Dividend Changes Do Not Signal Changes in Future Profitability

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Abstract

One of the most important predictions of the dividend-signaling hypothesis is that dividend changes are positively correlated with future changes in profitability and earnings. Contrary to this prediction, we show that after controlling for the well-known non-linear patterns in the behavior of earnings, dividend changes contain no information about future earnings changes. We also show that dividend changes are negatively correlated with future changes in profitability (return on assets). Finally, we investigate the out-of-sample forecasting ability of dividend changes. We find that models that include dividend changes do not outperform those that do not include dividend changes. In fact, our evidence indicates that investors are better off not using dividend changes in their earnings forecasting models.

1. Introduction

One of the most important issues in corporate finance is whether dividend changes contain information about future earnings and profitability. Although dividend signaling theories imply that dividend increases signal better prospects (e.g., Bhattacharya (1979); Miller and Rock (1985); and John and Williams (1985)), many empirical studies have failed to support this idea. Studies by Watts (1973), Gonedes (1983), Penman (1983), DeAngelo, DeAngelo and Skinner (1996), Benartzi, Michaely, and Thaler (1997) [hereafter BMT], and Grullon, Michaely, and Swaminathan (2002) find little or no evidence that dividend changes predict abnormal increases in earnings.[1] Similarly, evidence based on surveying and interviewing hundreds of financial executives indicates that managers reject the notion that dividends are used as a costly signaling device (see Brav, Graham, Harvey, and Michaely (2003)).

However, in a recent paper, Nissim and Ziv (2001) (hereafter NZ) consider a particular model of earnings expectations and find a positive association between current dividend changes and future earnings changes. NZ argue that previous studies have failed to uncover the true relation between dividends and future earnings because researchers have been using the wrong model to control for the expected changes in earnings. Specifically, they report that when using a regression analysis that controls for a particular (linear) form of mean reversion in earnings, dividend changes are positively correlated with future earnings changes.

The findings in NZ, that dividend changes predict earnings changes, are surprising since past researchers who have used control variables in a regression context

[1] For a comprehensive literature review on dividend signaling theories, see Allen and Michaely (2002).

find either the opposite relation (Penman (1983)), no relation, or a very weak relation (BMT). Recognizing the potential non-linearities in the relation between dividends and earnings, many of the prior investigators have used methods other than regression analysis and find results opposite to the ones in NZ. For example, DeAngelo, DeAngelo and Skinner (1996) analyze dividend policy during times where firm earnings unexpectedly decline and find that dividend changes contain virtually no information about future changes in earnings. BMT use a matched-sample approach in which dividend changing firms are matched to non-dividend changing firms based on their attributes such as market capitalization, industry, and past earnings performance---thus explicitly controlling for the earnings pattern and mean reversion---and find no evidence of positive abnormal earnings changes after dividend increases. Similar results have been obtained by Grullon, Michaely and Swaminathan (2002). In fact, even a simple comparison of the evolution of earnings for dividend changing firms (e.g., Grullon, Michaely and Swaminathan (2002)) yields results opposite to those drawn by NZ. These consistent findings across studies and methodologies make the NZ results surprising.

Given the importance of this issue to corporate finance in general, and to the question of why firms pay dividends in particular, we revisit the issue here. One of the main challenges in any study examining the relation between dividend changes and future earnings is choosing the appropriate method of estimating expected earnings. Since each model of expected earnings defines the portion of total realized earnings that is considered unexpected, it is important that researchers choose an earnings model that captures the features of the earning process. If, for example, earnings are assumed to follow a random walk, then any change in earnings from one year to another is unexpected. If earnings follow a random walk with a drift, then unexpected earnings are defined to be those which differ from the prior earnings grown at the expected growth rate. And so forth. In this paper we show that the assumption of linear mean reversion in earnings made by NZ is inappropriate. The reason for this is that the mean reversion process of earnings is highly non-linear [see Brook and Buckmaster (1976), Elgers and Lo (1994), and Fama and French (2000).] Thus, since assuming linearity when the true functional form is non-linear has the same consequences as leaving out relevant independent variables, it is possible that the positive correlation documented in NZ between dividend changes and future earnings changes is spurious.

We address this issue by using a model of unexpected earnings that explicitly controls for the non-linear patterns in the behavior of earnings. We correct for the non-linear evolution in earnings using the modified partial adjustment model proposed by Fama and French (2000). This model assumes that the rate of mean reversion and the coefficient of autocorrelation are highly non-linear. We use this approach because Fama and French (2000) empirically show that it explains the evolution of earnings much better than does a model with a uniform rate of mean reversion.

We show that after controlling for the non-linear patterns in the behavior of earnings, the relation between dividend changes and future earnings disappears. The relation between dividend increases and earning increases in Year 1 is positive and significant in only five out of 35 years (interestingly, this is the same number years in which the relation between these two variables is negative and significant). The results indicate that earning increases do not follow dividend increases in any systematic way. We also find that dividend changes are negatively correlated with future changes in profitability (return on assets, return on cash-adjusted assets, and return on sales). As a robustness check, we examine the relation between future earnings levels and changes in dividends, and find similar results: Dividends changes are very poor indicators of both earning and profitability levels. Overall, we do not find evidence supporting the idea that dividend increases signal better prospects about firm profitability.

The empirical tests we have discussed so far depend on the assumption that all the parameters of the model are known at the time of the forecast, an assumption that is likely to be violated if the parameters of the model change over time. To this end, we perform an out-of-sample test of the power of dividend changes to predict future earnings changes. We investigate whether investors can improve the precision of their real-time earnings forecasts by using dividend changes, given all other available information. We therefore examine the forecasting ability of dividend changes, explicitly accounting for the parameter uncertainty faced by investors who only have access to historical data. Our results indicate that independent of the model of earnings expectations that we use, models that include dividend changes do not outperform those that do not include dividend changes. In fact, the evidence indicates that investors are better off not using dividend changes in their forecasting models.

This article is organized as follows. Section 2 describes the sample selection procedure, defines the variables, and provides summary statistics. Section 3 examines the relation between dividend changes and future earnings. Section 4 examines the relation between dividend changes and profitability. Section 5 investigates the relation between dividend changes and levels in earnings and profitability. Section 6 examines the out-of-sample forecasting ability of dividend changes. Finally, Section 7 concludes the article with a discussion of the implications of our findings.

2. Sample Selection

Using the Center for Research in Securities Prices (CRSP) monthly event file, we identify all the dividend announcements made between 1963 and 1997 by firms listed on the New York (NYSE) and American (AMEX) stock exchanges.[2] To be included in the final sample, a dividend announcement must satisfy the following criteria:

a) The firm's financial data are available on the CRSP/COMPUSTAT merged database at the year of the announcement.

b) The firm is not a financial institution (SIC codes 6000-6999).[3]

c) The company paid a quarterly taxable cash dividend in U.S. dollars (code No. 1232 on the CRSP file) in the current and previous quarter.

d) Other distribution events such as stock splits, stock dividends, mergers, etc. were not declared between the declaration of the previous dividend and four days after the declaration of the current dividend.

e) There were no ex-distribution dates between the ex-distribution dates of the previous and current dividends.

Following BMT, we match the dividend announcements made during fiscal year t to the earnings in fiscal year t.[4] We then define the annual dividend change as the annualized rate of quarterly dividend changes:

[2] We restrict the sample to the period 1963-1997 so that the comparison with the NZ results will be more apparent. However, the results do not change if we extend the sample to 1999.
[3] We also replicate the analysis excluding utilities and the results are qualitatively the same.

$$R\Delta DIV_t = (1+\Delta DIV_{t,1})(1+\Delta DIV_{t,2})(1+\Delta DIV_{t,3})(1+\Delta DIV_{t,4}) - 1 \quad (1)$$

where $\Delta DIV_{t,q}$ is the dividend change (in fiscal year t) from quarter q-1 to q, scaled by the dividend payment in quarter q-1. The resulting sample contains 2,778 firms and 14,235 dividend increases, 974 dividend decreases, and 23,334 no-change events.

Table 1 provides preliminary statistics on the percent dividend change, the market value of equity, the market-to-book ratio and on profitability measures for dividend decreasing firms (Panel A), dividend increasing firms (Panel B), and firms with no change in their dividend payments (Panel C). The average (median) decrease in dividends is 45.5% (48%), compared with an average (median) increase in dividends of nearly 17.9% (12.5%). These results are consistent with prior empirical studies (e.g., Michaely, Thaler, Womack, 1995) showing that dividend cuts are less common than dividend increases, and more extreme in magnitude. Otherwise, the rest of the table shows much what might be expected. Firms that increase dividends are larger, and have been more profitable recently than firms that either cut their dividends or leave them unchanged.

