Understanding Stock-Price Volatility: The Role of Earnings*

Gil Sadka†

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Abstract

In an efficient capital market, asset prices vary when investors change their expectations about cash flows, discount rates, or both. Using dividends to measure cash flows, previous research shows that the aggregate dividend-price ratio varies due to changes in expected discount rates (returns) rather than expected cash flows. In contrast, using accounting earnings instead of dividends as a measure of cash flows, this paper shows that as much as 70% in the variation of the dividend-price ratio can be explained by changes in expected earnings. Moreover, the paper documents a significant negative correlation between expected returns and expected earnings, suggesting that variations in a common factor to both may generate significant price volatility. The results are consistent with the dividend-policy irrelevance hypothesis.

JEL classification: E32, G12, G14, M41.

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†Columbia Business School, 613 Uris Hall, 3022 Braodway, New York, NY 10027; e-mail: *gs2235@columbia.edu*.

1 Introduction

In theory, the price of an asset is equal to the discounted expected cash flows that it generates. There are therefore only two factors that can affect prices: expectations regarding discount rates (returns), and expectations regarding future cash flows. Research on stock-price volatility documents that variation in expected returns explains most of the variation in the aggregate dividend-price ratio (dividend yield),[1] while the variation in expected cash flows (dividends) does not seem to have such an effect (e.g., Campbell and Shiller, 1988a, 1988b; Campbell, 1991; and Campbell and Ammer, 1993). Consistent with this analysis of stock-price volatility, the finance literature finds that the dividend yield predicts returns but not dividends (see e.g., Fama and French, 1988, 1989; Keim and Stambaugh, 1986; Lettau and Ludvigson, 2001; Kothari and Shanken, 1997; Lamont, 1998; and Cochrane, 2001).[2] Nevertheless, from a theoretical standpoint, one would expect that both cash-flow and return variation generate price variation. As Cochrane (2001) points out: "*It is nonetheless an uncomfortable fact that almost all variation in price/dividend ratios is due to variation in expected excess returns. How nice it would be if high prices reflected expectations of higher future cash flows.*"

The finance literature studying the determinants of stock-price volatility employs two different methodologies. The first is a "level" methodology that is based on the decomposition of the dividend-price ratio into two components, expected returns and expected cash flows (e.g., Campbell and Shiller, 1988a, 1988b; and Vuolteenaho, 2000, who uses the book-to-market ratio). The results using this "level" methodology suggest that aggregate expected cash flows do not generate significant aggregate price volatility. The second methodology is a "flow" methodology that studies the volatility of stock returns rather than dividend-price ratios (e.g., Campbell, 1991; and Vuolteenaho, 2002). These studies similarly document that cash flows do not generate significant volatility in aggregate stock returns. Nevertheless, the two methodologies might, in principle, yield different results because, as pointed out in Hecht and Vuolteenaho (2006), stock returns are not a function of

[1] When the analysis is applied to the cross-section of firms (e.g. Vuolteenaho, 2002; Callen and Segal, 2004; Easton, 2004; and Cohen, Polk and Vuolteenaho, 2003), the results suggest that variation in expected profitability can explain much of the variation in firm-level returns, book-to-market ratios, and earnings-price ratios. These studies attribute the difference between the aggregate and firm-level results to the relative strength of the idiosyncratic components of cash-flow variation versus the systematic components of expected returns.

[2] While some recent studies find evidence of dividend predictability (e.g., Ribeiro, 2002; and Lettau and Ludvigson, 2005), it remains the case that dividend variation does not seem to explain volatility in the dividend-price ratio.

expected cash flows and expected returns, but rather of changes in expected cash flows and changes in expected returns (see also Campbell, 1991). Moreover, some studies do in fact document that cash flows cause significant returns variation by regressing returns on cash-flow-based measures, such as dividend growth, earnings growth, and growth in industrial production (e.g., Fama, 1990; Schwert, 1990; Kothari and Shanken, 1992; and Collins, Kothari, Shanken and Sloan, 1994). Here again, returns depend on *changes* in expectations of cash flows and returns, not on their expected values. Consistent with this statement, using various expectation models, Hecht and Vuolteenaho (2006) suggests that the cash-flow proxies used by Kothari and Shanken (1992), Fama (1990), and Schwert (1990), may provide more information about changes in expected returns than about changes in expected cash flows. Thus, Hecht and Vuolteenaho (2006) suggests that cash flows are indeed diversifiable and that aggregate cash flows do not affect stock returns. In sum, the prevalent view in the literature is that aggregate cash flows do not affect aggregate prices.

