta d\right)$ is the volatility of dividend growth and $\sigma\left(\Delta e\right)$ is the volatility of earnings growth. The smoothness parameter is 0.545 in the prewar period but only 0.295 in the postwar period. The fact that the smoothness parameter has been cut by about half suggests that dividends are indeed much more smoothed in the postwar period. Another piece of supporting evidence is that, for the prewar period, the AR(1) coefficient for the dividend yield is 0.518, which is lower than the AR(1) coefficient for earnings yield. However, for the postwar period, the AR(1) coefficient for dividend yield is 0.926, higher than that for earnings yield (0.832).

We estimate the dividend policy models using the levels of dividends and earnings and report the results in Table 2. We focus our discussion on the speed of adjustment parameter, SOA. Panel A of Table 2 reports the estimates from the standard Lintner's model where we find that in the prewar period the SOA is 0.37. In contrast, in the postwar period the SOA is only 0.09, where in both cases the estimates are significant at the 1% level. Clearly, dividends are indeed much more smoothed in the postwar period: the postwar SOA is only about one fourth of the prewar SOA. The final column of Panel A reports a Chow test and indicates a significant structural break before and after 1945. Similarly, in Panel B of Table 2 where we use first differences of the independent variables, the SOA coefficient for the postwar period is also about one fourth of that for the prewar period.

In Panel C of Table 2 we report estimates for the third model discussed above. The coefficient on the lagged change of dividends is 0.061 for the prewar period, statistically insignificant from zero. In stark contrast, the coefficient is 0.687 for the postwar period and statistically significant at the 1% level. The dependence of the dividend payout on its own lag has, thus, dramatically increased. Similarly, in Panel D for a simple autoregressive regression, the coefficient is small and statistically insignificant for the prewar period with the adjusted R-squared at 1%, but is 0.87 in the postwar period, significant at the 1% level, and with the adjusted R-squared at 72%. Therefore, dividend policy has evolved from little dependence on the lagged dividends in the prewar period to heavy dependence in the postwar period. The lagged dividend payout has become the dominant variable explaining current dividend payout. This finding is consistent with the survey by Brav, Graham, Harvey, and Michaely (2004), in which the managers acknowledge the importance of maintaining the level of dividends but show little willingness to change dividends beyond that.

To better understand the evolution of dividend policy, Figure 1 plots the rolling-regression coefficients and their statistics, with a rolling window of 30 years. For the standard Lintner's model, we observe a relatively stable coefficient on the current earnings from 1891 to the 1940s; this coefficient then declines steadily from then on until the end of the sample. We find the same pattern for the SOA coefficient. This coefficient is reasonably steady between 1891 and the 1940s, but drops sharply after that. Interestingly the reduction of the SOA coefficient in the postwar period is accompanied by a simultaneous upward spike of its t-values. What this says is that dividend payout has become much more dependent on its own lag; this dependence is so steady that the coefficient is estimated with much better precision.

Figure 2 plots, in sequence, the rolling-window time series of (i) the SOA coefficient from the first difference dividend policy model (equation (16)); (ii) the persistence coefficient in the third dividend policy model (equation (17)); and (iv) the autoregressive coefficient in the fourth dividend policy model (equation (18)). The results are highly consistent: we see a relatively steady SOA coefficient in the prewar period, which declines in the postwar period. Accordingly, we see a small, unsteady persistence (or autoregressive) coefficient of dividends in the prewar period, which rises in the postwar period.

3.3 Log form of dividends

The dividend policy models are reestimated with dividends and earnings replaced by their log form. A nice feature of using the log form is that the dependent variable is the dividend growth. The results are reported in Table 3.

Panel A of Table 3 reports the estimates from the first dividend policy model. In this case, the SOA coefficient is 0.343 for the prewar period and 0.186 for the postwar period – the adjustment speed has been cut by about half in the postwar period. This magnitude of reduction is consistent with the change of the smoothness parameter S in Table 1. The Chow test indicates a significant structural break around 1945.

Estimates from the second dividend policy model are reported in Panel B of Table 3. The SOA coefficient is 0.71 for the prewar period and 0.53 for the postwar period. In Panel C, the persistence coefficient is estimated to be 0.109 for the prewar period and is statistically insignificant. In the postwar sample the same coefficient is 0.472 and is now statistically significant at the 1% level. In Panel D, the autoregression coefficient is 0.204 in the prewar period and statistically insignificant from zero. In contrast, the coefficient rises to 0.465 in the postwar period and is statistically significant at the 1% level. The rolling-regression coefficients are very similar to those in Figures 1 and 2. For simplicity we do not report them.

In sum, the evidence of a dramatic change of dividend policy is compelling. The adjustment speed to target in the postwar period, depending on the version of the Linter's model estimated, is usually one half or one fourth of that in the prewar period. The dependence of dividend payout on its own lag is usually insignificant in the prewar period, but strongly significant in the postwar period. The dividend policy has evolved in such a way that the lagged dividend payout has become the most important predictor of future dividend payout.[6]

Our findings have a direct implication for the literature that aims to understand stock price variations. If future dividend growth depends mainly on its own lag then the bulk of dividend growth is deterministic. Its variation is determined by dividend policy and does not reflect the variation of future cash flows. Since most of the variation of the dividend yield comes from stock prices, and since price variation should reflect the variation of expected future cash flows that are largely independent of the dividend policy, the link between the dividend yield and future dividend growth is destined to be weak. The more smoothed the dividends are, the more severe the problem is. Our evidence suggests that dividends are very smoothed in the postwar period. The bottom line is that, for the purpose of understanding stock price variation, future dividend growth is not the appropriate measure of expected future cash flows. The lack of dividend growth predictability is not necessarily indicative of there being little cash flow news in price variations, as usually interpreted in the current literature.

A natural next question is what is a better measure of expected future cash flows. To this end, several studies have suggested to add stock repurchase on top of dividend payout (e.g., Boudoukh, Michaely, Richardson, and Roberts (2007) and Skinner (2008)). Skinner finds that the combined total payout fits the Lintner's model better. While this is a clear improvement, we note that the intuition by Miller and Modigliani (1961) is that *all* payout policies are irrelevant. Stock prices consider the future earnings power of assets. Therefore, to understand price variations, it seems most natural to consider earnings growth as the appropriate measure of future earnings power.[7]

[6] For studies on dividend behavior at firm level, see, among others, Brav, Graham, Harvey, and Michaely (2004), Aivazian, Booth, and Cleary (2006), Booth and Xu (2007), and Skinner (2008).

[7] Skinner (2008), for example, argues that "The fact that I am able to link repurchase to earnings is important in providing evidence that repurchases substitute for dividends." His results can be regarded as efforts to bring total cash flows to resemble earnings better. The logic goes that it might as well to use earnings growth as the measure for future cash flows.

4 Return and cash flow predictability

To test return and cash flow predictability we employ CRSP data. The reason for this is that besides being the more widely used market portfolio, the data allow us to separately consider repurchase and net issues. We will later provide robustness checks to S&P index firms.

4.1 Data construction

We follow Bansal, Dittmar, Lundblad (2005) and incorporate repurchase into dividends to improve the chance of cash flow predictability. In particular, denote n_t the number of shares (after adjusting for splits, stock dividends, etc. using the CRSP share adjustment factor) and P_t stock price. Then repurchase is defined as

$$rp = \frac{P_{t+1}}{P_t} \times \left[1 - \min\left(\frac{n_{t+1}}{n_t}, 1\right)\right]. \tag{20}$$

When there is a repurchase, $\frac{n_{t+1}}{n_t} < 1$ and $\left[1 - \min\left(\frac{n_{t+1}}{n_t}, 1\right)\right]$ is the proportional repurchase; rp then captures repurchase return. Similarly, stock net issue is defined as

$$si = \frac{P_{t+1}}{P_t} \times \left[1 - \max\left(\frac{n_{t+1}}{n_t}, 1\right)\right]. \tag{21}$$

We calculate dividends, repurchase, and net issue in dollars for each firm month, and sum them across months to get the annual numbers for each firm. We then merge this annual data with the COMPUSTAT annual tape. The COMPUSTAT data are used to calculate book equity following Cohen, Polk, and Vuolteenaho (2003). For earlier years when book equity is not available we use the book equity data from Davis, Fama, and French (2000). Earnings for each firm year are then obtained through the clean surplus formula:

$$E_t = B_t - B_{t-1} + RP_t - SI_t + D_t, \tag{22}$$

where E_t is earning in year t, B_t is book equity, RP is repurchase, SI is share issuance, and D_t is dividend. The equation says that earnings are equal to the change of book equity plus repurchase and minus net issue; retained earnings plus dividend gives the total earning. We take a couple of steps to remove outliers. First, we treat the earnings data as missing if they are more negative than the market capitalization of stocks. Second, we winsorize RP (repurchase) and SI (share issuance) at 99.9%. We then aggregate the data to obtain the market portfolio. The final annual data cover the period 1928-2006.

Figure 3 plots the aggregate dividend yield with and without repurchase. It is clear that repurchases are essentially non-existent until the end of the 1970s. From then on repurchases separate total payout from dividends. Between 2000 and 2006, the average dividend yield is 0.016 without repurchases, and 0.031 with repurchases. This pattern is consistent with the findings in Skinner (2008) that repurchases are roughly equal to dividends at the aggregate level.

4.2 Predictability by dividend yield

We begin the empirical analysis by examining the predictability of dividend growth and returns by the dividend yield. Table 4 reports results from testing the ability of the dividend yield to predict returns and cash flows from one to five-year horizons. We run the following predictive regression:

$$y_t = \alpha_0 + \alpha_1 \times x_{t-1} + \varepsilon_t, \tag{23}$$

where y_t is either the cumulative log dividend growth without repurchase (Δd_t), with repurchase (Δd_t^{re}), or log return (r_t); and x_{t-1} is either log dividend yield without repurchase (dp_{t-1}) or with repurchase (dp_{t-1}^{re}). The regressions are run for the full sample (1928-2006) and the postwar sample (1946-2006).