3. The Relation between Dividend Changes and Future Earnings Changes

3.1 Linear Model of Earnings Expectations

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[4] Using a different approach, NZ label the dividend payment paid in the first quarter of year t+1 as a year t dividend. This approach is inappropriate because it artificially strengthens the relation between dividend changes in year t and the earnings changes in year t+1. The reason for this is that the dividend changes in the first quarter of year t+1 already contain partial information about the earnings changes in year t+1 (see BMT). However, even when including the dividend change in the first quarter of year t+1 in the year t dividend, the positive relation between dividend changes and earnings in year t+1 is significant in only about 34% of the years. Further, there is no change in the relation between dividend changes and earnings in year t+2, nor there is any change in the relation for other measures of profitability such as ROA—not even for year t+1.

To establish a baseline, we first examine the relation between dividend changes and future earnings changes using a linear model of earnings expectations. We begin our analysis by veryfing that the NZ results hold in our sample. Specifically, we estimate the following regression model that allows for asymmetric reactions to dividends increases and decreases and controls for uniform mean reversion and momentum in earnings:

$$(E_{\tau} - E_{\tau-1}) / B_{-1} = \beta_0 + \beta_{1P} DPC_0 \times R\Delta DIV_0 + \beta_{1N} DNC_0 \times R\Delta DIV_0 + \beta_2 ROE_{\tau-1} + \beta_3 (E_0 - E_{-1}) / B_{-1} + \varepsilon_{\tau} \quad (2)$$

where E_{τ} is earnings before extraordinary items in year τ (year 0 is the event year), B_{-1} is the book value of equity at the end of year -1, $R\Delta DIV$ is the annual percentage change in the cash dividend payment, DPC (DNC) is a dummy variable that takes the value of 1 for positive (negative) dividend changes and 0 otherwise, and $ROE_{\tau-1}$ is equal to earnings before extraordinary items in year $\tau-1$ scaled by the book value of equity at the end of year $\tau-1$. Notice that this model assumes that the relation between future earnings changes and past earnings levels and changes is linear.

To reduce the problems associated with residual cross-correlation, we use the Fama-MacBeth (1973) procedure to estimate the coefficients of the regression model. In the first stage, we estimate cross-sectional regression coefficients each year using all the observations in that year. In the second-stage, we compute time-series means of the cross-sectional regression coefficients. The standard deviations for these averages are estimated using the Hansen-Hodrick (1980) standard error correction method.

Table 2 reports the results from equation 2. Consistent with the evidence in NZ, we find that dividend changes in year 0 are positively correlated with future earnings changes in year 1 and 2, that is, $\tau = 1$ and $\tau = 2$. Panel A shows that the coefficient for positive dividend changes, β_{1P}, is equal to 0.027 when $\tau = 1$ and to 0.017 when $\tau = 2$. Both coefficients are significantly different from zero at standard confidence levels. The evidence in Panel A also indicates that dividend decreases are not related to future changes in earnings. Overall, these results indicate that when the model of earnings expectations is linear, dividend changes convey some information about future changes in earnings.[5]

To gauge the reliability of dividend changes as predictors of future earnings changes and to see whether the relation between dividend changes and earnings changes varies through time in a systematic pattern, we also report the annual cross-sectional regression coefficients of dividend changes. The results from this analysis are reported in Panel B of Table 2. (In this panel, the coefficients that are positive and significant at least at the 10% level are highlighted in bold.) Note that even when the model of earnings expectations is linear, the coefficient for positive dividend changes is significant in only about 29% of the years when $\tau = 1$ and in only about 9% of the years (i.e., in only three out of the 35 years in the sample) when $\tau = 2$. That is, in most of the years in our sample, current changes in dividends are not a reliable signal of future earning changes (either one or two years ahead) in the same direction.

3.2 Non-Linear Model of Earnings Expectations

Nissim and Ziv (2001) argue that some previous studies examining the relation between earnings and dividends omit relevant variables in their regression analyses that are correlated with the dividend changes. To this end, NZ include the return on equity

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[5] Trying to replicate NZ, we use their empirical specification. However, it should be noted that this specification suffers from a look-ahead-bias when $\tau = 2$ because it uses as control variable the ROE in Year 1, which it is unknown in Year 0. If we use the ROE in Year 0 instead of the ROE in Year 1 as a control variable, the relation between the earnings changes in Year 2 and dividend changes disappears.

and past changes in earnings to control for the mean reversion and autocorrelation (e.g., momentum) in earnings. However, such regressions assume that the rate of mean reversion and the level of autocorrelation are uniform across all observations (see equation 2).

However, empirical evidence indicates that the mean reversion process of earnings and the level of autocorrelation are highly non-linear. For example, large changes in earnings revert faster than small changes and negative changes revert faster than positive changes [see Brook and Buckmaster (1976), Elgers and Lo (1994), and Fama and French (2000).] Since assuming linearity when the true functional form is non-linear has the same consequences as leaving out relevant independent variables, the coefficients of the regressions in NZ (and in equation 2 above) are likely to be biased.[6]

There are at least two alternatives methods for controlling for the non-linearities in the earnings process. The first is the matched firm sample approach.[7] For each firm that changes its dividend, select an otherwise similar firm that experienced the similar level of earnings and similar historical pattern in earnings. Then, calculate how the abnormal change in future earnings (that of the dividend changing firm minus the non-dividend changing firm) is related to the change in dividend. This method was used by BMT and by Grullon, Michaely and Swaminathan (2002), and neither paper found evidence that dividend changes predict future changes in earnings. However, these results may be specific to the matched sample methodology and may not hold in a more

[6] Kennedy (1998) explains this econometric issue as follows: "The properties of the OLS estimator applied to a situation in which the true functional form is nonlinear can be analyzed in terms of omitted relevant variables. A nonlinear function can be restated, via a Taylor series expansion, as a polynomial. Estimating a linear function is in effect omitting the higher-order terms of this polynomial."
[7] See Barber and Lyon (1996) for a general discussion of this issue.

general specification of the relation between current changes in dividends and future changes in earnings.

The second method of controlling for the non-linearities in the earnings process is through regression analysis. One advantage of regression analysis over the matching sample approach is that it enables the researcher to explicitly model the behavior of future earnings. Furthermore, it allows the researcher to control for more factors and to take advantage of the information contained in the cross-section of earnings. To this end, we use regression analysis that accounts for the non-linear patterns in earnings to examine this issue.

Specifically, we use the modified partial adjustment model suggested by Fama and French (2000) as a control for the non-linearities in the relation between future earnings changes and lagged earnings levels and changes. The model is the following:

$$(\mathrm{E}_{\tau} - \mathrm{E}_{\tau-1}) / \mathrm{B}_{-1} = \beta_0 + \beta_1 \mathrm{R\Delta DIV}_0 + (\gamma_1 + \gamma_2 \mathrm{NDFED}_0 + \gamma_3 \mathrm{NDFED}_0 * \mathrm{DFE}_0 + \gamma_4 \mathrm{PDFED}_0 * \mathrm{DFE}_0) * \mathrm{DFE}_0 + (\lambda_1 + \lambda_2 \mathrm{NCED}_0 + \lambda_3 \mathrm{NCED}_0 * \mathrm{CE}_0 + \lambda_4 \mathrm{PCED}_0 * \mathrm{CE}_0) * \mathrm{CE}_0 + \varepsilon_{\tau} \quad (3)$$

where DFE_0 is equal to ROE_0 - E[ROE_0], where E[ROE_0] is the fitted value from the cross-sectional regression of ROE_0 on the logarithm of total assets in year –1, the logarithm of the market-to-book ratio of equity in year –1, and ROE_{-1}. CE_0 is equal to $(\mathrm{E}_0 - \mathrm{E}_{-1}) / \mathrm{B}_{-1}$, NDFED_0 (PDFED_0) is a dummy variable that takes the value of 1 if DFE_0 is negative (positive) and 0 otherwise, and NCED_0 (PCED_0) is a dummy variable that takes the value of 1 if CE_0 is negative (positive) and 0 otherwise. As discussed in Fama and French (2000), the dummy variables and squared terms are designed to pick up the documented non-linearities in the mean reversion and autocorrelation of earnings. Specifically, these variables are meant to capture the fact that large changes in earnings revert faster than small changes and that negative changes revert faster than positive changes. This particular behavior of earnings has been documented in Brooks and Buckmaster (1976) and Elgers and Lo (1994).

In Table 3 we show the re-estimated coefficients of the regression models using the Fama and French (2000) methods. Unlike the results reported in Table 2 (where a linear model is used), we find no evidence that the magnitude of dividend changes contains information about future earnings. Panel A of Table 3 shows that for the first year following the dividend change, the coefficient for positive dividend changes, β_{1P}, is just 0.008 (it was 0.027 using the linear model). This coefficient is neither economically nor statistically significantly different from zero. Further, similar to the results in Table 2, we find no evidence that dividend decreases are related to future changes in earnings

When comparing the results in Table 3 to those in Table 2, notice that the non-linear model explains a larger fraction of the cross-sectional variation in earnings changes than the linear model. Specifically, we find that the average adjusted-R^2 increases from 11.73% to 21.01% when $\tau = 1$ and from 9.89% to 11.40% when $\tau = 2$. Further, the evidence in Table 3 indicates that the behavior of profitability is highly non-linear. Consistent with the findings in Fama and French (2000), this evidence indicates that the linear model in Table 2 misses important information about the behavior of earnings that seems to be correlated with dividend changes.