This paper demonstrates that the aggregate dividend-price ratio varies significantly due to variations in expected cash flows when cash flows are measured by earnings instead of dividends. This result overturns results of prior studies which suggest that cash flows do not affect the aggregate dividend-price ratio. The paper utilizes the Campbell and Shiller (1988a) variance decomposition approach, which enables the use of the dividend-price ratio without having to specify a particular expectation model for cash flows and returns. The paper also estimates the extent to which price volatility can be explained by expected-earnings variation. The results indicate that during the sample period 1952-2001, earnings growth explains as much as 70% of the variation in the aggregate dividend yield. In addition, using the Vuolteenaho (2002) variance decomposition for returns, the paper demonstrates that cash flows (proxied by accounting earnings) generate significant return variation.

The results of this paper are particularly important for accounting research. They enhance studies of the effects of earnings, dividends, and cash flows on prices insofar as they show that aggregate earnings affect aggregate prices, while aggregate dividends do not. This finding is consistent with studies that focus on the role of accounting in the economy and its effect on asset prices.[3] The latter studies show that earnings and accruals are more significantly associated with stock prices than are dividends and cash flows. But while these studies provide firm-level evidence,[4]

[3]See, e.g., Dechow (1994), Hayn (1995), Basu (1997), Ball, Kothari and Robin (2000), Ball (2001), Penman and Yehuda (2004), Dechow, Kothari and Watts (1998), Callen and Segal (2004), and Ball, Robin and Sadka (2006).

[4]See, e.g., Ball and Brown (1968), Beaver, Clarke, and Wright (1979), Beaver, Lambert, and Morse (1980), Collins,

this paper shows that the conclusion can be carried over to the aggregate level as well. This link between firm-level effects and aggregate-level effects is not obvious, because if earnings variation were mostly idiosyncratic, firm-level effects would not carry over to the aggregate level. In fact, Vuolteenaho (2002) suggests that accounting profitability is idiosyncratic and diversifiable. If accounting profitability is truly diversifiable, studying accounting figures will prove unimportant from an asset-pricing perspective, because only systematic or aggregate risk should be priced.

This paper posits that the aggregate dividend yield varies significantly due to variation in expected cash flows, when cash flows are measured by earnings instead of dividends. Since over the life of the firm earnings and dividends accumulate to the same value, using an infinite-horizon test should yield identical results for dividends and earnings. The difference in the results of this paper (using earnings) relative to previous studies (using dividends) could thus potentially occur due to the short horizon. In fact, the results suggest that the dividend yield predicts both earnings growth and changes in the dividend-earnings ratio, due to expected dividend "smoothing," expected earnings are high when the expected dividend-earnings ratio is low, and vice versa. This paper thus illustrates that the dividend yield may be able to predict dividends only in the long-run. While dividends might provide a signal for future profitability (e.g., Watts, 1973; and Healy and Palepu, 1988; and Nissim and Ziv, 2001),[5] it remains the case that dividends are distributed from accrued earnings, and therefore lag earnings. Thus, in the short-run, earnings rather than dividends provide a more appropriate and useful measure of cash flows.

The conclusion of this paper is consistent with the seminal work of Miller and Modigliani (1961), which shows that given earnings and ignoring taxes, dividend policy is irrelevant. Dividends are irrelevant because they are a result only of a financing decision made by the firm and its stock holders (made when the dividend is distributed), and are not a performance measure. Prior price-volatility studies that show that cash flows do not affect aggregate prices treat dividends as information about cash flows, yet dividends are not expected to have an effect on prices. The evidence presented in this paper suggests that dividends are high when firms have a higher cash-component in their assets and expect to spend less of their earnings on subsequent capital expenditures. This is consistent with standard financing decisions determining dividends. These results suggest that

Kothari, and Rayburn (1987), Collins and Kothari (1989), and Kothari and Sloan (1992).