The power of predictability tests are frequently questioned because of the persistence of the independent variable, its contemporaneous correlation with the dependent variables (e.g., Kendall (1954) and Stambaugh (1986, 1999)), and the overlapping nature of the dependent variable when conducting long-horizon tests (e.g., Boudoukh, Richardson, and Whitelaw (2006)), compounded with small sample size. For each regression coefficient, we provide both the Newey-West t-statistics and the simulated p-values that consider the above problems. The details of the simulation are provided in the appendix. We boldface the simulated p-values that are smaller or equal to 10%.

Panel A of Table 4 reports the predictability for dividend growth without repurchases. For the full sample, the one-year coefficient on the lagged dividend yield is -0.087 with a p-value of 0.02 and an adjusted R^2 of 9%. At the two year horizon dividend growth is predictable but the adjusted R^2 falls to 6%. At longer horizon the coefficient on lagged dividend yield, while having the correct sign, is statistically insignificant. For the postwar period, the coefficient has the wrong, positive, sign from one- to five-year horizons and is insignificant according to either the Newey-West t-statistics or the simulated p-values. In comparison, the estimated coefficients on the return predictability regression for the full sample are significant at three to five year horizons and in the postwar period significant at all horizons using Newey-West t-statistics. However, for both the full sample and the postwar sample the coefficients are insignificant when considering the simulated p-values.

Panel B reports the predictability of dividend growth when repurchases are included in dividends. For the full sample, the one year coefficient jumps to -0.212 (from -0.087 in Panel A) with a p-value of 0.00. The coefficients remain insignificant at longer horizons, but it is clear that including repurchase helps to some extent to find cash flow predictability in the full sample. However, there is still no sign of predictability in the postwar period. One interpretation, based on our earlier discussion, is that payout policy in the postwar period has led to more a smoothed dividend payout policy which prevents us from finding predictability. Including repurchase is slightly helpful in the full sample, but it does not help in the postwar sample.

In comparison, Table 4 shows that, consistent with Boudoukh, Michaely, Richardson, and Roberts (2007), the repurchase-included dividend yield exhibits a stronger ability to predict returns: the coefficients are significant at all horizons according to the p-values. Based on the size of the estimated coefficients and the adjusted R^2, the extent of return predictability is stronger in the postwar period. We note that the improvement in the postwar data arises because repurchases are negligible before that.

In sum, there are two findings in Table 4 that are of primary importance in the cash flow/return predictability debate. First, consistent with Chen (2008), dividend growth is predictable using the prewar data but not when only postwar data are used. This conclusion holds regardless of whether repurchases are included or not. Second, clear evidence of return predictability for the postwar period can be established if repurchases are considered in the dividend yield.[8]

4.3 Predictability by earnings yield and payout ratio

Compared to dividends, predictability involving earnings requires additional care. In particular, when we use the log earnings yield (ep_{t-1}) to predict return, we use the return from April of year t to April of year $t+1$. This lag is to ensure that the earnings in the predictor become public information before we count future returns. When predicting log earnings growth (eg_t), we use $ep0_{t-1}$ which uses price at the beginning of year $t-1$. When we predict returns and the payout growth rate we use price at the end of year $t-1$. The use of $ep0_{t-1}$ ensures that, regardless of the fiscal year end, the price we use is way ahead of earnings information. It is conservative and is likely to yield much smaller predictive power.[9]

One additional variable we consider is the payout ratio. To see why this variable is interesting, define the payout ratio as

$$DE_t = \frac{D_t}{E_t}. \tag{24}$$

Then dividend growth is

$$\begin{aligned} \Delta d_t &= \ln\left(E_t \times DE_t\right) - \ln\left(E_{t-1} \times DE_{t-1}\right) \\ &= \Delta e_t + \Delta de_t, \end{aligned} \tag{25}$$

where Δde_t is the growth rate of the payout ratio. If earnings growth is predictable but dividend growth is not because of dividend smoothing, the growth rate of payout ratio must be predictable.

[8]The finding that return predictability does not survive rigorous statistical simulations is consistent with Nelson and Kim (1993), Stambaugh (1999), and Boudoukh, Richardson, and Whitelaw (2006). Ang and Bekaert (2007) show that adding the riskfree rate as another explanatory variable helps to predict the excess returns. Chen (2008) shows that, even without repurchase, excess returns are predictable in the postwar period when horizons beyond five years are considered.

[9]When the aggregate earning is negative, we set the earning-to-price to be 0.0001, which translates to a log earning-to-price ratio of -9.21. Negative earnings occur only during 1933 following the great depression. Omitting this observation does not alter our results in any significant way.

The intuition is clear: to the extent that dividends are smoothed, the variation of the payout ratio is not random; rather, it represents the cash flow news that is not captured by dividends. If stock price variation contains information about future cash flows, it should be able to predict the growth rate of the payout ratio. The more smoothed dividends are, the stronger is this predictability.

On the other hand, Lintner (1956) argues that firms adjust dividends according to sustainable earnings. This suggests that the payout ratio is also likely to predict (sustainable) earnings growth. That is, a higher payout ratio suggests the firm is confident that earnings growth is likely to be higher in the future. Therefore, the payout ratio is interesting in the predictability tests both as a predictor for future earnings growth and as a variable to be predicted representing the degree of dividend smoothness.

Panel A of Table 5 reports the ability of the earnings yield to predict earnings growth, returns, and payout ratio growth. In contrast with the dividend yield coefficients in Table 4, the earnings yield coefficients are always significant when predicting earnings growth. In particular, for the full sample, the $ep0_{t-1}$ coefficient at one-year horizon is -0.721 with a p-value of 0.00 and an adjusted R^2 of 36%. At horizons greater than one year the estimated coefficients are around 0.85, always statistically significant and the adjusted R^2s are around 39%.

The most remarkable feature of the earnings growth estimates is that the results are as strong in the postwar sample as in the full sample: the coefficients in the postwar period are -0.651 at one-year horizon with an adjusted R^2 of 32%, and around -0.850 at the remaining horizons with an adjusted R^2 of just over 40%. In all cases the coefficients are statistically significant. Recall that we have used a conservative earnings yield $ep0_{t-1}$; using ep_{t-1} is likely to yield even stronger results.

The earnings yield also strongly predicts the payout ratio growth rate. For both the full and the postwar samples, the predictive coefficients are always significant at the 1% level from one-year to five-year horizons; the R-squared ranges from 32.2% to 46.6%. Intuitively, stock price variation reveals information about future cash flows (earnings) but not about dividends because the latter is heavily smoothed. As a result, the payout ratio growth absorbs the future cash flow variation and becomes predictable at all horizons.

The predictive power of earnings yield for returns is much weaker than that for earnings growth, consistent with Lamont (1998) and Goyal and Welch (2006). For example, in the full sample the coefficient on ep_{t-1} is significant at the one year horizon and the adjusted R^2 is 2.6%. With the exception of the four year horizon, the remaining estimates are not statistically significant. In the postwar sample, we find that the coefficient on ep_{t-1} is significant at the one and two year horizons, although the adjusted R^2 are low at 1.9% and 2.7% respectively. The magnitude of the regression coefficient when predicting returns is always much smaller than that when predicting earnings growth. This result suggests that the variation of the earnings yield reveals a lot of news about future cash flows: exactly the opposite of the conclusion reached when predicting dividend growth with the dividend yield.

Panel B reports the ability of the log payout ratio (de_{t-1}) to predict earnings growth, returns, and payout ratio growth. The payout ratio exhibits strong power to predict earnings growth at all horizons. The coefficients are large and positive indicating that a higher payout ratio predicts higher earnings growth at all horizons and the adjusted R^2s are roughly the same across all horizons. These results are consistent with the hypothesis that firms set dividends according to long-term sustainable earnings, and thus a high dividend yield predicts higher long-term earnings growth. The remaining columns of Panel B find that the payout ratio exhibits weak power to predict returns, but strongly predicts the payout ratio growth.

In Table 6 we examine the predictability of dividend growth by the payout ratio. The results show that the payout ratio does not predict dividend growth at all in the postwar period regardless of whether repurchase is included. Several recent studies (e.g., Hansen, Heaton, and Li (2008) and Bansal and Yaron (2007)) have included the payout ratio in their predictive regressions assuming that dividends and earnings are cointegrated in the long run. The findings in Table 6 are interesting in that they show how dividends and earnings are cointegrated: it seems that earnings, not dividends, are mainly responsible for the stationarity of the payout ratio.

In sum, in the postwar period, dividend growth is unpredictable regardless of whether repurchases are included or not. In contrast, earning growth is highly predictable, suggesting that dividend smoothing plays a crucial role in preventing us from finding cash flow predictability. Consistent with this intuition, the growth rate of the payout ratio is also highly predictable; it would not have been so if dividends were not smoothed. In addition, the payout ratio is also a strong predictor of earnings growth.

4.4 Predictability for smooth and volatile portfolios

If it is true that dividend smoothing has played a critical role in preventing us from finding cash flow predictability, then we have the following additional testable hypotheses: for the postwar period, dividend growth should not be predictable for firms who have the most smoothed dividend payout; dividend growth should be relatively more predictable for firms who have the least smoothed dividend payout. In contrast, earnings growth should be predictable for all firms regardless of how much dividends are smoothed.

To test these hypotheses, we sort firms into three portfolios according to the smoothness parameter S $(= \frac{\sigma(\Delta d)}{\sigma(\Delta e)})$ and then repeat the predictive regressions. Panel A of Table 7 reports the results that include the firms with the most smoothed dividend payout. In the full sample we find predictability at the one and two year horizons, as we did when looking at the aggregate portfolio. For the postwar period, the coefficients for predictive dividend growth all have the wrong positive sign and are all statistically insignificant, consistent with the findings for the aggregate portfolio. In comparison, the coefficients for predicting returns have the right positive sign, and are significant at all horizons.

Panel B reports results for firms that have the least smoothed dividend payout. In stark contrast to Panel A, dividend growth is reasonably predictable in the postwar period: the coefficients are all large and negative; they are significant for three out of five horizons according to the simulated p-values. That is, once dividends are much less smoothed, dividend growth becomes strongly predictable. This finding confirms the role of dividend smoothing in negating cash flow predictability at the aggregate level. Regarding return predictability, similar to Panel A, returns are strongly predictable by the dividend yield in the postwar period.