Panel B of Table 3 shows that when earnings changes in Year 1 are the dependent variable, the coefficient for the positive dividend changes is significant in only about 14% of the years when $\tau = 1$ and in only about 9% of the years when $\tau = 2$. In fact, the number of negative and significant coefficients for positive dividend changes when $\tau = 1$

is the same as the number of positive and significant coefficients. Thus, allowing for the empirically documented non-linearities in the mean reversion process leads to the conclusion that changes in dividends are not useful in predicting future earnings changes. Similar results emerge for dividend decreases.

One explanation for these results is that dividend changes act as a surrogate for the non-linearity in earnings under a uniform mean reverting model. This explanation is consistent with the empirical regularity that firms tend to change their dividend policy only when earnings changes have been substantial. Firms increase their dividends after they have done well for a long period of time and they cut dividends after a long period of poor performance, which they expect to continue (see also Brav et. al. 2003). Therefore, dividend changes are likely to be correlated with the non-linear component of earnings changes that is missing from equation 2. When we model the earning process more precisely and incorporate the non-linear portion, dividends indeed contain no information about future earnings, supporting the idea that dividends are proxying for the non-linear patterns in the evolution of earnings.

4. Do Changes in Dividends forecast Profitability?

Dividend-signaling theory does not indicate precisely which firm performance metric (e.g. future income or future profitability) should be used. Therefore, in addition to earnings, an alternative firm performance variable that is widely used is profitability, as measured by the return on assets (ROA). Indeed, Fama and French (2000) use the same methods to forecast changes in both earnings and profitability (return on assets). ROA is defined as the operating income before depreciation (EBITDA) scaled by the book value of total assets. This measure of operating performance is preferable to ROE (or other scaled-earnings variables) in several dimensions. First, ROE is sensitive to changes in capital structure while ROA is not (since ROA is measured using EBITDA and not Net Income). Second, the ROA is not affected by factors such as special items (i.e., unusual and nonrecurring items reported before taxes), accounting for minority interest, and income taxes that usually obscure the ROE. Indeed, using simulation analysis Barber and Lyon (1996) show that ROA is the best available measure to detect abnormal operating performance under most circumstances.

With this in mind, we replicate all of the previous analyses replacing the change in earnings with the change in ROA as the dependent variable. These results are shown in Table 4. In Panel A of Table 4 we rerun the linear regression model (parallel to Table 2). For consistency, we replace the ROE on the right-hand-side with ROA. Panel A shows that the relation between positive and negative dividend changes and ROA changes is indistinguishable from zero, at both the one and at the two year horizons. Panel B of Table 4 shows that when using the non-linear earnings model, the relation between positive dividend changes and changes in future profitability is negative and significant when $\tau = 1$. Moreover, Panel B shows that the relation between negative dividend changes and changes in future profitability has the wrong sign and is highly significant when $\tau = 1$ and $\tau = 2$.

Overall, the results in this section indicate that firm profitability is not positively associated with past changes in dividends. In fact, opposite to the predictions of the signaling hypothesis, the evidence seems to indicate that dividend changes are negatively correlated with future changes in ROA. [8]

5. The Relation between Dividend Changes and Future Earnings Levels

In addition to the regressions of changes in earnings on dividend changes, NZ also find that dividend changes are positively correlated with future earnings levels. Although the specification using earnings levels provides an alternative way to examine the relation between earnings and dividend changes, it has several limitations.[9] Nevertheless, we replicate the analyses in Sections 3 and 4 using earnings levels instead of earnings changes to ensure that our results are robust to alternative specifications. Specifically, we estimate the following linear and non-linear regression models:

$$\begin{aligned}\text{ROE}_{\tau} = {} & \beta_0 + \beta_{1\text{P}}\text{DPC}_0 \times \text{R}\Delta\text{DIV}_0 + \beta_{1\text{N}}\text{DNC}_0 \times \text{R}\Delta\text{DIV}_0 + \beta_2\text{ROE}_{\tau-1} + \beta_3(\text{ROE}_0\text{-ROE}_{-1}) \\ & + \beta_4\text{MB}_{-1} + \beta_5\text{SIZE}_{-1} + \varepsilon_{\tau}\end{aligned} \quad (4)$$

and

$$\begin{aligned}\text{ROE}_{\tau} = {} & \beta_0 + \beta_{1\text{P}}\text{DPC}_0 \times \text{R}\Delta\text{DIV}_0 + \beta_{1\text{N}}\text{DPN}_0 \times \text{R}\Delta\text{DIV}_0 \\ & +(\gamma_1 + \gamma_2\text{NDFED}_0 + \gamma_3\text{NDFED}_0 \times \text{ROE}_0 + \gamma_4\text{PDFED}_0 \times \text{ROE}_0) \times \text{ROE}_0 \\ & +(\lambda_1 + \lambda_2\text{NCED}_0 + \lambda_3\text{NCED}_0 \times \text{CE}_0 + \lambda_4\text{PCED}_0 \times \text{CE}_0) \times \text{CE}_0 + \varphi_1\text{MB}_{-1} + \varphi_2\text{SIZE}_{-1} + \varepsilon_{\tau}\end{aligned} \quad (5)$$

where the variables have been previously defined. Note that in these regressions we relate ROE (the scaled level of earnings at time t (E_τ/B_τ)) to changes in dividends and

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[8] For robustness, we also replicate our analysis using the return on cash-adjusted assets, the return on sales, and the cash-flow return on assets. We find that after controlling for the non-linear patterns in the earnings process, dividends are not positively correlated with future changes in performance. In fact, we find that dividend changes are negatively correlated with the return on cash-adjusted assets and the return on sales. We also used analysts' earnings forecast instead of the actual change in earnings. The results indicate that dividends are not positively correlated with future earnings--consistent with our previous results.

[9] Conceptually, if a change in dividend is supposed to contain "information" about earnings, then, by definition, that information should be about changes because the current level of earnings is already known. Thus, it is not clear what we learn by using earnings levels instead of earnings changes. More importantly, empirical evidence suggests that changes in profitability or earnings tend to have better statistical properties than levels. For example, Barber and Lyon (1996) find that test statistics using the change in a firm's operating performance yield more powerful test statistics than do those based on the level of a firm's operating performance.

other control variables. Further, note that in Equation 5 we use the ROE in Year 0 instead of its predicted value as we do in Equation 3. We do this because the dependent variable in Equation 5 is primarily determined by the ROE in Year 0 (e.g., $\text{ROE}_1 = \text{ROE}_0 + \Delta\text{ROE}_1$).

The results from this analysis are reported in Table 5. Consistent with the evidence in NZ, Panel A shows that the level of ROE in Year 1 and 2 are positively correlated with the positive changes in dividends. Note that the coefficient for positive dividend changes is equal to 0.021 when $\tau = 1$ and to 0.025 when $\tau = 2$. Both coefficients are significantly different from zero at standard confidence levels. This further shows that the results in NZ hold in our sample. However, consistent with the evidence in Section 3, Panel B shows that after controlling for the non-linear patterns in earnings, dividends changes do not contain information about the future level of ROE. Once again, the evidence in this section does not support the predictions of the signaling hypothesis.[10]

6. The Economic Significance of the Predictive Power of Dividends

The results discussed so far show that after controlling for the non-linear patterns in the earnings process, dividend changes are not positively correlated with future changes in earnings. However, these results follow the standard procedure of estimating the model using all the time-series data. Actual market participants, of course, would not be able to make use of future years in determining the relationship between, say, dividend

[10] For robustness, we also replicate all of the previous analyses replacing ROE with ROA as the dependent variable. These results show that dividend increases are uncorrelated with the future level of ROA, independent of the earnings model that we use. Interestingly, we find that dividend decreases are negatively correlated with the level of ROA in Year 1. That is, firms that reduce their dividends tend to do better than other firms in the future.

changes and earnings changes. To circumvent this problem, we use out-of-sample methods to evaluate the forecasting ability of dividend changes. These out-of-sample methods are useful in determining the forecasting ability of a variable and are widely used in the finance and economics literature (see for example, Meesse and Rogoff (1983), Akgiray (1989), Keim and Stambaugh (1986), Pesaran and Timmermann (1995), and Graham (1996), among others.)

The main advantage of using these methods is that they help us assess the economic significance of dividend changes, explicitly accounting for the fact that investors can only use historical data to estimate the parameters of the earnings model. This alternative analysis is similar to the matched-sample approach in the sense that it only uses the information that is available at the time of the forecast. However, it also has the advantage of allowing the researcher to control for many factors.

To assess the economic value of dividends to predict future earnings, we compare the out-of-sample forecasting ability of the linear (Equation 2) and non-linear (Equation 3) models to the forecasting ability of similar models that exclude dividend changes as an explanatory variable. If dividends provide useful information about future earnings, then the model that includes dividends should systematically outperform the model that excludes dividends.