[5] In contrast, DeAngelo, DeAngelo and Skinner (1996) find that dividends are not a reliable signal of future profitability. In addition, Watts (1973) finds only weak evidence of the predictive power of dividends with respect to earnings.

high growth options and high earnings growth are associated with a lower dividend-earnings ratio, because in these situations firms intend to use the cash for future investments. Unlike dividends, however, earnings are not merely a financing decision. They are a result of the firms' operations and investments and thus represent the ability of firms to distribute dividends. Therefore, earnings (profitability) growth rather than dividend growth should be reflected in prices (e.g., Easton, 1985; and Francis and Schipper, 1999).

This paper also enhances our understanding of the reason for high levels of stock-price volatility. The results suggest that the dividend yield predicts both expected returns and expected earnings growth, and that the two therefore cannot be independent. Further analysis shows a high negative contemporaneous correlation between returns and earnings growth. (See also Lewellen, Kothari and Warner, 2006; and Hecht and Vuolteenaho, 2006.)[6] The negative correlation between long-run earnings growth and returns implies that expected earnings are negatively correlated with expected returns. For example, in recessions, investors are more reluctant to hold risky securities and therefore demand a higher risk-premium. At the same time, profitability is expected to decline (relative to its steady-state level) due to the business conditions. Since prices are equal to discounted future cash flows, little volatility in the underlying factor (e.g., the business cycle) that affects both earnings and returns will generate significant volatility in prices. The high volatility is enhanced by the fact that the two components of price (cash flows and returns) consistently vary in different directions. However, due to the high correlation between earnings and returns, it is difficult to assess the independent role of earnings and returns in generating price volatility.

This paper also relates to two recent volatility studies in the accounting literature that examine firm-level stock return volatility using the Vuolteenaho (2002) methodology. Callen and Segal (2004) study the importance of expected accruals and cash flows in generating stock price volatility. Callen, Hope and Segal (2005) examine the relative importance of domestic and foreign income in generating return volatility of international firms. This paper complements these studies by examining, using aggregate data, the relative importance of actual cash distributed to shareholders (dividends) versus an accrual and cash flow measure of firm performance that is expected to generate future dividends (earnings).

[6] It is important to note, however, that returns are positively correlated (0.21) with the one-year-ahead earnings growth, which is consistent with the conservative nature of accounting income. (This result is not tabulated in the paper.)

The remainder of this paper is organized as follows. Section 2 provides a description of the data and their sources. Section 3 tests whether the dividend yield contains information about cash flows through expected accounting earnings growth. Section 4 employs the return decomposition suggested by Vuolteenaho (2002). Section 5 concludes.

2 Data

The sample contains all firm-year data in the CRSP monthly and COMPUSTAT annual databases for the period 1952-2001 for firms with fiscal-year ending in December. The December fiscal year end requirement avoids temporal misspecifications due to different reporting and different cumulation periods of annual earnings. The returns, dividends, and price data are extracted from the CRSP monthly data set. Earnings, cash, assets and capital expenditures are extracted from the COMPUSTAT industrial annual file. The earnings item used is the earnings before extraordinary items. The annual variables are measured from April of year t until March of year $t+1$. Table 1 reports summary statistics for the data used in this paper: The time-series averages, medians, and standard deviations of the variables. The annual returns are the annual value-weighted returns in excess of the risk-free rate. The risk-free rate is extracted from the Fama and French three factor model data in the WRDS database. The real data employs the GDP deflator from the International Financial Statistics database by the International Monetary Fund (period 1957-2001).

The time-series average of the dividend yield is about 4%, which is consistent with prior studies (see, e.g., Cochrane, 2001). Note also that the average one-year ahead dividend growth (1.068) is about the same as the one-year ahead earnings growth (1.087). This observation suggests that long-run expected earnings growth is similar to expected dividends growth. Moreover, their standard deviation is similar as well (0.165, 0.127 for dividend growth and earnings growth, respectively). The similar volatility of earnings and dividend growth suggests that if one generates price volatility and the other does not, it is because one is priced and the other is not.

Previous studies (e.g., Goyal and Welch, 2003; and Lettau and Ludvigson, 2005) find that the dividend yield lost its predictive power with respect to returns in the 1990s and also was lower than its prior mean. This finding suggests that one, or a combination of the following is true: first, it is possible that the dividend yield is no longer informative with respect to expected returns as suggested by prior research. Second, it is possible that the dividend yield will again increase to the level of its past mean due to higher dividends and/or lower returns. Finally, it is possible that the dividend yield has declined to a new, permanently lower equilibrium, stationary level. This interpretation is consistent with Fama and French (2001), which finds that fewer firms now pay cash dividends. Note, however, that the tests in this paper are not affected by the permanent shift. Since the tests use 10-year horizon returns and earnings, the dividend yields during the 1990s are therefore excluded.