Whilst dividend smoothing effects dividend growth predictability it should not impact on earnings growth predictability. In order to check this, we examine earnings growth predictability for the portfolios formed on the extent that dividends are smoothed. In Panel A of Table 8, we examine, for the most smoothed portfolio, the ability of the earnings yield to predict earnings growth and returns. For both the full sample and the post war sample, the coefficients for predicting earnings growth are negative and highly significant for all horizons. The returns are also predictable at short horizons, but the results are weaker, judged from both the coefficients and the p-values, than the cases for predicting earnings growth. Therefore, for the most smoothed portfolios, once earnings growth is used, cash flow predictability is stronger than return predictability.

We find similar patterns in Panel B for the firms with the least smoothed dividends. In particular, for the postwar period, both earnings growth and returns are predictable by the earnings yield. The results regarding the predictive power of the payout ratio and the predictability of the payout ratio growth are similar to those in earlier tables. For brevity we do not report them.

The evidence from the portfolios sorted by smoothness is quite revealing. The finding that dividend growth is not predicable for the most smoothed portfolio, but earnings growth is equally predictable for all portfolios, strongly supports our hypothesis that dividend smoothing has imposed a negative impact on finding cash flow predictability. Again, the fact that dividend growth is not predictable for the most smoothed portfolio does not mean that there is not cash flow news in stock price variations. Rather, it means that, due to dividend smoothing, dividend growth is an inappropriate measure for the outlook of cash flows.

5 Robustness checks

5.1 Actual earnings data

Thus far the earnings data are calculated using the clean surplus formula. This approach has the advantage of allowing for more firms and thus represents the market better. For robustness, we construct the following alternative: starting from 1950 (the starting year of COMPUSTAT data) we only include those firm years with earnings data available from COMPUSTAT; before 1950 we still use the clean surplus formula to calculate earnings.

Panel A of Table 9 reports the predictive results using earnings yield. For both the full-sample and the postwar periods, earnings yield does a good job in predicting future earnings growth. The coefficient is significant at all horizons in the full sample and at year one to four in the postwar period. The magnitude of the coefficient is smaller than that when earnings are computed using clean-surplus identity. Therefore, using actual earnings data leads to slightly weaker results, presumably due to the smaller number of firms included. Nevertheless, earnings growth is still predictable in most cases. In comparison, while not reported, we find that dividend yield does not predict dividend growth, regardless of whether repurchases are included. The predictability of the payout ratio growth is similar to the case of earnings growth. Again, since dividend growth is not predictable, all the predictability of the payout ratio growth comes from earnings growth predictability. In addition, the earnings yield can predict returns in the postwar period.

In Panel B, the payout ratio strongly predicts the earnings growth and the payout ratio growth at most of the horizons. In comparison, the payout ratio does not predict returns in the postwar period. Overall, using direct earnings data yields conclusions similar to those in earlier tables.

5.2 S&P index firms in CRSP

Since we have used the S&P index portfolio earlier to establish the results regarding dividend policy, it is useful to also examine the predictability using S&P index firms. We thus construct a market portfolio as earlier but with only CRSP firms belonging to the S&P index.

Table 10 reports the predictive results using the dividend yield. We only report the dividends with repurchases included to achieve better predictability. Dividend yield does not predict dividend growth in the postwar period even when repurchases are included. In contrast, the repurchase-included dividend yield significantly predicts returns, and the results are stronger using the postwar data. Therefore, considering repurchases does not change the conclusion that, for the postwar period, dividend growth is unpredictable but returns are by the dividend yield.

Table 11 reports the predictive results using the earnings yield. As before, earnings yield is a strong predictor of both earnings growth and payout ratio growth, but is a relatively weak predictor of returns. Finally, Table 12 shows that the payout ratio is also a strong predictor of both earnings growth and payout ratio growth for all horizons and for both prewar and postwar periods. In contrast, it does not predict returns; nor does it predict dividend growth, regardless of whether repurchase is included. Therefore, our conclusions are robust to the case of S&P index firms.

6 Conclusion

A central issue for financial economists is to understand stock price variations. The current stock price is the sum of discounted expected future cash flows; its variation must reflect the revisions to expected future cash flows or the revisions to discount rates. The crucial question is "by how much of each" (Cochrane (2006)).

The answer to this question is usually acquired by comparing the relative predictability of cash flows and returns by the dividend yield. In this regard, the usual finding is that, at the aggregate level, returns are predictable by the dividend yield but dividend growth is not. This leads to the somewhat uncomfortable conclusion that there is little cash flow news in stock price variations.

Chen (2008) shows that dividend growth is strongly predictable in the prewar period, but this predictability completely disappears in the postwar period. It is difficult to imagine that the financial market has evolved in such a way that a lot of cash flow news is incorporated in price variations in the prewar period but little is incorporated in the postwar period. Rather, it is natural to suspect that the dramatic change of cash flow predictability has more to do with the cash flow measures than with the way investors evaluate securities.

Miller and Modigliani (1961) suggest that payout policies are irrelevant for price variations. This provides a critique on any study that attempts to link price variation to the variation of cash flows based on any particular form of payout. Payout policy changes affect payout predictability but not price variations.

In this regard, we document a significant change of dividend policy at the aggregate level from the prewar to the postwar period. In the postwar period, dividends are much more smoothed and respond much more to their past levels. The change of dividend policy corresponds to the change of its predictability. Importantly we also show that dividend growth is not predictable in the postwar period even after repurchases are included.

According to Miller and Modigliani (1961), stock prices are decided by future earnings and investment opportunities, not by how such earnings are distributed. Therefore, if one wants to link price variation to cash flows, the proper measure is earnings. Consistent with this intuition, we find that earnings yield strongly predicts earnings growth in the postwar period.

Earnings yield also strongly predicts payout ratio growth in the postwar period. Naturally, since earnings growth is predictable but dividend growth is not, the variation of cash flows that is not reflected by dividends must be absorbed by the payout ratio growth. The message is clear: due to dividends being smoothed, cash flow predictability is captured by payout ratio growth predictability.

We further sort firms according to the degree of dividend smoothness. For the most smoothed portfolio, dividend growth is not predictable in the postwar period; for the least smoothed portfolio, dividend growth is predictable. In contrast, for both portfolios, earnings growth is predictable in the full sample as well as the postwar sample. That is, the lack of cash flow predictability has more to do with dividend smoothness than with cash flow per se.

Our take-away message is that there is significant cash flow news in price variations at the aggregate level. The lack of dividend predictability in the postwar period is likely caused by the fact that dividends become much more smoothed and thus do not fully reflect the outlook of future cash flows.

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Appendix

The power of predictability tests is frequently questioned because of the persistence of the independent variable and its contemporaneous correlation with the dependent variables (e.g., Kendall (1954) and Stambaugh (1986, 1999)), and the overlapping nature of the dependent variable when conducting long-horizon tests (e.g., Boudoukh, Richardson, and Whitelaw (2006)), compounded with small sample size. We describe below the procedure through which we simulate p-value for each predictive coefficient to take care of the above problems.

Suppose we will run the following predictive regressions:

$$y_t^i = \xi_i + \alpha_i \times x_{t-1} + \varepsilon_{it}, \tag{A1}$$

where y_t^i, $i = 1, 2, ..., 5$, is the cumulative summation of y_t from 1 to horizon i. Also suppose y_t^1 and x_t follow $AR(1)$ processes:

$$y_t^1 = \beta_0 + \beta_1 \times y_{t-1}^1 + \omega_t, \tag{A2}$$

$$x_t = \gamma_0 + \gamma_1 \times x_{t-1} + \upsilon_t, \tag{A3}$$

and the correlation $corr(\omega_t, \upsilon_t) = \rho$. In addition, the standard deviation of ω_t is σ_y and the standard deviation of υ_t is σ_x. Finally, the sample size is T.

To simulate the p-value for the predictive coefficient α_1, we first conduct OLS regressions for equations A1-A3 and obtain estimates for the coefficients and parameters ρ, σ_y, and σ_x.... We then jointly simulate time series for y_t^1 and x_t with size T and with parameters ρ, σ_y, and σ_x. The null is that y_t^1 is not predictable by x_{t-1}. Long-horizon simulates of y_t^i are subsequently constructed by summing the simulated y_t^1.. We regress the simulated y_t^i on the simulated x_{t-1}, obtaining the simulated α_i, which we call $\alpha_{sim,i}$. We repeat the exercise 10,000 times to obtain the time series of $\alpha_{sim,i}$. We finally compare the estimated α_i with the time series of $\alpha_{sim,i}$ to obtain the p-value for the estimated α_i.

The above simulations take into consideration the autocorrelation of the variables, the contemporaneous correlation between the variables, and small sample size, and the overlapping data construction.