We use the conditional predictive ability approach in Giacomini and White (2003) to measure the forecasting ability of each model. To implement this approach, we calculate the out-of-sample forecast error of each model using the following equations:

$$f_1 = \left[(E_1 - E_0) / B_{-1} - g(\beta'_{-1} X_0) \right] \qquad (6)$$

and

$$f_2 = \left[(E_2 - E_1) / B_{-1} - g(\beta'_{-2} X_0) \right] \quad (7)$$

where f_1 and f_2 are the out-of-sample forecast errors for the 1-year ahead and 2-year ahead forecasts, respectively, E_τ is the actual earnings before extraordinary items in year τ (year 0 is the event year), B_{-1} is the book value of equity at the end of year –1, g(·) is the earnings model, and X_0 is the set of independent variables in year 0.

To measure the forecasting ability of each model, we calculate the out-of-sample forecast error of each model using a rolling scheme and a recursive scheme. Under the rolling scheme, the parameter of variable i in year t is equal to the value of the cross-sectional coefficient of variable i in year t-1 when $\tau = 1$ and to the value of the cross-sectional coefficient of variable i in year t-2 when $\tau = 2$. The advantage of this scheme is that uses the most recent estimates to forecast future earnings. Under the recursive scheme, the parameter of variable i in year t is equal to the average of all the annual cross-sectional coefficients of variable i up to year t-1 when $\tau = 1$ and to the average of all the annual cross-sectional coefficients of variable i up to year t-2 when $\tau = 2$.[11] Notice that these coefficients are estimated only using the data available at the time of the forecast to take into account the parameter uncertainty that investors actually face.

Using these forecast errors from Equations 5 and 6, we calculate the annual differences in mean squared error (MSE) and mean absolute deviation (MAD) between the model that includes dividend changes and the model that excludes them. To assess the statistical significance of the MSE and the MAD, we use a bootstrapping methodology. This procedure is carried out following these steps:

[11] We also set the parameter β_{-1} (β_{-2}) of variable i in year t equal to the average of the parameters over the period t-5 to t-1 (t-6 to t-2), and the results are similar.

(1) We randomly select observations from the sample of annual MSEs and MADs, with replacement.

(2) We calculate the time-series averages of the MSE and the MAD from the bootstrap sample.

(3) We repeat steps 1 and 2 ten thousand times.

(4) Using the simulated distribution, we calculate the p-value of the test statistics.

The results from this analysis are reported in Tables 6 and 7. The results indicate that models that include dividend changes do not outperform models that exclude dividends, and in most cases models with dividends actually underperform those models without dividends. Table 6 show the annual differences in mean squared error (MSE) and mean absolute deviation (MAD) between the linear model (Equation 2) and a similar model that excludes dividend changes as an explanatory variable. Under the rolling scheme, the model that excludes dividends always dominates the model that includes dividends. Under the recursive method, the two models seem to have the same out-sample performance, except in the case when we calculate the MSE for the change in earnings in Year 2, where the model that excludes dividends dominates the model that includes dividends. Table 7 examines the differences in the out-sample performance of the non-linear model (Equation 3) and a similar model that excludes dividend changes as an explanatory variable. This table shows that the model that excludes dividend changes almost always dominates the model that includes dividend changes, except in the case when we calculate the MSE for the change in earnings in Year 1.

For robustness, we also replicate all of the previous analyses replacing the change in earnings with the change in ROA as the dependent variable. The results from this analysis are reported in Tables 8 and 9. Once again, we find that, on average, the model that includes dividend changes underperforms the model that excludes dividend changes. Interestingly, Table 9 shows that under the recursive scheme, the model that includes dividend changes outperforms the model that excludes dividend changes when $\tau = 1$. This is the only situation in our analysis where dividends appear to have out-of-sample predictive power. However, it is important to notice that the coefficients of dividend changes in the non-linear model when we use ROA are negative (see Panel B of Table 4). Thus, the predictive power of dividends comes from the fact that firms that increase (reduce) their dividends experience a decline (an increase) in ROA. This result is at odds with the predictions of the signaling hypothesis.[12]

Overall, our results indicate that models that include dividend changes systematically underperform models that exclude dividends. This suggests that after accounting for the fact that investors can only use historical data to estimate the parameters of the earnings model, dividends changes are not reliable predictors of future earnings. One potential reason for this result is that the coefficients of dividend increases and decreases are unstable over time to the extent that the inclusion of these variables in the earnings model only generates noise. The evidence in Panels B of Table 2 and 3 seems to support this argument. Note that in those tables the coefficients of positive and negative dividend changes tend to significantly vary over time.

6. Conclusions

Since the influential papers of Miller and Modigliani (1961) and Watts (1973), economists have been looking without success for evidence that changes in dividends

[12] We also replicate the out-of-sample analysis using levels in ROE and ROA instead of changes. Our results are qualitatively the same.

contain information about future changes in earnings. Using various empirical methods, many papers have been unable to find a reliable link between dividend changes and future changes in earnings or profitability. Using a linear model of earnings expectations, a recent paper by Nissim and Ziv (2001) finds that dividend changes are positively correlated with future earnings changes.

In this paper we show that dividend changes are uncorrelated with future earnings changes when one controls for the well-known non-linearities in the earnings process. This result underscores the importance of controlling for non-linearities in the earnings process when examining the performance of a firm following a corporate event. Thus, even when researchers find a weak link between dividend changes and future earnings changes (only in about 29% of the years, as we show in Table 2), the association is not reliable, and can be attributed to incorrect modeling of the earnings process.

We also find that regardless of the model of earnings expectations, models that include dividend changes do not outperform those that do not include dividend changes. Some of our results even suggest that investors may be better off not using dividend changes when they forecast earnings changes.

Given the evidence presented here and in the other recent papers we have cited, it is sensible to conclude that changes in dividends are not useful in predicting future changes in earnings. It is possible to find a weak association between dividend changes and future earnings, but only with an incorrectly specified model. Using several different estimation methods (e.g., matched sample, and non-linear specification) and various measures of profitability (e.g., return on assets, return on cash-adjusted assets, return on sales, and cash-flow return on assets) we find that this association is weak and unreliable. We cannot rule out that dividend increases signal something, but that something is neither abnormal increases in future earnings nor abnormal increases in future profitability. Perhaps the motives for paying dividends, and the market reaction to it should be looked for elsewhere.[13]

[13] For example, recent evidence suggests that dividend changes contain information about unexpected changes in systematic risk (Grullon, Michaely and Swaminathan (2002)).

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Table 1
Summary Statistics

This table reports the firm characteristics for the sample firms. RΔDIV is the annual percentage change in the cash dividend payment. MV is the market value of equity. M/B is the market value of equity relative to the book value of equity. ROE is equal to the earnings before extraordinary items scaled by the book value of equity. ROA is equal to the operating income before depreciation scaled by total assets. The values of all financial variables are determined at the beginning of the year of the announcement. To reduce the effect of outliers, RΔDIV , M/B, ROE, and ROA have been winsorized at the 0.1% and the 99.9% of the empirical distribution.

Panel A: Dividend Decreases

	Mean	Std.	5%	50%	95%	N
RΔDIV	-45.5%	17.0%	-76.0%	-48.0%	-18.2%	974
MV (millions of $)	591.2	1,839.6	6.6	87.2	2,737.6	946
M/B	1.19	1.22	0.35	0.90	2.64	906
ROE	7.1%	15.7%	-11.7%	7.0%	23.1%	920
ROA	12.2%	7.7%	2.6%	11.2%	24.5%	954

Panel B: Dividend Increases

	Mean	Std.	5%	50%	95%	N
RΔDIV	17.9%	20.0%	3.3%	12.5%	50.0%	14,235
MV (millions of $)	1,595.5	5,518.2	13.5	280.0	6,267.3	14,122
M/B	1.94	1.77	0.55	1.48	4.72	13,697
ROE	15.3%	8.6%	6.5%	14.4%	26.1%	13,743
ROA	18.0%	7.2%	8.8%	16.7%	31.4%	14,093

Panel C: No Changes

	Mean	Std.	5%	50%	95%	N
RΔDIV	0	0	0	0	0	23,334
MV (millions of $)	868.7	3,525.3	8.1	127.2	3,434.5	22.998
M/B	1.76	1.73	0.47	1.32	4.31	21,658
ROE	12.2%	11.4%	0.24%	11.9%	25.2%	21,778
ROA	16.0%	7.7%	5.8%	14.8%	29.8%	23,029

Table 2
Regressions of Raw Earnings Changes on Dividend Changes

This table reports estimates of regressions relating raw earnings changes to dividend changes. E_τ is the earnings before extraordinary items in year τ (year 0 is the event year). B_{-1} is the book value of equity at the end of year –1. RΔDIV is the annual percentage change in the cash dividend payment. DPC (DNC) is a dummy variable that takes the value of 1 for dividend increases (decreases) and 0 otherwise. $ROE_{\tau-1}$ is equal to the earnings before extraordinary items in year $\tau-1$ scaled by the book value of equity at the end of year $\tau-1$. We use the Fama-MacBeth (1973) procedure to estimate the regression coefficients. In the first stage, we estimate cross-sectional regression coefficients each year using all the observations in that year. In the second-stage, we compute time-series means of the cross-sectional regression coefficients. The standard deviations for these averages are estimated using the Hansen-Hodrick (1980) standard error correction method. To reduce the effect of outliers, all the variables have been winsorized at the 0.1% and the 99.9% of the empirical distribution. The "average adjusted-R^2" is the average (adjusted) R^2 of the cross-sectional regressions. In Panel B, positive and significant coefficients (at least at the 10% level) are highlighted in bold. a, b, and c denote significantly different from zero at the 1%, 5%, and 10% level, respectively.