In contrast to prior studies which use either industrial production, dividends or average earnings growth, this paper uses the growth in the sum of earnings as a measure of the value-weighted earnings growth, which is then used as a proxy for future cash flows. This measure of cash flows has several advantages over prior measures such as average earnings growth and industrial production. First, this measure is less affected by the idiosyncratic negative shocks (caused by accounting conservatism) than is average or median profitability or earnings growth. In fact, the earnings growth measure does not experience the same trends as average and median profitability (Sadka, 2006). Note that the summary statistics in Table 1 for earnings growth are consistent with a symmetric distribution. Second, unlike industrial production, which is used by Fama (1990) and Schwert (1990), earnings are reported by the firms, and over the life of the firm are equal to the cash flows investors accumulate from holding the asset. Third, the legal status of earnings makes it the most appropriate measure of future cash flows; in most states dividends cannot, legally, exceed the book value of retained earnings. Fourth, there is existing evidence of the predictability of aggregate earnings.[7] Finally, earnings growth is very similar in essence to dividend growth, which is commonly used in the variance-decomposition literature (e.g., Cochrane, 2001), and the sum of earnings is a good approximation for the profitability of the market portfolio.

The data consists of different sets of firms in each period. The sample includes all available firms (with fiscal-year ends in December) in each period.[8] Thus, the composition of firms does not remain constant over the sample period. Allowing the sample to change over time avoids data-selection

[7] See e.g., Lamont (1998), Ribeiro (2002), and Pástor and Veronesi (2003). In addition, Vuolteenaho (2000) finds that as much as 40% of the variation in the aggregate book-to-market ratio is due to expected profitability (Return on Equity - ROE).

[8] For robustness, the earnings growth variable was calculated only for firms that were in the sample in period t. The correlation between this earnings growth variable and the one used in the paper is 0.98. This is to be expected, because the earnings growth variable is affected mostly by the 100-500 largest earnings firms in the sample. The results are also qualitatively the same when using aggregate cumulative dividend-earnings (Penman, 2004). Cumulative dividend-earnings is defined as current earnings plus the return on prior period dividends, which I assume to be 10%.

and survivorship bias.

3 The Dividend Yield and the Predictability of Earnings, Dividends and Returns

Previous studies suggest that the dividend yield varies mainly due to variations in expected returns. As noted above, the stationarity of the dividend yield (see e.g., Campbell and Shiller, 1988a, 1988b; and Cochrane, 2001) implies that the dividend yield must predict either returns, cash flows, or both. The evidence suggests that the dividend-price ratio contains very little information regarding future dividend growth.

Table 2 reports the estimation of the regression models:

$$R_{t\longrightarrow t+i} = \delta_0 + \delta_1 \cdot D/P_t + \eta_{t+i} \tag{1}$$

and

$$D_{t+i}/D_t = \delta_0 + \delta_1 \cdot D/P_t + \eta_{t+i}, \tag{2}$$

where $R_{t\longrightarrow t+i}$ denotes the cumulative (compounded) annual return for the period $t \rightarrow t+i$. D_t, D/P_t denotes dividends and dividend-price ratio, respectively, for the period t. Table 2 provides results for $i = 1, ..., 10$. The table provides a short summary of previously recorded results in the literature (e.g., Fama and French, 1988, 1989). The dividend yield predicts returns (Table 2, Panels A and B) and its predictive power increases over the long term. The adjusted R^2 for the 10-year horizon returns increases to 55% for excess returns and 46% for real returns. This result is very similar to the results reported in Fama and French (1988). The coefficient on the dividend-price ratio increases with the horizon as well.

The relation between short and long-term predictability can be interpreted by the following two assumptions:

$$R_{t+1} = a \cdot D/P_t + \varepsilon_{1,t+1} \tag{3}$$

and

$$D/P_{t+1} = \rho \cdot D/P_t + \varepsilon_{2,t+1}. \quad (4)$$

Cochrane (2001) shows that these assumptions (where $\rho \approx 0.96$) imply both an increase in the coefficient and an increase in R^2 over longer horizons. The coefficients on the dividend yield are all positive, implying that low prices are associated with high expected returns.