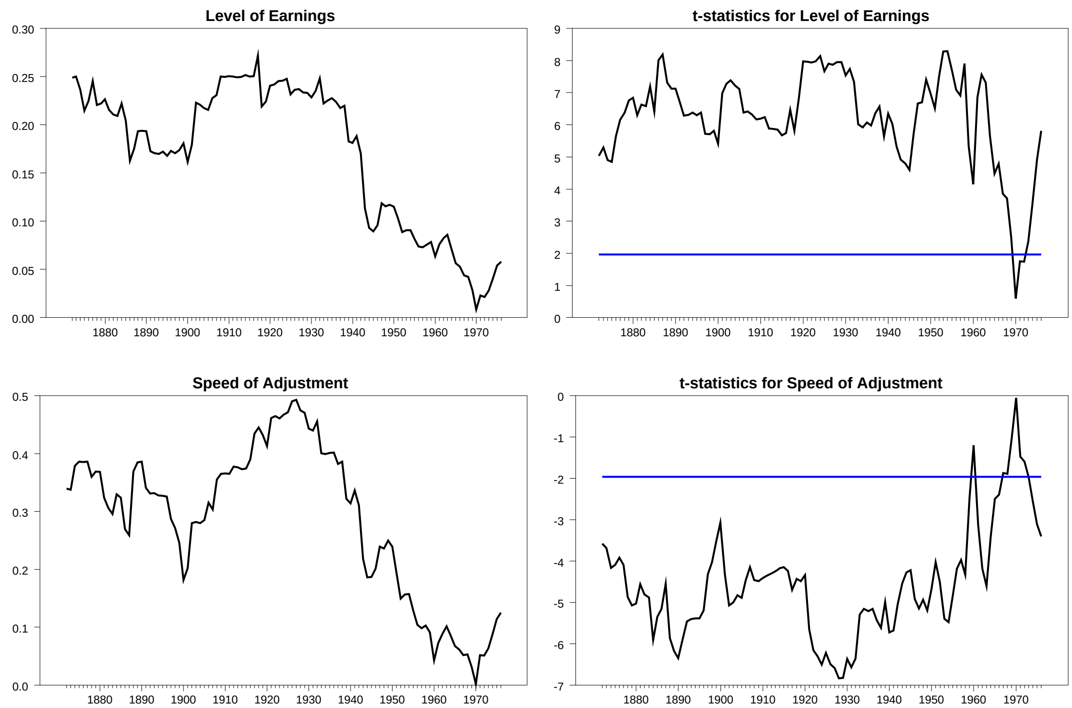

Figure 1. Rolling-Window Regressions for the First Dividend Model All panels correspond to Lintner's (1956) model (equation (15)). The length of rolling window is 30 years. The first row presents the rolling coefficients of earnings and Newey-West t-statistics; the second row the rolling speed of adjustment and t-statistics.

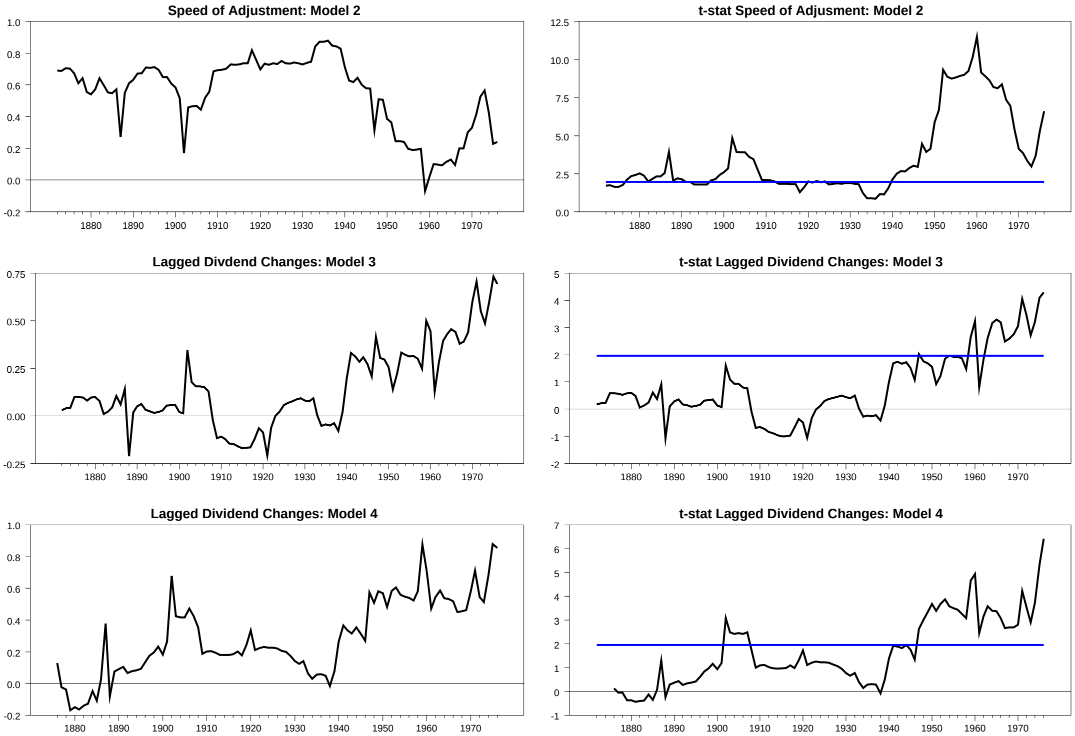

Figure 2. Rolling-Window Regressions for the Last Three Dividend Models The length of rolling window is 30 years. The first row reports the speed of adjustment for the second dividend model (equation (16)) and the Newey-West t-statistics; the second row the coefficient on the lagged change of dividends for the third dividend model (equation (17)) and the t-statistics; the third row the coefficient on the lagged change of dividends for the fourth dividend model (equation (18)) and the t-statistics.

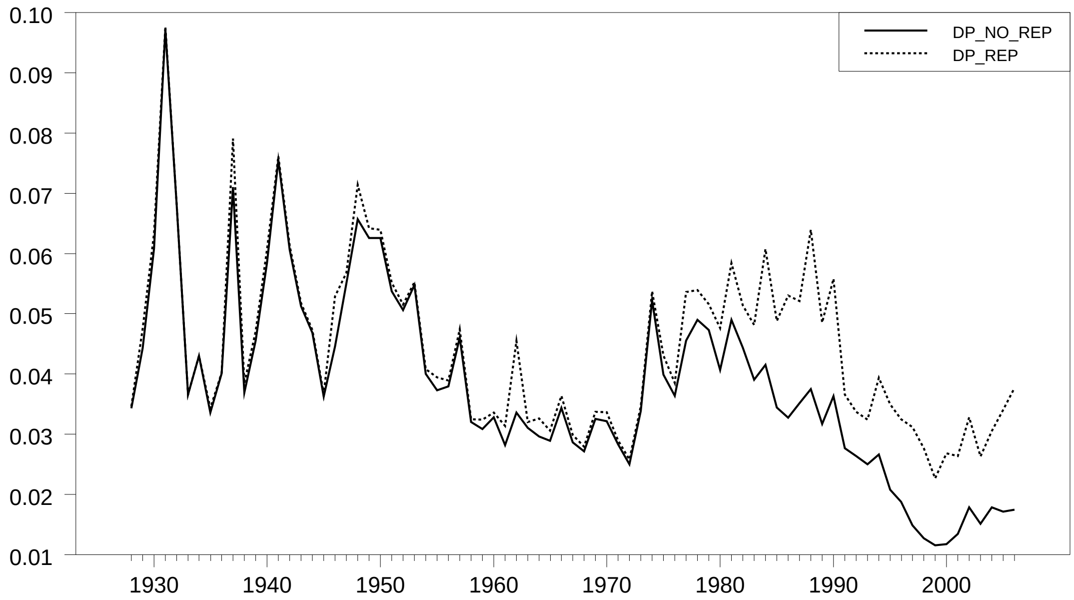

Figure 3. Aggregate Dividend Yield with and without Repurchase.

Table 1 : Summary Statistics

We report the S&P index annual data obtained from Robert Shiller's website. Δd is the log dividend growth rate; Δe is the log earnings growth rate; $\frac{D}{P}$ is the dividend-price ratio (i.e., dividend yield); $\frac{E}{P}$ is the earnings-price ratio (i.e., earnings yield); $\frac{D}{E}$ is the dividend-earnings ratio (i.e., payout ratio); and S is the standard deviation of dividend growth dividend by the standard deviation of earnings growth, which is a measure of dividend smoothness. The data cover 1872-2006.

		Δd	Δe	$\frac{D}{P}$	$\frac{E}{P}$	$\frac{D}{E}$	$S = \frac{\sigma(\Delta d)}{\sigma(\Delta e)}$
	Mean	0.034	0.039	0.045	0.075	0.618	0.500
	(*sd*)	(0.12)	(0.25)	(0.02)	(0.03)	(0.20)	
1872-2006	AR(1)	0.256	0.024	0.781	0.740	0.632	
	Mean	0.013	0.012	0.053	0.077	0.719	0.545
	(*sd*)	(0.16)	(0.29)	(0.14)	(0.03)	(0.21)	
1872-1945	AR(1)	0.204	-0.017	0.518	0.621	0.440	
	Mean	0.059	0.073	0.036	0.073	0.497	0.295
	(*sd*)	(0.05)	(0.18)	(0.01)	(0.03)	(0.09)	
1946-2006	AR(1)	0.473	0.089	0.926	0.832	0.649	

Table 2 : Dividend Policy Models Using Levels of Dividends and Earnings

Denote D_t the level of dividends, E_t the level of earnings, and Δ the change operator. Four dividend behavior models are estimated. The first is the original Lintner (1956) model and the second is estimated using the first differences. For these two models the speed of adjustment (SOA) and the target payout ratio (TPR) are implied. The focus of the third and the forth models is the coefficient on the lagged ΔD_t, which measures persistence (smoothness). New-West t-values are provided below each coefficient controlling for heteroskedasticity and autocorrelation. We also report the Chow test for structural break around 1945. The full data are the S&P 500 annual data covering 1872-2006.