Panel A: Time-Series Means of the Cross-Sectional Regression Coefficients

$$(E_\tau - E_{\tau-1})/B_{-1} = \beta_0 + \beta_{1P}DPC_0 \times R\Delta DIV_0 + \beta_{1N}DNC_0 \times R\Delta DIV_0 + \beta_2 ROE_{\tau-1} + \beta_3(E_0 - E_{-1})/B_{-1} + \varepsilon_\tau$$

Year		β_0	β_{1P}	β_{1N}	β_2	β_3	Average Adjusted-R^2
$\tau = 1$	Mean	0.026 [a]	0.027 [a]	0.08	-0.144 [a]	0.079 [c]	11.73%
	Wald-statistic	32.75	12.49	0.32	33.37	3.36	
$\tau = 2$	Mean	0.021 [a]	0.017 [b]	0.024	-0.089 [a]	-0.018	9.89%
	Wald-statistic	24.40	5.08	2.06	12.33	0.36	

Panel B: Annual Cross-Sectional Regression Coefficients of Dividend Changes

$$(E_\tau - E_{\tau-1})/B_{-1} = \beta_0 + \beta_{1P}DPC_0 \times R\Delta DIV_0 + \beta_{1N}DNC_0 \times R\Delta DIV_0 + \beta_2 ROE_{\tau-1} + \beta_3(E_0 - E_{-1})/B_{-1} + \varepsilon_\tau$$

	$\tau = 1$				$\tau = 2$			
Year	β_{1P}	$t(\beta_{1P})$	β_{1N}	$t(\beta_{1N})$	β_{1P}	$t(\beta_{1P})$	β_{1N}	$t(\beta_{1N})$
1963	0.054	1.504	-0.173	-2.073	0.045	1.141	0.059	0.776
1964	0.013	0.566	-0.041	-0.483	0.019	0.745	-0.079	-0.832
1965	0.008	0.564	0.055	0.552	-0.027	-1.204	0.013	0.087
1966	-0.007	-0.224	0.026	0.505	-0.002	-0.067	-0.057	-0.932
1967	-0.073	-2.303	-0.007	-0.081	-0.009	-0.242	0.030	0.273
1968	0.012	0.551	-0.105	-2.222	0.008	0.301	0.046	0.780
1969	**0.088**	**2.881**	-0.012	-0.339	0.058	1.447	0.045	1.018
1970	**0.057**	**1.847**	0.003	0.199	0.047	1.613	0.005	0.341
1971	-0.010	-0.784	-0.020	-1.479	0.025	1.381	0.015	0.824
1972	0.014	0.753	0.004	0.146	**0.072**	**2.054**	0.068	1.186
1973	-0.010	-0.596	0.061	1.223	-0.041	-2.321	0.064	1.247
1974	0.007	0.600	**0.065**	**1.741**	**0.020**	**1.657**	**0.089**	**2.285**
1975	-0.031	-2.607	0.023	0.883	0.010	0.750	0.050	1.626
1976	0.010	0.935	**0.095**	**1.843**	0.016	1.260	-0.027	-0.395
1977	0.005	0.530	-0.052	-1.539	-0.013	-0.827	0.004	0.088
1978	0.024	1.577	**0.191**	**2.718**	0.012	0.631	0.011	0.128
1979	**0.062**	**3.535**	0.028	0.487	-0.025	-1.259	-0.020	-0.312
1980	0.040	1.566	-0.022	-0.689	0.035	0.951	0.064	1.339
1981	0.030	1.040	-0.013	-0.249	0.015	0.511	-0.113	-2.031
1982	0.020	0.697	-0.033	-1.305	0.059	1.580	0.036	1.095
1983	0.002	0.052	-0.042	-1.095	0.060	1.371	0.062	1.156
1984	**0.102**	**3.278**	-0.182	-2.739	**0.078**	**2.629**	**0.367**	**5.813**
1985	**0.087**	**2.180**	0.054	0.989	0.079	1.605	0.111	1.599
1986	**0.081**	**1.912**	-0.007	-0.134	0.071	1.293	0.065	1.202
1987	**0.093**	**1.999**	0.073	0.994	0.052	1.085	-0.092	-1.181
1988	0.027	1.358	0.095	1.095	-0.015	-0.606	-0.067	-0.641
1989	-0.046	-1.354	**0.208**	**2.988**	-0.017	-0.440	0.041	0.461
1990	0.035	0.980	-0.001	-0.024	0.021	0.581	-0.123	-2.352
1991	**0.104**	**2.489**	-0.004	-0.109	0.064	1.401	0.019	0.493
1992	0.060	1.441	0.039	0.896	-0.008	-0.183	-0.023	-0.458
1993	-0.038	-1.489	-0.007	-0.139	-0.007	-0.236	-0.033	-0.556
1994	**0.054**	**1.802**	0.082	0.982	-0.037	-1.044	0.106	1.059
1995	-0.002	-0.060	-0.081	-1.517	0.045	0.951	-0.138	-1.881
1996	**0.067**	**1.818**	-0.083	-1.194	-0.128	-2.228	**0.299**	**2.611**
1997	0.021	0.375	0.063	0.736	0.009	0.163	-0.067	-0.800

Table 3
Regressions of Raw Earnings Changes on Dividend Changes Using the Fama and French Approach to Predict Expected Earnings

This table reports estimates of regressions relating raw earnings changes to dividend changes. E_τ is the earnings before extraordinary items in year τ (year 0 is the event year). B_{-1} is the book value of equity at the end of year –1. RΔDIV is the annual percentage change in the cash dividend payment. DPC (DNC) is a dummy variable that takes the value of 1 for dividend increases (decreases) and 0 otherwise. ROE_τ is equal to the earnings before extraordinary items in year τ scaled by the book value of equity at the end of year τ. DFE_0 is equal to ROE_0 - E[ROE_0], where E[ROE_0] is the fitted value from the cross-sectional regression of ROE_0 on the logarithm of total assets in year –1, the logarithm of the market-to-book ratio of equity in year –1, and ROE_{-1}. CE_0 is equal to $(E_0 - E_{-1}) / B_{-1}$. $NDFED_0$ is a dummy variable that takes the value of 1 if DFE_0 is negative and 0 otherwise. $PDFED_0$ is a dummy variable that takes the value of 1 if DFE_0 is positive and 0 otherwise. $NCED_0$ is a dummy variable that takes the value of 1 if CE_0 is negative and 0 otherwise. $PCED_0$ is a dummy variable that takes the value of 1 if CE_0 is positive and 0 otherwise. We use the Fama-MacBeth (1973) procedure to estimate the regression coefficients. In the first stage, we estimate cross-sectional regression coefficients each year using all the observations in that year. In the second-stage, we compute time-series means of the cross-sectional regression coefficients. The standard deviations for these averages are estimated using the Hansen-Hodrick (1980) standard error correction method. To reduce the effect of outliers, all the variables, except the log of total assets, have been winsorized at the 0.1% and the 99.9% of the empirical distribution. The "average adjusted R^2" is the average (adjusted) R^2 of the cross-sectional regressions. In Panel B, positive and significant coefficients (at least at the 10% level) are highlighted in bold. a, b, and c denote significantly different from zero at the 1%, 5%, and 10% level, respectively.