While the dividend-price ratio predicts returns, it does not predict future long-run dividend growth. (See Table 2, Panels C and D). In the short run, the dividend yield seems to predict dividend growth: The coefficient on dividend yield is negative and statistically significant for the one period ahead horizon, yet, the adjusted R^2 is relatively low (2% for nominal dividend growth and 4% for real dividend growth). In longer horizons, however, the coefficients on the dividend yield are statistically insignificant for all horizons, and their signs change for different horizons. Moreover, apart from the two-year horizon using real dividend growth, the adjusted R^2 for all horizons is negative.

3.1 Predictability of Earnings

To summarize, the dividend yield predicts returns, but not dividend growth. This lack of dividend predictability has led the finance literature to conclude that expected returns are the main cause for aggregate price movements. Although the dividend-price ratio does not predict dividend growth, it may nontheless contain information about expected cash flows through other measures such as accounting earnings. In fact, as discussed above, investors should be more interested in measures of future cash flows, which represent their portfolios' ability to distribute dividends, than in actual dividends, which represent only financing decisions.

To test whether the dividend yield does in fact predict earnings growth, the following two regression models are estimated for one- to ten-year horizons:

$$E_{t+i}/E_t = \delta_0 + \delta_1 \cdot D/P_t + \eta_{t+1} \quad (5)$$

and

$$\frac{D_{t+i}/E_{t+i}}{D_t/E_t} = \delta_0 + \delta_1 \cdot D/P_t + \eta_{t+1}, \quad (6)$$

where E_t, D_t, D/P_t denote earnings, dividends and dividend-price ratio, respectively, for the period t. Table 3 reports the results of OLS estimation of the above two equations. Notice that $(E_{t+i}/E_t) \cdot [(E_t/D_t) / (E_{t+i}/D_{t+1})] = D_{t+i}/D_t$. Thus, the information about dividend growth can be expressed as information about expected earnings growth and expected dividend-earnings ratio.[9] This decomposition is not specific to accounting earnings. Dividend growth can be expressed as $D_{t+i}/D_t = (X_{t+i}/X_t) \cdot [(X_t/D_t) / (X_{t+i}/D_{t+1})]$ for any X. However, accounting profitability is not used arbitrarily. It contains information regarding the future dividend stream and is therefore the most appropriate measure of cash flows.

The results reported in Table 3, Panels A and B appear to confirm the hypothesis that the dividend yield contains information about cash flows in terms of earnings. The dividend yield predicts long-term earnings growth. This result is consistent with the conservative nature of accounting. Because under accounting rules, economic gains incorporated in prices are not recorded in a timely fashion, economic growth at period t would therefore result in earnings increases as much as ten years later. The patterns of predictability are similar to those of the returns predictability reported in Table 2. The coefficient on the dividend yield increases in absolute value with the horizon, as does the R^2. The results of earnings predictability hold for both real and nominal earnings growth.

Table 3 also reports the results for predicting changes in the dividend-earnings ratio (Panels C and D). The positive coefficient on the dividend yield suggests that higher prices predict a future long-run decline in the dividend-earnings ratio. While lower dividend yields predict higher earnings (as reported in Table 3), they do not seem to predict changes in dividends. Thus, a predicted change in earnings would result in a predicted change in the dividend-earnings ratio.[10] In contrast to the long horizon, in the one-year ahead horizon, the coefficient on the dividend yield is negative and statistically insignificant. This result is consistent with the results in Table 2 and 3 with regards to predictability of earnings and dividend growth. For the one-year ahead horizon, the coefficient on the dividend yield is larger for dividend growth than for earnings growth. Thus, in the short-run, higher prices are consistent with higher expected dividend-earnings ratios. However, this result is

[9] It is also possible to include profitability using the Clean-Surplus Relation (e.g. Ohlson, 1995; Feltham and Ohlson, 1995; and Vuolteenaho, 2000). However, as Lo and Lys (1999) points out, accounting rules violate the clean-surplus relation and this relation is not necessarily related to accounting. Lo and Lys (1990) states that either the book value or earnings can be chosen arbitrarily and still satisfy the Clean-Surplus Relation.

[10] Note that the change in dividend-earnings ratio is the same for real and nominal values of earnings and dividends growth. The difference between the real and nominal results stem from the different sample periods for the real and nominal data.

statistically insignificant and reverses for long horizons.