Panel A: $\Delta D_t = \alpha_0 + \alpha_1 E_t + \alpha_2 D_{t-1} + u_t$							
	c	E_t	D_{t-1}	$\overline{R}^2$	SA	TPR	Chow 1945
1872-2006	0.035	0.052	-0.079	0.73	0.08	0.08	2.656
	(1.42)	(10.99)	(5.87)				[0.05]
1872-1945	0.005	0.248	-0.373	0.60	0.37	0.18	
	(0.32)	(10.22)	(8.93)				
1946-2006	0.120	0.054	-0.090	0.68	0.09	0.05	
	(1.74)	(7.69)	(4.25)				
$F-Test$		766.43	175.08				
		[0.00]	[0.00]				
Panel B: $\Delta D_t = \beta_0 + \beta_1 \times \Delta E_t + \beta_2 \times \Delta D_{t-1} + \varepsilon_t$							
	c	ΔE_t	ΔD_{t-1}	$\overline{R}^2$	SA	TPR	Chow 1945
1872-2006	0.025	0.037	0.825	0.81	0.17	0.22	3.677
	(1.38)	(7.30)	(17.25)				[0.01]
1872-1945	0.001	0.237	0.284	0.35	0.72	0.33	
	(0.20)	(6.09)	(2.94)				
1946-2006	0.062	0.036	0.808	0.79	0.19	0.19	
	(1.47)	(5.07)	(10.91)				
$F-Test$		773.78	50.15				
		[0.00]	[0.00]				
Panel C: $\Delta D_t = \gamma_0 + \gamma_1 E_t + \gamma_2 \times \Delta D_{t-1} + \upsilon_t$							
	c	E_t	ΔD_{t-1}	$\overline{R}^2$	SA	TPR	Chow 1945
1872-2006	-0.012	0.011	0.652	0.78			1.311
	(0.57)	(5.29)	(8.46)				[0.27]
1872-1945	-0.056	0.093	0.061	0.15			
	(2.90)	(3.45)	(0.53)				
1946-2006	-0.025	0.011	0.687	0.19			
	(0.47)	(3.29)	(4.04)				
$F-Test$		618.87	30.39				
		[0.00]	[0.00]				
Panel D: $\Delta D_t = \delta_0 + \delta_1 \times t + \delta_2 \times \Delta D_{t-1} + \nu_t$							
	c	ΔD_{t-1}	$Trend$	$\overline{R}^2$			Chow 1945
1872-2006	-0.053	0.913	0.001	0.74			3.408
	(2.24)	(15.43)	(2.07)				[0.02]
1872-1945	-0.001	0.187	0.000	0.01			
	(0.04)	(1.53)	(0.25)				
1946-2006	-0.448	0.872	0.005	0.72			
	(1.63)	(9.37)	(1.87)				
$F-Test$		54.23					
		[0.00]					

Table 3 : Dividend Policy Models Using Log Dividends and Earnings

Denote d_t the log of dividends, e_t the level of earnings, and Δ the change operator. Four dividend behavior models are estimated. The first is the original Lintner (1956) model and the second is estimated using the first differences. For these two models the speed of adjustment (SOA)and the target payout ratio (TPR) are implied. The focus of the third and the forth models is the coefficient on the lagged ΔD_t, which measures persistence (smoothness). New-West t-values are provided below each coefficient controlling for heteroskedasticity and autocorrelation. The full data are the S&P 500 annual data covering 1872-2006.

Panel A: $\Delta d_t = \alpha_0 + \alpha_1 e_t + \alpha_2 d_{t-1} + u_t$

	c	e_t	d_{t-1}	$\overline{R}^2$	SA	TPR	Chow 1945
1872-2006	−0.125	0.291	−0.319	0.55	0.32	0.22	3.229
	(8.74)	(12.70)	(12.09)				[0.02]
1872-1945	−0.125	0.332	−0.343	0.57	0.34	0.25	
	(4.33)	(9.72)	(8.62)				
1946-2006	−0.034	0.163	−0.186	0.43	0.19	0.14	
	(1.80)	(6.62)	(6.82)				
$F-Test$		47.11	33.78				
		[0.00]	[0.00]				

Panel B: $\Delta d_t = \beta_0 + \beta_1 \times \Delta e_t + \beta_2 \times \Delta d_{t-1} + \varepsilon_t$

	c	Δe_t	Δd_{t-1}	$\overline{R}^2$	SA	TPR	Chow 1945
1872-2006	0.012	0.247	0.311	0.30	0.68	0.36	1.523
	(1.31)	(6.74)	(4.21)				[0.21]
1872-1945	0.004	0.278	0.294	0.28	0.71	0.39	
	(0.26)	(5.04)	(2.90)				
1946-2006	0.023	0.133	0.462	0.40	0.53	0.24	
	(2.80)	(4.52)	(4.61)				
$F-Test$		24.51	2.83				
		[0.01]	[0.09]				

Panel C: $\Delta d_t = \gamma_0 + \gamma_1 e_t + \gamma_2 \times \Delta d_{t-1} + \upsilon_t$

	c	e_t	Δd_{t-1}	$\overline{R}^2$	SA	TPR	Chow 1945
1872-2006	0.015	0.016	0.211	0.09			4.520
	(1.30)	(2.43)	(2.51)				[0.00]
1872-1945	0.066	0.101	0.109	0.13			
	(2.58)	(3.04)	(0.96)				
1946-2006	0.033	−0.001	0.472	0.19			
	(2.05)	(0.10)	(4.04)				
$F-Test$		310.32	9.69				
		[0.00]	[0.00]				

Panel D: $\Delta d_t = \delta_0 + \delta_1 \times t + \delta_2 \times \Delta d_{t-1} + \nu_t$

	c	Δd_{t-1}	$Trend$	$\overline{R}^2$			Chow 1945
1872-2006	−0.005	0.235	0.000	0.07			0.550
	(0.22)	(2.78)	(1.61)				[0.64]
1872-1945	−0.002	0.204	0.000	0.02			
	(0.04)	(1.75)	(0.30)				
1946-2006	0.052	0.465	−0.000	0.20			
	(1.32)	(3.95)	(0.53)				
$F-Test$		4.924					
		[0.03]					

Table 4 : Predictability by Dividend Yield

We regress cumulative log dividend growth or returns, from one to five years, on the lagged log dividend yield. For example, g_t^1 is the annual dividend growth, g_t^5 is the five-year dividend growth, r_t^1 is annual return, and dp_{t-1} is the lagged dividend yield. We provide the New-West (NW) t-value and the simulated (Sim) p-value for each coefficients. The simulation considers the biases caused by the persistence of the variables, the contemporaneous correlation between the dependent and independent variables, and the overlapping small sample. See Appendix for more details. We boldface the p-value if it is lower than or equal to 0.10. The sample is constructed using the merged dataset of CRSP, COMPUSTAT, and Moody's book equity. The final sample covers annual data during 1928-2006.

	1928-2006		1946-2006			1928-2006		1946-2006	
	Dividend Growth					Returns			
	dp_{t-1}	$\overline{R}^2$	dp_{t-1}	$\overline{R}^2$		dp_{t-1}	$\overline{R}^2$	dp_{t-1}	$\overline{R}^2$
Panel A: Without Repurchases									
dg_t^1	−0.087	8.7	0.012	-0.9	r_t^1	0.049	1.2	0.103	6.9
NW	(1.85)		(0.51)			(0.99)		(2.40)	
Sim	[**0.02**]		[0.68]			[0.25]		[0.20]	
dg_t^2	−0.114	5.6	0.033	0.7	r_t^2	0.135	3.2	0.207	15.9
NW	(1.14)		(0.86)			(1.84)		(3.71)	
Sim	[**0.08**]		[0.80]			[0.19]		[0.16]	
dg_t^3	−0.121	3.5	0.033	-0.2	r_t^3	0.199	5.3	0.274	22.8
NW	(1.13)		(0.85)			(3.32)		(16.78)	
Sim	[0.15]		[0.75]			[0.21]		[0.19]	
dg_t^4	−0.097	1.1	0.042	-0.1	r_t^4	0.277	9.9	0.349	29.3
NW	(1.02)		(0.98)			(3.15)		(6.26)	
Sim	[0.28]		[0.77]			[0.19]		[0.19]	
dg_t^5	−0.067	-0.2	0.036	-0.6	r_t^5	0.349	15.7	0.455	36.2
NW	(0.90)		(0.81)			(2.89)		(4.71)	
Sim	[0.40]		[0.73]			[0.18]		[0.16]	
Panel B: With Repurchases									
dg_t^1	−0.212	17.7	−0.027	-1.1	r_t^1	0.128	3.1	0.226	17.0
NW	(2.91)		(0.58)			(1.78)		(4.10)	
Sim	[**0.00**]		[0.43]			[**0.04**]		[**0.01**]	
dg_t^2	−0.236	9.4	0.032	-1.2	r_t^2	0.294	9.36	0.407	30.4
NW	(1.45)		(0.39)			(3.25)		(4.56)	
Sim	[**0.01**]		[0.78]			[**0.02**]		[**0.00**]	
dg_t^3	−0.231	5.1	0.034	-1.5	r_t^3	0.413	13.7	0.519	40.5
NW	(1.37)		(0.32)			(6.08)		(5.54)	
Sim	[**0.07**]		[0.74]			[**0.02**]		[**0.01**]	
dg_t^4	−0.162	1.1	0.067	-0.1	r_t^4	0.523	19.5	0.595	42.2
NW	(1.07)		(0.53)			(5.62)		(5.50)	
Sim	[0.22]		[0.80]			[**0.01**]		[**0.01**]	
dg_t^5	−0.104	-0.3	0.044	-1.5	r_t^5	0.617	27.2	0.752	50.3
NW	(1.11)		(0.55)			(5.91)		(5.68)	
Sim	[0.36]		[0.73]			[**0.01**]		[**0.00**]	

Table 5 : Predictability by Earnings Yield and Payout Ratio

We regress cumulative log earnings growth (eg), returns (r), and payout ratio growth (deg), from one to five years, on the lagged log earnings yield (ep_{t-1}) in Panel A and on the lagged log payout ratio (de) in Panel B. For example, eg_t^3 is the three-year earnings growth. When predicting earnings growth, we use ep_{t-1}^0, in which the price is from the beginning (rather than the end) of the year. We provide the New-West (NW) t-value and the simulated (Sim) p-value for each coefficient. The simulation considers the biases caused by the persistence of the variables, the contemporaneous correlation between the dependent and independent variables, and the overlapping small sample. See Appendix for more details. We boldface the p-value if it is lower than or equal to 0.10. The sample is constructed using the merged dataset of CRSP, COMPUSTAT, and Moody's book equity. The final sample covers annual data during 1928-2006.