Panel A: Time-Series Means of the Cross-Sectional Regression Coefficients

$$(E_\tau - E_{\tau-1})/B_{-1} = \beta_0 + \beta_{1P} DPC_0 \times R\Delta DIV_0 + \beta_{1N} DPN_0 \times R\Delta DIV_0 + (\gamma_1 + \gamma_2 NDFED_0 + \gamma_3 NDFED_0 \times DFE_0 + \gamma_4 PDFED_0 \times DFE_0) \times DFE_0$$
$$+ (\lambda_1 + \lambda_2 NCED_0 + \lambda_3 NCED_0 \times CE_0 + \lambda_4 PCED_0 \times CE_0) \times CE_0 + \varepsilon_\tau$$

Year		β_0	β_{1P}	β_{1N}	γ_1	γ_2	γ_3	γ_4	λ_1	λ_2	λ_3	λ_4	Average Adjusted-R^2
$\tau = 1$	Mean	-0.003	0.008	0.009	-0.173 [b]	-0.282 [b]	-0.849	-1.160	0.452 [a]	-0.217 [c]	1.626	-0.507	21.01%
	Wald-Statistic	1.50	1.45	0.43	5.22	4.36	1.85	2.56	24.64	3.27	1.25	2.14	
$\tau = 2$	Mean	0.011 [a]	0.004	-0.001	-0.210	-0.001	-0.336	-1.078	0.163 [c]	-0.107	0.120	0.050	11.40%
	Wald-Statistic	20.46	0.29	0.00	2.31	0.00	0.21	0.39	3.75	0.55	0.02	0.00	

Panel B: Annual Cross-Sectional Regression Coefficients of Dividned Changes

$$(E_\tau - E_{\tau-1})/B_{-1} = \beta_0 + \beta_{1P}DPC_0 \times R\Delta DIV_0 + \beta_{1N}DPN_0 \times R\Delta DIV_0$$
$$+(\gamma_1 + \gamma_2 NDFED_0 + \gamma_3 NDFED_0 \times DFE_0 + \gamma_4 PDFED_0 \times DFE_0) \times DFE_0$$
$$+(\lambda_1 + \lambda_2 NCED_0 + \lambda_3 NCED_0 \times CE_0 + \lambda_4 PCED_0 \times CE_0) \times CE_0 + \varepsilon_\tau$$

	$\tau = 1$				$\tau = 2$			
Year	β_{1P}	$t(\beta_{1P})$	β_{1N}	$t(\beta_{1N})$	β_{1P}	$t(\beta_{1P})$	β_{1N}	$t(\beta_{1N})$
1963	0.037	1.470	-0.051	-0.882	**0.069**	**1.888**	0.081	0.958
1964	-0.014	-0.761	-0.025	-0.354	-0.004	-0.202	-0.093	-1.102
1965	0.003	0.194	0.057	0.580	-0.030	-1.328	0.007	0.046
1966	0.006	0.229	**0.088**	**1.996**	-0.017	-0.489	-0.056	-0.949
1967	-0.071	-2.391	-0.014	-0.170	-0.017	-0.454	0.027	0.256
1968	0.005	0.226	-0.129	-2.761	0.012	0.445	0.020	0.335
1969	**0.069**	**2.356**	0.008	0.236	0.022	0.551	-0.028	-0.637
1970	0.027	0.897	-0.004	-0.247	0.042	1.464	0.010	0.665
1971	-0.015	-1.068	-0.001	-0.057	-0.009	-0.460	0.014	0.747
1972	0.014	0.817	-0.018	-0.685	**0.100**	**2.800**	0.067	1.179
1973	-0.006	-0.331	0.028	0.563	-0.009	-0.468	0.022	0.409
1974	-0.015	-1.321	0.009	0.260	**0.029**	**2.443**	**0.070**	**1.821**
1975	-0.043	-3.551	0.036	1.352	0.017	1.194	0.037	1.138
1976	0.008	0.823	0.056	1.215	0.019	1.538	-0.003	-0.039
1977	-0.009	-0.921	-0.101	-2.973	-0.007	-0.476	0.006	0.114
1978	0.016	1.079	**0.159**	**2.356**	0.012	0.619	-0.056	-0.632
1979	**0.032**	**1.998**	-0.064	-1.174	-0.025	-1.197	-0.067	-0.976
1980	0.031	1.278	-0.027	-0.876	0.043	1.187	0.054	1.153
1981	0.025	0.863	-0.004	-0.072	-0.018	-0.581	-0.165	-2.874
1982	-0.072	-2.439	-0.029	-1.153	0.037	0.950	0.042	1.212
1983	-0.038	-1.274	-0.088	-2.324	0.056	1.302	0.052	0.955
1984	**0.086**	**2.989**	-0.130	-2.062	0.046	1.458	**0.404**	**5.928**
1985	0.038	1.015	0.067	1.320	0.024	0.492	0.050	0.741
1986	0.038	0.872	-0.095	-1.825	0.017	0.342	0.012	0.201
1987	**0.074**	**1.727**	0.078	1.141	0.017	0.328	-0.118	-1.405
1988	0.007	0.372	**0.152**	**1.826**	-0.013	-0.551	-0.170	-1.680
1989	-0.066	-2.088	**0.251**	**3.796**	-0.035	-0.892	-0.083	-0.961
1990	0.019	0.586	-0.018	-0.376	-0.002	-0.065	-0.122	-2.215
1991	0.040	1.070	-0.014	-0.444	0.006	0.124	-0.003	-0.071
1992	0.032	0.838	0.031	0.760	-0.036	-0.794	-0.028	-0.555
1993	-0.054	-2.156	0.048	0.968	-0.009	-0.318	-0.038	-0.638
1994	0.017	0.565	0.086	1.045	-0.069	-1.969	0.091	0.936
1995	-0.013	-0.359	-0.069	-1.355	0.046	0.968	-0.186	-2.553
1996	**0.068**	**1.917**	-0.017	-0.247	-0.167	-2.854	**0.230**	**1.928**
1997	0.009	0.176	0.067	0.786	-0.005	-0.080	-0.102	-1.082

Table 4
Regressions of Changes in ROA on Dividend Changes

This table reports estimates of regressions relating changes in ROA to dividend changes. ROA_τ is equal to the operating income before depreciation in year τ scaled by total assets at the end of year τ. RΔDIV is the annual percentage change in the cash dividend payment. DPC (DNC) is a dummy variable that takes the value of 1 for dividend increases (decreases) and 0 otherwise. DFE_0 is equal to ROA_0 - E[ROA_0], where E[ROA_0] is the fitted value from the cross-sectional regression of ROA_0 on the logarithm of total assets in year –1, the logarithm of the market-to-book ratio of equity in year –1, and ROA_{-1}. CE_0 is equal to $ROA_0 - ROA_{-1}$. $NDFED_0$ is a dummy variable that takes the value of 1 if DFE_0 is negative and 0 otherwise. $PDFED_0$ is a dummy variable that takes the value of 1 if DFE_0 is positive and 0 otherwise. $NCED_0$ is a dummy variable that takes the value of 1 if CE_0 is negative and 0 otherwise. $PCED_0$ is a dummy variable that takes the value of 1 if CE_0 is positive and 0 otherwise. We use the Fama-MacBeth (1973) procedure to estimate the regression coefficients. In the first stage, we estimate cross-sectional regression coefficients each year using all the observations in that year. In the second-stage, we compute time-series means of the cross-sectional regression coefficients. The standard deviations for these averages are estimated using the Hansen-Hodrick (1980) standard error correction method. To reduce the effect of outliers, all the variables, except the log of total assets, have been winsorized at the 0.1% and the 99.9% of the empirical distribution. The "average adjusted-R^2" is the average (adjusted) R^2 of the cross-sectional regressions. a, b, and c denote significantly different from zero at the 1%, 5%, and 10% level, respectively.

Panel A: Time-Series Means of the Cross-Sectional Regression Coefficients from the Linear Model

$$ROA_\tau - ROA_{\tau-1} = \beta_0 + \beta_{1P} DPC_0 \times R\Delta DIV_0 + \beta_{1N} DNC_0 \times R\Delta DIV_0 + \beta_2 ROA_{\tau-1} + \beta_3 (ROA_0 - ROA_{-1}) + \varepsilon_\tau$$

Year		β_0	β_{1P}	β_{1N}	β_2	β_3	Average Adjusted-R^2
$\tau = 1$	Mean	0.019 [a]	-0.001	-0.008	-0.146 [a]	-0.017	10.76%
	Wald-statistic	156.95	0.02	2.19	547.25	0.85	
$\tau = 2$	Mean	0.019 [a]	-0.001	0.004	-0.144 [a]	-0.085 [a]	11.63%
	Wald-statistic	135.46	0.06	0.33	327.31	26.03	

Panel B: Time-Series Means of the Cross-Sectional Regression Coefficients from the Non-Linear Model

$$\text{ROA}_{\tau}\text{-ROA}_{\tau-1} = \beta_0 + \beta_{1P}\text{DPC}_0 \times \text{R}\Delta\text{DIV}_0 + \beta_{1N}\text{DPN}_0 \times \text{R}\Delta\text{DIV}_0 + (\gamma_1 + \gamma_2\text{NDFED}_0 + \gamma_3\text{NDFED}_0 \times \text{DFE}_0 + \gamma_4\text{PDFED}_0 \times \text{DFE}_0) \times \text{DFE}_0$$
$$+(\lambda_1 + \lambda_2\text{NCED}_0 + \lambda_3\text{NCED}_0 \times \text{CE}_0 + \lambda_4\text{PCED}_0 \times \text{CE}_0) \times \text{CE}_0 + \varepsilon_{\tau}$$