The results in Table 3 for the estimation of Equations (5) and (6) are consistent with expected dividend smoothing. While the dividend yield predicts future earnings growth (Panels A and B), it also predicts changes in the dividend-earnings ratio (Panels C and D). The change in dividend-earnings ratio is also predictable in the long-term and offsets the effects of expected earnings growth. The results suggest that an increase in expected profitability is associated with an expected decline in the dividend-earnings ratio. In other words, dividends do not vary as strongly as earnings, and an expected earnings increase does not imply an equivalent expectation for a dividend increase. Since $(E_{t+i}/E_t) \cdot [(E_t/D_t) / (E_{t+i}/D_{t+i})] = D_{t+i}/D_t$, this result is consistent with the inability of the dividend yield to predict future dividend growth. Hence, the market anticipates dividend smoothing.

The results are consistent with either expected dividend smoothing or because dividends are a financing decision, actual dividend irrelevance. In fact, however, the results are inconsistent with actual dividend smoothing. Table 1 shows that the mean and standard deviation of dividend growth is similar to that of earnings growth. Prices predict long-run earnings growth but do not seem to predict dividends growth. Thus, while earnings variation seems to affect the dividend yield, dividend variation does not, which suggests that earnings variation is priced, while dividend variation is not.

3.1.1 The Information Content of Dividend Growth

Previous work, such as Healy and Palepu (1988) and Nissim and Ziv (2001), shows that dividends can provide information about future profitability. To test the implications of the predictive power of dividend increases for future profitability, the following model is estimated including and excluding the dividend yield:

$$E_{t+i}/E_t = \delta_0 + \delta_1 \cdot D/P_t + \delta_2 \cdot D_t/D_{t-1} + \eta_{t+1}. \tag{7}$$

The results (not reported) are not consistent with dividend growth predicting future profitability growth. The coefficient on D_t/D_{t-1}, δ_2, is generally negative and for all but the one-year ahead horizon, is statistically insignificant. The negative coefficient suggests that higher dividends indicate lower future profitability, in contrast to the hypothesis that higher dividends signals high future profits. This result suggests that the information content of the dividend yield with respect to earnings is generated mostly from the denominator (i.e., prices).

3.2 Understanding the Lack of Dividend Predictability

The results in Figure 1 summarize and illustrate the relation between earnings growth, expected dividend-earnings ratio, and expectations for future dividend growth. The figure plots the expected earnings growth and expected dividend-earnings ratio from estimating:

$$\ln\left(E_{t+i}/E_t\right) = \delta_0 + \delta_1 \cdot \ln\left(D/P_t\right) + \eta_{t+1} \tag{8}$$

and

$$\ln\left(\left(D_{t+i}/E_{t+i}\right)/\left(D_t/E_t\right)\right) = \delta_0 + \delta_1 \cdot \ln\left(D/P_t\right) + \eta_{t+1}. \tag{9}$$

The implied expected log dividend growth is the sum of the predicted values from the above regression model. Since $E\left(xy\right) \neq E\left(x\right)E\left(y\right)$, Figure 1 uses logs to make use of the property of expectations $E\left(x+y\right) = E\left(x\right) + E\left(y\right)$, to calculate the implied log dividend growth rate.[11]

Notice that while there is an increase in expected earnings growth, the expected dividend-earnings ratio declines. The resulting implied dividend growth is very weak. There are two possible interpretations for this result: first, the dividend yield might predict dividend growth in the very long-horizon. Second, it is possible that the dividend "smoothness" is endogenous, implying that dividend growth is unpredictable. Since some recent studies find evidence of dividend predictability, the first interpretation, i.e., that dividend yield predicts dividends only in the very long horizon, is more likely. The results show that firms are expected to keep reserves when earnings are high and use them when earnings are low, resulting in smooth dividends.

To understand the lack of dividend predictability, consider the following equations:

$$\Delta_{10} e_{t+10} = a \cdot dp_t + \epsilon_{t+10} \tag{10}$$

$$\Delta_{10}(d-e)_{t+10} = b \cdot dp_t + \varsigma_{t+10} \tag{11}$$

[11] The figure uses only the slope coefficients, or demeaned variables.

$$dp_{t+1} = \rho \cdot dp_t + \psi_{t+1}, \tag{12}$$

where $\Delta_i x_{t+i} = x_{t+i} - x_t$, for all x and for all i, $e_t = \ln(E_t)$, $(d-e)_t = \ln(D_t/E_t)$, and $dp_t = \ln(D/P_t)$.