	1928-2006		1946-2006			1928-2006		1946-2006			1928-2006		1946-2005	
						Panel A: Predictability by the earnings yield								
	ep_{t-1}^0	$\overline{R}^2$	ep_{t-1}^0	$\overline{R}^2$		ep_{t-1}	$\overline{R}^2$	ep_{t-1}	$\overline{R}^2$		ep_{t-1}	$\overline{R}^2$	ep_{t-1}	$\overline{R}^2$
eg_t^1	−0.721	36.2	−0.651	32.1	r_t^1	0.037	2.6	0.027	1.9	deg_t^1	0.712	36.9	0.655	32.2
NW	(8.57)		(4.01)			(2.24)		(1.78)			(7.54)		(3.68)	
Sim	[**0.00**]		[**0.01**]			[**0.06**]		[**0.08**]			[**0.00**]		[**0.02**]	
eg_t^2	−0.855	40.2	−0.827	40.7	r_t^2	0.035	0.4	0.038	2.7	deg_t^2	0.895	49.1	0.856	44.0
NW	(10.18)		(7.14)			(1.26)		(1.54)			(11.48)		(7.05)	
Sim	[**0.00**]		[**0.01**]			[0.18]		[**0.09**]			[**0.00**]		[**0.00**]	
eg_t^3	−0.839	38.2	−0.849	42.7	r_t^3	0.032	-0.2	0.030	-0.1	deg_t^3	0.838	44.7	0.857	44.1
NW	(8.07)		(6.30)			(1.55)		(0.80)			(8.81)		(6.51)	
Sim	[**0.00**]		[**0.00**]			[0.26]		[0.21]			[**0.00**]		[**0.00**]	
eg_t^4	−0.898	40.4	−0.880	45.3	r_t^4	0.085	5.6	0.037	0.2	deg_t^4	0.891	47.1	0.886	46.6
NW	(8.66)		(6.69)			(1.72)		(0.85)			(9.82)		(6.61)	
Sim	[**0.00**]		[**0.00**]			[**0.05**]		[0.21]			[**0.00**]		[**0.00**]	
eg_t^5	−0.846	37.6	−0.850	43.7	r_t^5	0.071	3.85	0.022	-1.3	deg_t^5	0.854	44.1	0.868	45.6
NW	(9.35)		(8.02)			(1.21)		(0.38)			(10.58)		(7.77)	
Sim	[**0.00**]		[**0.00**]			[0.12]		[0.34]			[**0.00**]		[**0.01**]	
						Panel B: Predictability by the payout ratio								
	de_{t-1}	$\overline{R}^2$	de_{t-1}	$\overline{R}^2$		de_{t-1}	$\overline{R}^2$	de_{t-1}	$\overline{R}^2$		de_{t-1}	$\overline{R}^2$	de_{t-1}	$\overline{R}^2$
eg_t^1	0.743	34.8	0.768	36.1	r_t^1	−0.032	1.3	−0.011	-1.3	deg_t^1	−0.737	35.8	−0.778	37.5
NW	(8.03)		(5.87)			(1.94)		(1.03)			(7.90)		(6.06)	
Sim	[**0.00**]		[**0.01**]			[**0.10**]		[0.31]			[**0.00**]		[**0.00**]	
eg_t^2	0.894	39.7	0.982	45.9	r_t^2	−0.017	-0.9	−0.007	-1.6	deg_t^2	−0.891	43.6	−0.992	48.2
NW	(10.81)		(21.2)			(0.71)		(0.46)			(10.2)		(24.3)	
Sim	[**0.00**]		[**0.00**]			[0.35]		[0.41]			[**0.00**]		[**0.00**]	
eg_t^3	0.872	36.8	0.983	45.1	r_t^3	−0.005	-1.3	0.019	-1.2	deg_t^3	−0.859	41.7	−0.998	48.2
NW	(8.99)		(18.45)			(0.75)		(1.09)			(7.81)		(20.14)	
Sim	[**0.00**]		[**0.00**]			[0.50]		[0.71]			[**0.00**]		[**0.00**]	
eg_t^4	0.939	38.9	1.011	46.1	r_t^4	−0.053	1.0	0.026	-1.0	deg_t^4	−0.928	44.8	−1.022	48.8
NW	(10.26)		(13.20)			(1.13)		(1.18)			(9.53)		(13.90)	
Sim	[**0.00**]		[**0.00**]			[0.18]		[0.74]			[**0.00**]		[**0.00**]	
eg_t^5	0.879	36.2	0.966	44.5	r_t^5	−0.028	-0.7	0.062	1.8	deg_t^5	−0.905	43.6	−0.986	47.0
NW	(10.76)		(14.60)			(0.45)		(2.10)			(12.30)		(16.94)	
Sim	[**0.00**]		[**0.00**]			[0.36]		[0.90]			[**0.00**]		[**0.00**]	

Table 6 : Predictability of Dividend Growth by Payout Ratio

We regress cumulative log dividend growth (dg) on the lagged log payout ratio (de). For example, dg_t^3 is the three-year dividend growth. We provide the New-West (NW) t-value and the simulated (Sim) p-value for each coefficient. The simulation considers the biases caused by the persistence of the variables, the contemporaneous correlation between the dependent and independent variables, and the overlapping small sample. See Appendix for more details. We boldface the p-value if it is lower than or equal to 0.10. The sample is constructed using the merged dataset of CRSP, COMPUSTAT, and Moody's book equity. The final sample covers annual data during 1928-2006.

	Without Repurchases					With Repurchases			
	1928-2006		1946-2006			1928-2006		1946-2006	
	de_{t-1}	$\overline{R}^2$	de_{t-1}	$\overline{R}^2$		de_{t-1}	$\overline{R}^2$	de_{t-1}	$\overline{R}^2$
dg_t^1	0.005	-1.1	-0.009	0.3	dg_t^1	0.005	-1.1	-0.016	0.1
NW	(0.71)		(1.66)			(0.57)		(1.64)	
Sim	[0.73]		[0.22]			[0.66]		[0.11]	
dg_t^2	0.002	-1.3	-0.009	-0.1	dg_t^2	0.011	-1.0	0.001	-1.7
NW	(0.14)		(1.26)			(0.73)		(0.06)	
Sim	[0.57]		[0.31]			[0.68]		[0.45]	
dg_t^3	-0.013	-0.9	-0.015	-0.3	dg_t^3	0.029	0.0	0.012	-1.4
NW	(0.60)		(1.80)			(1.42)		(0.65)	
Sim	[0.70]		[0.25]			[0.81]		[0.59]	
dg_t^4	0.011	-1.1	-0.011	-1.2	dg_t^4	0.038	0.4	0.025	-0.4
NW	(0.56)		(0.91)			(1.52)		(1.08)	
Sim	[0.64]		[0.34]			[0.83]		[0.73]	
dg_t^5	-0.025	-0.2	-0.019	0.0	dg_t^5	0.003	-1.3	0.035	0.5
NW	(2.07)		(1.38)			(0.09)		(0.98)	
Sim	[0.27]		[0.25]			[0.52]		[0.79]	

Table 7 : Predictability by Dividend Yield: Smooth versus Volatile portfolios

We sort firms into three portfolios according to the ratio of the standard deviation of dividend growth to the standard deviation of earnings growth. The firms with the lowest (highest) ratios consists the smooth (volatile) portfolio. For the smooth and volatile portfolios respectively, we regress cumulative log dividend growth (dg) and returns (r) on the lagged log dividend yield ($dp0$). For example, dg_t^3 is the three-year dividend growth. We provide the New-West (NW) t-value and the simulated (Sim) p-value for each coefficient. The simulation considers the biases caused by the persistence of the variables, the contemporaneous correlation between the dependent and independent variables, and the overlapping small sample. See Appendix for more details. We boldface the p-value if it is lower than or equal to 0.10. The sample is constructed using the merged dataset of CRSP, COMPUSTAT, and Moody's book equity. The final sample covers annual data during 1928-2006.

	1928-2006		1946-2006			1928-2006		1946-2006	
	Dividend Growth					Returns			
	dp_{t-1}	$\overline{R}^2$	dp_{t-1}	$\overline{R}^2$		dp_{t-1}	$\overline{R}^2$	dp_{t-1}	$\overline{R}^2$
Panel A: Smooth portfolios									
dg_t^1	-0.142	12.1	0.014	-1.4	r_t^1	0.153	4.8	0.211	16.1
NW	(2.16)		(0.43)			(2.23)		(4.21)	
Sim	[**0.01**]		[0.74]			[**0.02**]		[**0.02**]	
dg_t^2	-0.182	7.3	0.042	-0.4	r_t^2	0.346	13.0	0.373	28.6
NW	(1.22)		(0.99)			(4.38)		(4.31)	
Sim	[**0.03**]		[0.82]			[**0.01**]		[**0.01**]	
dg_t^3	-0.145	2.1	0.077	1.2	r_t^3	0.476	18.2	0.476	39.5
NW	(0.94)		(0.95)			(6.15)		(4.57)	
Sim	[0.14]		[0.87]			[**0.01**]		[**0.02**]	
dg_t^4	-0.063	-0.8	0.121	4.5	r_t^4	0.602	25.6	0.576	45.2
NW	(0.46)		(1.37)			(5.76)		(5.47)	
Sim	[0.35]		[0.91]			[**0.01**]		[**0.02**]	
dg_t^5	-0.022	-1.3	0.109	2.3	r_t^5	0.683	32.4	0.715	52.0
NW	(0.22)		(1.94)			(9.66)		(6.88)	
Sim	[0.45]		[0.86]			[**0.01**]		[**0.01**]	
Panel B: Volatile portfolios									
dg_t^1	-0.548	34.4	-0.432	21.5	r_t^1	0.111	2.2	0.182	14.4
NW	(5.29)		(3.92)			(1.62)		(3.65)	
Sim	[**0.00**]		[**0.06**]			[**0.05**]		[**0.00**]	
dg_t^2	-0.484	20.1	-0.308	9.9	r_t^2	0.248	6.8	0.288	22.7
NW	(2.99)		(2.65)			(2.67)		(3.49)	
Sim	[**0.00**]		[**0.09**]			[**0.01**]		[**0.00**]	
dg_t^3	-0.436	12.1	-0.285	7.5	r_t^3	0.319	8.3	0.303	22.1
NW	(2.90)		(3.00)			(4.07)		(2.55)	
Sim	[**0.03**]		[0.30]			[**0.01**]		[**0.00**]	
dg_t^4	-0.358	6.6	-0.322	7.6	r_t^4	0.447	16.5	0.343	25.9
NW	(4.38)		(3.41)			(4.15)		(3.19)	
Sim	[0.13]		[0.23]			[**0.00**]		[**0.01**]	
dg_t^5	-0.370	7.0	-0.475	14.1	r_t^5	0.482	21.9	0.450	32.0
NW	(3.60)		(3.49)			(6.19)		(3.63)	
Sim	[0.16]		[**0.09**]			[**0.00**]		[**0.00**]	

Table 8 : Predictability by Earnings Yield: Smooth versus Volatile portfolios

We sort firms into three portfolios according to the ratio of the standard deviation of dividend growth to the standard deviation of earnings growth. The firms with the lowest (highest) ratios consists the smooth (volatile) portfolio. For the smooth and volatile portfolios respectively, we regress cumulative log earnings growth (eg) and returns (r) on the lagged log earnings yield (ep). For example, eg_t^3 is the three-year earnings growth. We provide the New-West (NW) t-value and the simulated (Sim) p-value for each coefficient. The simulation considers the biases caused by the persistence of the variables, the contemporaneous correlation between the dependent and independent variables, and the overlapping small sample. See Appendix for more details. We boldface the p-value if it is lower than or equal to 0.10. The sample is constructed using the merged dataset of CRSP, COMPUSTAT, and Moody's book equity. The final sample covers annual data during 1928-2006.