Year		β_0	β_{1P}	β_{1N}	γ_1	γ_2	γ_3	γ_4	λ_1	λ_2	λ_3	λ_4	Average Adjusted-R^2
$\tau = 1$	Mean	-0.003 [a]	-0.007 [b]	-0.014 [a]	-0.582 [a]	-0.101	3.147 [a]	-0.625	0.535 [a]	0.033	-2.076 [b]	-0.160	14.15%
	Wald-Statistic	8.64	5.63	6.87	40.58	0.55	9.60	0.36	30.20	0.06	5.59	0.02	
$\tau = 2$	Mean	0.000	-0.004	-0.004	-0.511 [a]	0.064	0.434	-1.559 [c]	0.294 [a]	0.044	0.007	0.992	10.31%
	Wald-Statistic	0.01	2.41	0.35	72.32	0.61	0.39	3.07	18.74	0.19	0.00	1.21	

Table 5
Regressions of ROE Levels on Dividend Changes

This table reports estimates of regressions relating ROE levels to dividend changes. ROE_{τ} is equal to the earnings before extraordinary items in year τ scaled by the book value of equity at the end of year τ. RΔDIV is the annual percentage change in the cash dividend payment. DPC (DNC) is a dummy variable that takes the value of 1 for dividend increases (decreases) and 0 otherwise. CE_0 is equal to $(ROE_0\text{-}ROE_{-1})$. $NDFED_0$ is a dummy variable that takes the value of 1 if ROE_0 is negative and 0 otherwise. $PDFED_0$ is a dummy variable that takes the value of 1 if ROE_0 is positive and 0 otherwise. $NCED_0$ is a dummy variable that takes the value of 1 if CE_0 is negative and 0 otherwise. $PCED_0$ is a dummy variable that takes the value of 1 if CE_0 is positive and 0 otherwise. MB_{-1} is the logarithm of the market-to-book ratio of equity in year –1. $SIZE_{-1}$ is the logarithm of total assets in year –1. We use the Fama-MacBeth (1973) procedure to estimate the regression coefficients. In the first stage, we estimate cross-sectional regression coefficients each year using all the observations in that year. In the second-stage, we compute time-series means of the cross-sectional regression coefficients. The standard deviations for these averages are estimated using the Hansen-Hodrick (1980) standard error correction method. To reduce the effect of outliers, all the variables, except the log of total assets, have been winsorized at the 0.1% and the 99.9% of the empirical distribution. The "average adjusted-R^2" is the average (adjusted) R^2 of the cross-sectional regressions. a, b, and c denote significantly different from zero at the 1%, 5%, and 10% level, respectively.

Panel A: Time-Series Means of the Cross-Sectional Regression Coefficients from the Linear Model

$$ROE_{\tau} = \beta_0 + \beta_{1P} DPC_0 \times R\Delta DIV_0 + \beta_{1N} DNC_0 \times R\Delta DIV_0 + \beta_2 ROE_{\tau-1} + \beta_3 (ROE_0\text{-}ROE_{-1}) + \beta_4 MB_{-1} + \beta_5 SIZE_{-1} + \varepsilon_{\tau}$$

Year		β_0	β_{1P}	β_{1N}	β_2	β_3	β_4	β_5	Average Adjusted-R^2
$\tau = 1$	Mean	0.000	0.021 [a]	0.009	0.706 [a]	-0.023	0.019 [a]	0.003 [a]	59.05%
	Wald-statistic	0.00	9.33	0.22	492.53	0.37	25.79	18.02	
$\tau = 2$	Mean	0.007	0.025 [c]	0.048	0.518 [a]	-0.080 [b]	0.024 [a]	0.005 [a]	44.87%
	Wald-statistic	0.32	3.36	2.40	200.28	6.31	30.83	21.39	

Panel B: Time-Series Means of the Cross-Sectional Regression Coefficients from the Non-Linear Model

$$\text{ROE}_\tau = \beta_0 + \beta_{1P}\text{DPC}_0 \times \text{R}\Delta\text{DIV}_0 + \beta_{1N}\text{DPN}_0 \times \text{R}\Delta\text{DIV}_0 + (\gamma_1 + \gamma_2\text{NDFED}_0 + \gamma_3\text{NDFED}_0 \times \text{ROE}_0 + \gamma_4\text{PDFED}_0 \times \text{ROE}_0) \times \text{ROE}_0$$
$$+ (\lambda_1 + \lambda_2\text{NCED}_0 + \lambda_3\text{NCED}_0 \times \text{CE}_0 + \lambda_4\text{PCED}_0 \times \text{CE}_0) \times \text{CE}_0 + \varphi_1\text{MB}_{-1} + \varphi_2\text{SIZE}_{-1} + \varepsilon_\tau$$

Year		β_0	β_{1P}	β_{1N}	γ_1	γ_2	γ_3	γ_4	λ_1	λ_2	λ_3	λ_4	φ_1	φ_2	Average Adjusted-R^2
$\tau = 1$	Mean	-0.014 [b]	0.007	0.001	0.957 [a]	0.335	1.794	-0.419 [a]	0.028	0.142	-0.465	-0.857	0.011 [a]	0.002 [a]	62.64%
	Wald-Statistic	3.96	1.58	0.00	265.30	0.11	0.95	8.78	0.12	1.11	0.59	2.39	21.96	11.12	
$\tau = 2$	Mean	-0.006	0.011	0.030	0.775 [a]	-1.454 [b]	-21.75	-0.428 [a]	-0.072	0.319 [b]	1.05	-0.578	0.015 [a]	0.004 [a]	47.33%
	Wald-Statistic	0.35	0.56	1.06	130.88	4.13	1.00	6.52	0.65	5.28	0.85	1.15	15.46	17.66	

Table 6
The Out-of-Sample Ability of Dividend Changes to Predict Future Earnings Changes: Linear Model

This table compares the out-of-sample forecasting ability of the following model:

$$(E_{\tau} - E_{\tau-1}) / B_{-1} = \beta_0 + \beta_{1P} DPC_0 \times R\Delta DIV_0 + \beta_{1N} DNC_0 \times R\Delta DIV_0 + \beta_2 ROE_{\tau-1} + \beta_3 (E_0 - E_{-1}) / B_{-1} + \varepsilon_{\tau}$$

to the forecasting ability of a similar model that excludes dividend changes as an explanatory variable. To measure the forecasting ability of each model, we calculate the out-of-sample forecast error of each model using a rolling scheme and a recursive scheme. Under the rolling scheme, the parameter of variable i in year t is equal to the value of the cross-sectional coefficient of variable i in year t-1 when $\tau = 1$ and to the value of the cross-sectional coefficient of variable i in year t-2 when $\tau = 2$. Under the recursive scheme, the parameter of variable i in year t is equal to the average of all the annual cross-sectional coefficients of variable i up to year t-1 when $\tau = 1$ and to the average of all the annual cross-sectional coefficients of variable i up to year t-2 when $\tau = 2$. Using these forecast errors, we calculate the annual differences in mean squared error (MSE) and mean absolute deviation (MAD) between the model that includes dividend changes and the model that exclude them. MSE_{DIV} (MAD_{DIV}) is the average annual mean squared error (mean absolute deviation) of the model that includes dividend changes. MSE_{NODIV} (MAD_{NODIV}) is the average annual mean squared error (mean absolute deviation) of the model that excludes dividend changes. To assess the statistical significance of the MSE and the MAD, we use a bootstrapping methodology. To reduce the effect of outliers, all the variables, except the log of total assets, have been winsorized at the 0.1% and the 99.9% of the empirical distribution. a, b, and c denote significantly different from zero at the 1%, 5%, and 10% level, respectively.

Panel A: Rolling Scheme

Year		Mean	p-value
$\tau = 1$	MSE_{DIV} - MSE_{NODIV}	0.000045 [a]	0.0031
	MAD_{DIV} - MAD_{NODIV}	0.000271 [a]	0.0003
$\tau = 2$	MSE_{DIV} - MSE_{NODIV}	0.000118 [a]	0.0008
	MAD_{DIV} - MAD_{NODIV}	0.000367 [a]	0.0003

Panel B: Recursive Scheme

Year		Mean	p-value
$\tau = 1$	MSE_{DIV} - MSE_{NODIV}	0.000002	0.3650
	MAD_{DIV} - MAD_{NODIV}	0.000003	0.4618
$\tau = 2$	MSE_{DIV} - MSE_{NODIV}	0.000012 [c]	0.0611
	MAD_{DIV} - MAD_{NODIV}	0.000040	0.2112

Table 7
The Out-of-Sample Ability of Dividend Changes to Predict Future Earnings Changes: Non-Linear Model