Since Figure 1 shows that the implied dividend growth appears only over the long term, the analysis begins with the long-term predictability of earnings growth (ten years). Equation (12) states that

$$dp_{t+10} = \rho^{10} \cdot dp_t + \xi_{1,t+10} \tag{13}$$

and for the log dividend growth, $\Delta_{10} d_{t+10}$, Equations (10) and (11) imply that

$$\Delta_{10} d_{t+10} = (a+b) \cdot dp_t + \xi_{2,t+10}. \tag{14}$$

Using Equations (13) and (14), the implied long-term dividend growth is given by

$$\Delta_{10 \cdot i} d_{t+10 \cdot i} = \left[(a+b) + \rho^{10} (a+b) + ... + \rho^{10 \cdot (i-1)} (a+b) \right] \cdot dp_t + \xi_{3,t+10 \cdot i} \tag{15}$$

for all i. The results for Equations (10) and (11) (which are not reported) are $a = -0.84$, $b = 0.76$, and $\rho = 0.96$. Therefore, $a + b = -0.08$. Note that the implied dividend growth is very low. The following table reports the implied dividend growth, given these results:

i	*Implied Dividend Growth Coefficient*
1	-0.08
2	-0.13
3	-0.17
4	-0.19

The table above describes the lack of dividend predictability. Since earnings growth is only predictable in the long-term at the five years ahead horizon and longer, dividends are unpredictable in longer horizons. In fact, the table shows that the implied 40-year-ahead horizon dividend growth coefficient is only -0.19. The table implies that to find dividend predictability using the dividend yield, one must use very long-horizon tests. Such a test is not feasible with the available data, and long horizon tests might in any case be unreliable due to the number of shocks that occur over such long horizons. In sum, earnings are more timely and provide a better measure for cash flows than do dividends.

3.2.1 An Impulse Response Function

Another method of illustrating the point presented in Figure 1 is by using an impulse-response function. In particular, the following set of equations can illustrate the effects of a shock to the dividend yield while it converges back to its equilibrium level:

$$D/P_{t+1} = \rho \cdot D/P_t + \varepsilon_{1,t+1} \tag{16}$$

$$R_{t+1} = a \cdot D/P_t + \varepsilon_{2,t+1} \tag{17}$$

$$E_{t+i}/E_t = b \cdot D/P_t + \varepsilon_{3,t+1} \tag{18}$$

and

$$\frac{E_t/D_t}{E_{t+i}/D_{t+i}} = c \cdot D/P_t + \varepsilon_{4,t+1}. \tag{19}$$

Unfortunately, Table 3 shows that the predictability in the dividends/earnings ratio begins only at the two-year horizon. The coefficient on the one-year-ahead horizon is negative. It is therefore necessary to extract a more appropriate estimate for c. Since $(E_t/D_t)\,/\,(E_{t+2}/D_{t+2}) = (c + \rho \cdot c) \cdot D/P_t + \varepsilon_{4,t+2}$, the figure uses the two-year-horizon regression to extract c.

The impulse-response function is plotted in Figure 2. The pattern in this figure is consistent with Figure 1. A positive shock to the dividend yield results in higher future returns, lower earnings, and a higher dividends/earnings ratio. Notice that the effect on earnings growth is higher than the expected effect on the dividends/earnings ratio, implying long-term dividend decline.

3.2.2 Cash, Capital Expenses and the Dividend-Earnings Ratio

The theory of dividend irrelevance argues that the choice to pay dividends is solely a financing decision. This paper therefore tests whether changes to the dividend-earnings ratio are related to the amount of cash held by firms, as well as to their investment decisions. If financing decisions determine dividends, one would expect dividends to be high when the firm has excess cash which is not needed for investments. In sum: dividend yield is low when growth opportunities and expected earnings are high, and therefore expected investment is high, and dividend-earnings ratios are low.