	1928-2006		1946-2006			1928-2006		1946-2006	
	Earnings Growth					Returns			
	ep^0_{t-1}	$\overline{R}^2$	ep^0_{t-1}	$\overline{R}^2$		ep_{t-1}	$\overline{R}^2$	ep_{t-1}	$\overline{R}^2$
Panel A: Smooth portfolios									
eg_t^1	−0.779	39.8	−0.714	35.3	r_t^1	0.055	1.4	0.028	4.3
NW	(6.58)		(5.30)			(2.83)		(2.31)	
Sim	[**0.00**]		[**0.01**]			[**0.00**]		[**0.04**]	
eg_t^2	−0.831	40.5	−0.852	42.3	r_t^2	0.056	6.8	0.035	3.5
NW	(22.8)		(9.02)			(3.60)		(2.03)	
Sim	[**0.00**]		[**0.00**]			[**0.01**]		[**0.07**]	
eg_t^3	−0.613	28.7	−0.848	43.0	r_t^3	0.049	3.5	0.027	0.2
NW	(3.81)		(7.16)			(4.16)		(0.92)	
Sim	[**0.06**]		[**0.00**]			[**0.00**]		[0.20]	
eg_t^4	−0.940	44.9	−0.880	45.6	r_t^4	0.092	13.4	0.035	0.7
NW	(10.12)		(8.18)]			(2.54)		(0.92)	
Sim	[**0.00**]		[**0.00**]			[**0.00**]		[0.17]	
eg_t^5	−0.856	39.4	−0.851	44.7	r_t^5	0.086	12.1	0.017	-1.3
NW	(11.65)		(9.00)			(1.91)		(0.41)	
Sim	[**0.00**]		[**0.01**]			[**0.02**]		[0.35]	
Panel B: Volatile portfolios									
eg_t^1	−0.769	40.5	−0.449	21.1	r_t^1	0.043	1.5	0.106	12.8
NW	(8.66)		(3.04)			(1.32)		(3.68)	
Sim	[**0.00**]		[**0.05**]			[**0.10**]		[**0.00**]	
eg_t^2	−0.512	22.9	−0.590	26.5	r_t^2	0.042	0.1	0.142	17.1
NW	(3.77)		(9.05)			(0.66)		(5.43)	
Sim	[**0.00**]		[**0.01**]			[0.23]		[**0.00**]	
eg_t^3	−0.844	38.1	−0.570	25.6	r_t^3	0.081	2.4	0.152	13.7
NW	(6.43)		(6.32)			(0.96)		(4.33)	
Sim	[**0.00**]		[**0.05**]			[**0.10**]		[**0.01**]	
eg_t^4	−0.738	31.1	−0.494	22.7	r_t^4	0.151	11.2	0.188	18.5
NW	(7.28)		(6.67)			(2.99)		(6.11)	
Sim	[**0.00**]		[0.16]			[**0.01**]		[**0.01**]	
eg_t^5	−0.737	30.9	−0.518	23.5	r_t^5	0.151	13.9	0.254	27.4
NW	(7.47)		(13.28)			(4.57)		(3.84)	
Sim	[**0.00**]		[0.18]			[**0.02**]		[**0.00**]	

Table 9 : Predictability by Earnings Yield and Payout Ratio Using Actual Earnings Data

For firm years after 1950 we use earnings data from COMPUSTAT; for firm years before that we use the clean surplus formula to back out earnings. We then regress cumulative log earnings growth (eg), returns (r), and payout ratio growth (deg), from one to five years, on the lagged log earnings yield (ep_{t-1}) in Panel A and on the lagged log payout ratio (de) in Panel B. For example, eg_t^3 is the three-year earnings growth. We provide the New-West (NW) t-value and the simulated (Sim) p-value for each coefficient. The simulation considers the biases caused by the persistence of the variables, the contemporaneous correlation between the dependent and independent variables, and the overlapping small sample. See Appendix for more details. We boldface the p-value if it is lower than or equal to 0.10. The final sample covers annual data during 1928-2006.

	1928-2006		1946-2006			1928-2006		1946-2006			1928-2006		1946-2005	
Panel A: Predictability by the earnings yield														
	ep_{t-1}^0	$\overline{R}^2$	ep_{t-1}^0	$\overline{R}^2$		ep_{t-1}	$\overline{R}^2$	ep_{t-1}	$\overline{R}^2$		ep_{t-1}	$\overline{R}^2$	ep_{t-1}	$\overline{R}^2$
eg_t^1	−0.645	31.9	−0.099	2.0	r_t^1	0.0639	4.9	0.129	11.0	deg_t^1	0.644	34.8	0.133	6.4
NW	(4.89)		(0.87)			(2.11)		(2.24)			(5.14)		(1.49)	
Sim	[**0.00**]		[**0.09**]			[**0.03**]		[**0.02**]			[**0.00**]		[**0.06**]	
eg_t^2	−0.732	32.1	−0.265	10.1	r_t^2	0.062	1.9	0.201	17.1	deg_t^2	0.796	46.6	0.270	14.3
NW	(6.44)		(3.62)			(0.97)		(4.87)			(7.46)		(3.88)	
Sim	[**0.00**]		[**0.05**]			[0.12]		[**0.02**]			[**0.00**]		[**0.04**]	
eg_t^3	−0.702	28.2	−0.392	18.6	r_t^3	0.076	2.3	0.248	16.6	deg_t^3	0.709	39.7	0.356	21.2
NW	(7.21)		(4.11)			(2.62)		(6.05)			(8.29)		(4.59)	
Sim	[**0.01**]		[**0.05**]			[0.12]		[**0.03**]			[**0.00**]		[**0.05**]	
eg_t^4	−0.788	31.1	−0.486	27.6	r_t^4	0.169	14.4	0.294	18.8	deg_t^4	0.784	42.4	0.432	29.3
NW	(7.07)		(4.81)			(6.00)		(3.31)			(8.94)		(3.81)	
Sim	[**0.00**]		[**0.06**]			[**0.00**]		[**0.04**]			[**0.00**]		[**0.06**]	
eg_t^5	−0.727	27.8	−0.450	25.0	r_t^5	0.170	15.7	0.402	26.3	deg_t^5	0.743	38.4	0.432	31.1
NW	(7.52)		(3.59)			(4.17)		(6.69)			(10.63)		[5.90]	
Sim	[**0.03**]		[0.13]			[**0.01**]		[**0.02**]			[**0.00**]		[**0.10**]	
Panel B: Predictability by the payout ratio														
	de_{t-1}	$\overline{R}^2$	de_{t-1}	$\overline{R}^2$		de_{t-1}	$\overline{R}^2$	de_{t-1}	$\overline{R}^2$		de_{t-1}	$\overline{R}^2$	de_{t-1}	$\overline{R}^2$
eg_t^1	0.614	27.8	0.222	6.2	r_t^1	-0.053	2.5	−0.021	-1.5	deg_t^1	−0.601	29.0	−0.243	10.5
NW	(3.64)		(1.62)			(1.81)		(0.32)			(3.63)		(2.11)	
Sim	[**0.01**]		[**0.02**]			[**0.07**]		[0.36]			[**0.02**]		[**0.03**]	
eg_t^2	0.710	28.7	0.529	15.7	r_t^2	-0.029	-1.6	0.023	-1.6	deg_t^2	−0.703	34.1	−0.513	21.3
NW	(9.23)		(2.35)			(0.58)		(0.16)			(10.93)		(3.00)	
Sim	[**0.00**]		[**0.01**]			[0.33]		[0.58]			[**0.00**]		[**0.01**]	
eg_t^3	0.682	25.1	0.672	18.6	r_t^3	−0.029	-0.8	0.114	-0.4	deg_t^3	−0.654	31.4	−0.651	26.2
NW	(13.44)		(5.90)			(0.41)		(0.86)			(15.60)		(16.15)	
Sim	[**0.02**]		[**0.02**]			[0.38]		[0.77]			[**0.02**]		[**0.01**]	
eg_t^4	0.776	28.1	0.785	22.0	r_t^4	−0.110	4.8	0.203	1.5	deg_t^4	−0.755	36.2	−0.733	28.2
NW	(13.63)		(3.22)			(2.62)		(0.93)			(12.88)		(3.90)	
Sim	[**0.01**]		[**0.02**]			[**0.09**]		[0.58]			[**0.85**]		[**0.02**]	
eg_t^5	0.703	24.6	0.588	14.4	r_t^5	-0.095	3.6	0.249	2.0	deg_t^5	−0.742	35.5	−0.615	22.1
NW	(11.78)		(3.23)			(2.67)		(0.77)			(13.39)		(4.14)	
Sim	[**0.05**]		[0.14]			[0.16]		[0.86]			[**0.02**]		[**0.09**]	

Table 10 : Predictability by Dividend Yield: S&P Firms

The sample is constructed using the merged dataset of the S&P index firms in CRSP, COMPUSTAT, and Moody's book equity. The final sample covers annual data during 1928-2006. We regress cumulative log dividend growth (dg) and returns (r), from one to five years, on the lagged log dividend yield (dp_{t-1}). For example, dg_t^3 is the three-year dividend growth. We provide the New-West (NW) t-value and the simulated (Sim) p-value for each coefficient. The simulation considers the biases caused by the persistence of the variables, the contemporaneous correlation between the dependent and independent variables, and the overlapping small sample. See Appendix for more details. We boldface the p-value if it is lower than or equal to 0.10.