This table compares the out-of-sample forecasting ability of the following model:

$$(E_\tau - E_{\tau-1})/B_{-1} = \beta_0 + \beta_{1P}DPC_0 \times R\Delta DIV_0 + \beta_{1N}DPN_0 \times R\Delta DIV_0$$
$$+(\gamma_1 + \gamma_2 NDFED_0 + \gamma_3 NDFED_0 \times DFE_0 + \gamma_4 PDFED_0 \times DFE_0) \times DFE_0$$
$$+(\lambda_1 + \lambda_2 NCED_0 + \lambda_3 NCED_0 \times CE_0 + \lambda_4 PCED_0 \times CE_0) \times CE_0 + \varepsilon_\tau$$

to the forecasting ability of a similar model that excludes dividend changes as an explanatory variable. To measure the forecasting ability of each model, we calculate the out-of-sample forecast error of each model using a rolling scheme and a recursive scheme. Under the rolling scheme, the parameter of variable i in year t is equal to the value of the cross-sectional coefficient of variable i in year t-1 when $\tau = 1$ and to the value of the cross-sectional coefficient of variable i in year t-2 when $\tau = 2$. Under the recursive scheme, the parameter of variable i in year t is equal to the average of all the annual cross-sectional coefficients of variable i up to year t-1 when $\tau = 1$ and to the average of all the annual cross-sectional coefficients of variable i up to year t-2 when $\tau = 2$. Using these forecast errors, we calculate the annual differences in mean squared error (MSE) and mean absolute deviation (MAD) between the model that includes dividend changes and the model that exclude them. MSE_{DIV} (MAD_{DIV}) is the average annual mean squared error (mean absolute deviation) of the model that includes dividend changes. MSE_{NODIV} (MAD_{NODIV}) is the average annual mean squared error (mean absolute deviation) of the model that excludes dividend changes. To assess the statistical significance of the MSE and the MAD, we use a bootstrapping methodology. To reduce the effect of outliers, all the variables, except the log of total assets, have been winsorized at the 0.1% and the 99.9% of the empirical distribution. a, b, and c denote significantly different from zero at the 1%, 5%, and 10% level, respectively.

Panel A: Rolling Scheme

Year		Mean	p-value
$\tau = 1$	MSE_{DIV} - MSE_{NODIV}	0.000084	0.1044
	MAD_{DIV} - MAD_{NODIV}	0.000385 [a]	0.0000
$\tau = 2$	MSE_{DIV} - MSE_{NODIV}	0.000275 [a]	0.0046
	MAD_{DIV} - MAD_{NODIV}	0.000417 [a]	0.0010

Panel B: Recursive Scheme

Year		Mean	p-value
$\tau = 1$	MSE_{DIV} - MSE_{NODIV}	0.000941[a]	0.0000
	MAD_{DIV} - MAD_{NODIV}	0.000291[a]	0.0000
$\tau = 2$	MSE_{DIV} - MSE_{NODIV}	0.000569 [b]	0.0470
	MAD_{DIV} - MAD_{NODIV}	0.000226 [a]	0.0019

Table 8
The Out-of-Sample Ability of Dividend Changes to Predict Future ROA Changes: Linear Model

This table compares the out-of-sample forecasting ability of the following model:

$$\text{ROA}_{\tau} - \text{ROA}_{\tau-1} = \beta_0 + \beta_{1P}\text{DPC}_0 \times \text{R}\Delta\text{DIV}_0 + \beta_{1N}\text{DNC}_0 \times \text{R}\Delta\text{DIV}_0 + \beta_2\text{ROA}_{\tau-1} + \beta_3(\text{ROA}_0 - \text{ROA}_{-1}) + \varepsilon_{\tau}$$

to the forecasting ability of a similar model that excludes dividend changes as an explanatory variable. To measure the forecasting ability of each model, we calculate the out-of-sample forecast error of each model using a rolling scheme and a recursive scheme. Under the rolling scheme, the parameter of variable i in year t is equal to the value of the cross-sectional coefficient of variable i in year t-1 when $\tau = 1$ and to the value of the cross-sectional coefficient of variable i in year t-2 when $\tau = 2$. Under the recursive scheme, the parameter of variable i in year t is equal to the average of all the annual cross-sectional coefficients of variable i up to year t-1 when $\tau = 1$ and to the average of all the annual cross-sectional coefficients of variable i up to year t-2 when $\tau = 2$. Using these forecast errors, we calculate the annual differences in mean squared error (MSE) and mean absolute deviation (MAD) between the model that includes dividend changes and the model that exclude them. MSE_{DIV} (MAD_{DIV}) is the average annual mean squared error (mean absolute deviation) of the model that includes dividend changes. $\text{MSE}_{\text{NODIV}}$ ($\text{MAD}_{\text{NODIV}}$) is the average annual mean squared error (mean absolute deviation) of the model that excludes dividend changes. To assess the statistical significance of the MSE and the MAD, we use a bootstrapping methodology. To reduce the effect of outliers, all the variables, except the log of total assets, have been winsorized at the 0.1% and the 99.9% of the empirical distribution. . a, b, and c denote significantly different from zero at the 1%, 5%, and 10% level, respectively.

Panel A: Rolling Scheme

Year		Mean	p-value
$\tau = 1$	$\text{MSE}_{\text{DIV}} - \text{MSE}_{\text{NODIV}}$	0.00001 [a]	0.0000
	$\text{MAD}_{\text{DIV}} - \text{MAD}_{\text{NODIV}}$	0.00007 [a]	0.0005
$\tau = 2$	$\text{MSE}_{\text{DIV}} - \text{MSE}_{\text{NODIV}}$	0.00002 [a]	0.0000
	$\text{MAD}_{\text{DIV}} - \text{MAD}_{\text{NODIV}}$	0.00013 [a]	0.0001

Panel B: Recursive Scheme

Year		Mean	p-value
$\tau = 1$	$\text{MSE}_{\text{DIV}} - \text{MSE}_{\text{NODIV}}$	0.000001	0.1017
	$\text{MAD}_{\text{DIV}} - \text{MAD}_{\text{NODIV}}$	-0.000001	0.5790
$\tau = 2$	$\text{MSE}_{\text{DIV}} - \text{MSE}_{\text{NODIV}}$	0.000004 [a]	0.0006
	$\text{MAD}_{\text{DIV}} - \text{MAD}_{\text{NODIV}}$	0.000040 [b]	0.0149

Table 9
The Out-of-Sample Ability of Dividend Changes in Predicting Future ROA Changes: Non-Linear Model

This table compares the out-of-sample forecasting ability of the following model:

$$\begin{aligned}\text{ROA}_{\tau}\text{-ROA}_{\tau-1} &= \beta_0 + \beta_{1P}\text{DPC}_0 \times \text{R}\Delta\text{DIV}_0 + \beta_{1N}\text{DPN}_0 \times \text{R}\Delta\text{DIV}_0 \\ &+(\gamma_1 + \gamma_2\text{NDFED}_0 + \gamma_3\text{NDFED}_0 \times \text{DFE}_0 + \gamma_4\text{PDFED}_0 \times \text{DFE}_0) \times \text{DFE}_0 \\ &+(\lambda_1 + \lambda_2\text{NCED}_0 + \lambda_3\text{NCED}_0 \times \text{CE}_0 + \lambda_4\text{PCED}_0 \times \text{CE}_0) \times \text{CE}_0 + \varepsilon_{\tau}\end{aligned}$$

to the forecasting ability of a similar model that excludes dividend changes as an explanatory variable. To measure the forecasting ability of each model, we calculate the out-of-sample forecast error of each model using a rolling scheme and a recursive scheme. Under the rolling scheme, the parameter of variable i in year t is equal to the value of the cross-sectional coefficient of variable i in year t-1 when $\tau = 1$ and to the value of the cross-sectional coefficient of variable i in year t-2 when $\tau = 2$. Under the recursive scheme, the parameter of variable i in year t is equal to the average of all the annual cross-sectional coefficients of variable i up to year t-1 when $\tau = 1$ and to the average of all the annual cross-sectional coefficients of variable i up to year t-2 when $\tau = 2$. Using these forecast errors, we calculate the annual differences in mean squared error (MSE) and mean absolute deviation (MAD) between the model that includes dividend changes and the model that exclude them. MSE_{DIV} (MAD_{DIV}) is the average annual mean squared error (mean absolute deviation) of the model that includes dividend changes. MSE_{NODIV} (MAD_{NODIV}) is the average annual mean squared error (mean absolute deviation) of the model that excludes dividend changes. To assess the statistical significance of the MSE and the MAD, we use a bootstrapping methodology. To reduce the effect of outliers, all the variables, except the log of total assets, have been winsorized at the 0.1% and the 99.9% of the empirical distribution. a, b, and c denote significantly different from zero at the 1%, 5%, and 10% level, respectively.

Panel A: Rolling Scheme

Year		Mean	p-value
$\tau = 1$	MSE_{DIV} - MSE_{NODIV}	0.000001	0.4421
	MAD_{DIV} - MAD_{NODIV}	0.000050	0.1100
		0.00002 [b]	0.0146
$\tau = 2$	MSE_{DIV} - MSE_{NODIV}	0.00012 [a]	0.0080
	MAD_{DIV} - MAD_{NODIV}		

Panel B: Recursive Scheme

Year		Mean	p-value
$\tau = 1$	MSE_{DIV} - MSE_{NODIV}	-0.00001 [a]	0.0000
	MAD_{DIV} - MAD_{NODIV}	-0.00006 [a]	0.0000
$\tau = 2$	MSE_{DIV} - MSE_{NODIV}	0.000001	0.3978
	MAD_{DIV} - MAD_{NODIV}	0.00002	0.3833