	Dividend Growth					Returns			
	1928-2006		1946-2006			1928-2006		1946-2006	
	dp_{t-1}	$\overline{R}^2$	dp_{t-1}	$\overline{R}^2$		dp_{t-1}	$\overline{R}^2$	dp_{t-1}	$\overline{R}^2$
dg_t^1	-0.208	15.3	-0.012	-1.6	r_t^1	0.132	3.7	0.226	19.5
NW	(2.48)		(0.24)			(1.94)		(4.48)	
Sim	[**0.00**]		[0.61]			[**0.03**]		[**0.00**]	
dg_t^2	-0.253	9.6	0.041	-1.0	r_t^2	0.303	11.1	0.407	33.5
NW	(1.33)		(0.49)			(3.53)		(6.02)	
Sim	[**0.01**]		[0.85]			[**0.01**]		[**0.00**]	
dg_t^3	-0.252	5.9	0.038	-1.3	r_t^3	0.414	15.1	0.518	42.3
NW	(1.30)		(0.47)			(5.53)		(7.87)	
Sim	[**0.07**]		[0.79]			[**0.01**]		[**0.01**]	
dg_t^4	-0.182	1.8	0.069	-0.7	r_t^4	0.537	21.5	0.612	44.8
NW	(1.11)		(0.86)			(5.65)		(7.03)	
Sim	[0.20]		[0.83]			[**0.01**]		[**0.01**]	
dg_t^5	-0.119	-0.1	0.052	-1.2	r_t^5	0.632	28.6	0.757	50.9
NW	(1.17)		(1.62)			(6.73)		(7.16)	
Sim	[0.34]		[0.77]			[**0.01**]		[**0.00**]	

Table 11 : Predictability by Earnings Yield: S&P Firms

The sample is constructed using the merged dataset of the S&P index firms in CRSP, COMPUSTAT, and Moody's book equity. The final sample covers annual data during 1928-2006. We regress cumulative log earnings growth (eg), returns (r), and payout ratio growth (deg), from one to five years, on the lagged log earnings yield (ep_{t-1}). For example, eg_t^3 is the three-year earnings growth. We provide the New-West (NW) t-value and the simulated (Sim) p-value for each coefficient. The simulation considers the biases caused by the persistence of the variables, the contemporaneous correlation between the dependent and independent variables, and the overlapping small sample. See Appendix for more details. We boldface the p-value if it is lower than or equal to 0.10.

	Earnings					Returns					Payout Ratio			
	1928-2006		1946-2008			1928-2006		1946-2006			1928-2006		1946-2006	
	ep^0_{t-1}	$\overline{R}^2$	ep^0_{t-1}	$\overline{R}^2$		ep_{t-1}	$\overline{R}^2$	ep_{t-1}	$\overline{R}^2$		ep_{t-1}	$\overline{R}^2$	ep_{t-1}	$\overline{R}^2$
eg_t^1	−0.746	38.0	−0.594	29.1	r_t^1	0.054	9.2	0.027	2.0	deg_t^1	0.731	37.1	0.596	29.2
NW	(6.21)		(3.08)			(2.17)		(1.98)			(5.77)		(2.88)	
Sim	[**0.00**]		[**0.02**]			[**0.00**]		[**0.07**]			[**0.00**]		[**0.02**]	
eg_t^2	−0.847	40.5	−0.781	38.2	r_t^2	0.049	3.2	0.039	2.4	deg_t^2	0.906	48.5	0.799	40.8
NW	(11.58)		(5.99)			(1.86)		(1.40)			(15.09)		(5.89)	
Sim	[**0.00**]		[**0.00**]			[**0.06**]		[**0.10**]			[**0.00**]		[**0.00**]	
eg_t^3	−0.605	27.3	−0.808	40.6	r_t^3	0.039	0.8	0.034	0.1	deg_t^3	0.614	31.6	0.812	41.8
NW	(4.18)		(5.26)			(2.23)		(0.74)			(4.88)		(5.43)	
Sim	[**0.05**]		[**0.00**]			[0.18]		[0.20]			[**0.04**]		[**0.00**]	
eg_t^4	−0.850	39.8	−0.860	44.3	r_t^4	0.082	6.8	0.037	0.0	deg_t^4	0.846	44.6	0.862	45.3
NW	(7.65)		(6.12)			(2.25)		(0.83)			(8.34)		(5.96)	
Sim	[**0.00**]		[**0.00**]			[**0.03**]		[0.22]			[**0.00**]		[**0.00**]	
eg_t^5	−0.896	41.3	−0.824	42.2	r_t^5	0.092	9.2	0.022	-1.3	deg_t^5	0.927	49.5	0.830	43.3
NW	(9.84)		(7.66)			(1.78)		(0.38)			(11.32)		(7.00)	
Sim	[**0.00**]		[**0.02**]			[**0.04**]		[0.35]			[**0.00**]		[**0.02**]	

Table 12 : Predictability by Payout Ratio: S&P Firms

The sample is constructed using the merged dataset of the S&P index firms in CRSP, COMPUSTAT, and Moody's book equity. The final sample covers annual data during 1928-2006. We regress cumulative log earnings growth (eg), returns (r), and payout ratio growth (deg), from one to five years, on the lagged log payout ratio (de_{t-1}). For example, eg_t^3 is the three-year earnings growth. "Dividend No Rep" refers to the case in which dividends do not include repurchase; "Dividend Rep" refers to the case in which dividends include repurchase. We provide the New-West (NW) t-value and the simulated (Sim) p-value for each coefficient. The simulation considers the biases caused by the persistence of the variables, the contemporaneous correlation between the dependent and independent variables, and the overlapping small sample. See Appendix for more details. We boldface the p-value if it is lower than or equal to 0.10.

Earnings			Returns			Payout Ratio			Dividend No Rep			Dividend Rep		
	de_{t-1}	$\overline{R}^2$		de_{t-1}	$\overline{R}^2$		de_{t-1}	$\overline{R}^2$		de_{t-1}	$\overline{R}^2$		de_{t-1}	$\overline{R}^2$
Panel A: 1928-2006														
eg_t^1	0.784	37.7	r_t^1	−0.052	7.5	deg_t^1	-0.778	37.9	dg_t^1	0.007	-0.9	dg_t^1	−0.010	-1.1
NW	(6.06)			(1.93)			(6.09)			(1.04)			(0.92)	
Sim	[**0.00**]			[0.99]			[**0.00**]			[0.67]			[0.65]	
eg_t^2	0.908	41.7	r_t^2	-0.036	0.7	deg_t^2	-0.924	45.4	dg_t^2	−0.015	-0.4	dg_t^2	−0.013	-0.9
NW	(16.55)			(1.52)			(19.43)			(2.49)			(0.86)	
Sim	[**0.00**]			[0.85]			[**0.00**]			[0.23]			[0.30]	
eg_t^3	0.641	27.3	r_t^3	−0.017	-0.9	deg_t^3	-0.639	30.9	dg_t^3	0.002	-1.3	dg_t^3	-0.011	-1.1
NW	(4.04)			(0.54)			(3.92)			(0.24)			(1.45)	
Sim	[**0.05**]			[0.62]			[**0.05**]			[0.51]			[0.64]	
eg_t^4	0.891	38.7	r_t^4	−0.056	1.9	deg_t^4	-0.881	42.9	dg_t^4	0.010	-1.1	dg_t^4	-0.024	-0.4
NW	(8.85)			(1.54)			(8.23)			(0.39)			(0.99)	
Sim	[**0.00**]			[0.86]			[**0.00**]			[0.61]			[0.74]	
eg_t^5	0.940	40.7	r_t^5	−0.009	-1.4	deg_t^5	-0.741	35.7	dg_t^5	−0.004	-1.5	dg_t^5	-0.007	-1.4
NW	(16.75)			(0.88)			(19.69)			(2.21)			(0.11)	
Sim	[**0.00**]			[0.85]			[**0.00**]			[0.31]			[0.47]	
Panel B: 1946-2006														
eg_t^1	0.737	34.8	r_t^1	−0.008	-1.4	deg_t^1	-0.741	35.7	dg_t^1	−0.004	-1.5	dg_t^1	−0.007	-1.4
NW	(4.57)			(0.82)]			(4.62)			(0.85)			(1.18)	
Sim	[**0.01**]			[0.64]			[**0.01**]			[0.35]			[0.26]	
eg_t^2	0.967	45.6	r_t^2	−0.002	-1.7	deg_t^2	-0.968	47.2	dg_t^2	−0.001	-1.8	dg_t^2	0.008	-1.5
NW	(26.83)			(0.14)			(28.46)			(0.11)			(1.19)	
Sim	[**0.00**]			[0.52]			[**0.00**]			[0.46]			[0.59]	
eg_t^3	0.972	45.2	r_t^3	0.023	-1.0	deg_t^3	-0.980	47.6	dg_t^3	−0.008	-1.4	dg_t^3	0.021	-0.7
NW	(19.15)			(1.30)			(19.68)			(1.75)]			(2.29)	
Sim	[**0.00**]			[0.27]			[**0.00**]			[0.33]			[0.71]	
eg_t^4	1.027	47.9	r_t^4	0.037	-0.4	deg_t^4	-1.031	49.9	dg_t^4	−0.003	-1.7	dg_t^4	0.033	0.4
NW	(18.85)			(1.71)]			(18.84)			(0.51)			(2.21)	
Sim	[**0.00**]			[0.21]			[**0.00**]			[0.43]			[0.78]	
eg_t^5	0.966	45.5	r_t^5	0.077	2.9	deg_t^5	-0.977	46.9	dg_t^5	−0.010	-1.4	dg_t^5	0.041	1.3
NW	(18.75)			(2.99)			(20.25)			(1.58)			(1.51)	
Sim	[**0.00**]			[**0.07**]			[**0.00**]			[0.34]			[0.80]	