In order to further examine the relation between dividends, cash, and investments, this paper tests whether the dividend-earnings ratio is correlated with the contemporaneous cash-to-assets ratio and the capital-expenses-to-lagged-earnings ratio (CAP).[12] The results are reported in Table 4 and show that the dividend-earnings ratio is negatively correlated with earnings growth (-0.44) and CAP (-0.36). Thus, when earnings and growth options are high, the firm expects to increase its investments and will therefore pay out fewer dividends. Moreover, CAP is positively correlated with the aggregate cash-assets ratio, suggesting that firms keep cash when future investment is expected. In addition to the relation between dividends and future investments, the dividend-earnings ratio is associated with high cash-to-asset ratios (0.05), which suggest that firms tend to pay more dividends when they hold excess cash.

3.3 A Variance Decomposition Approach

The variance decomposition approach follows the work of Campbell and Shiller (1988a),[13] and decomposes the variance of the dividend-price ratio to two major components: expected returns and expected dividend growth. This approach contributes to the previous tests by estimating the economic significance of the extent to which the dividend yield variation is explained by earnings variation. For brevity, this paper provides only the key steps. Note,

$$R_{t+1} = \left(P_{t+1} + D_{t+1}\right)/P_t. \tag{20}$$

Equation (20) can be rewritten so that the price-dividend ratio can be written as

$$\frac{P_t}{D_t} = R_{t+1}^{-1}\left(1 + \frac{P_{t+1}}{D_{t+1}}\right)\frac{D_{t+1}}{D_t}. \tag{21}$$

Taking natural logs yields

[12] An AR(2) model is used to de-trend the cash-to-assets ratio and CAP.

[13] For a similar approach, see Cochrane (1991).

$$p_t - d_t = -r_{t+1} + \Delta d_{t+1} + \ln\left(1 + e^{p_{t+1} - d_{t+1}}\right) \tag{22}$$

The lowercase letter denotes the natural log and $\Delta d_{t+1} = d_{t+1} - d_t$. Taking a Taylor expansion of the last term yields

$$p_t - d_t = -r_{t+1} + \Delta d_{t+1} + const. + \rho\left(p_{t+1} - d_{t+1}\right) \tag{23}$$

where $\rho = 1/\left(1 + D/P\right) \approx 0.96$. Notice in Table 1 Panel B that the average dividend-price ratio is approximately 4%. Iterating forward and assuming that $\lim_{j\to\infty} \rho^j\left(p_{t+j} - d_{t+j}\right) = 0$ results in the following expression

$$d_t - p_t = const. + E\sum_{j=1}^{\infty} \rho^{j-1}\left(r_{t+j} - \Delta d_{t+j}\right) \tag{24}$$

Equation (24) implies that the variance of the dividend yield can be decomposed into two parts: predictability of returns, and dividend predictability.

$$var\left(d_t - p_t\right) = cov\left(d_t - p_t, \sum_{j=1}^{\infty} \rho^{j-1} r_{t+j}\right) - cov\left(d_t - p_t, \sum_{j=1}^{\infty} \rho^{j-1} \Delta d_{t+j}\right) \tag{25}$$

Table 5 reports the results for the estimation of Equation (25). Most of the variation in the dividend-price ratio is due to variation in expected returns: about 122% and 148% for nominal and real returns respectively.[14] On the other hand, due to dividend irrelevance, dividend growth variation does not generate variation in the dividend-price ratio. These results are consistent with previous findings (e.g., Campbell and Shiller, 1988a; and Cochrane, 2001) and the results in Table 2. When cash flow information is restricted to dividend growth, this result suggests that the dividend yield does not contain much information about cash flows.

Equation (24) can be modified slightly to include other sources of information about cash flows. Notice as before that $\Delta d_{t+j} = \Delta x_{t+j} - \Delta\left(x_{t+j} - d_{t+j}\right)$ for any x. This paper focuses on one source of cash flow information: accounting earnings (denoted by E and $e = \ln\left(E\right)$).[15] Equation (24) can

[14] Expected-returns variation explains 132% of the variation when using returns in excess of the risk-free rate.

[15] For robustness, the tests were replicated using value-weighted (market-value) return on assets (ROA). Due to the increase in conservatism over time, the aggregate ROA was de-trended using an AR(1) model. The results are qualitatively the same. In addition, the tests were replicated using growth in free cash-flows. Consistent with the results of prior studies comparing free cash-flows to earnings (e.g., Penman and Sougiannis, 1998) the results are weaker when using free cash-flows than they are when using earnings.

be written as

$$d_t - p_t = const. + E_t \sum_{j=1}^{\infty} \rho^{j-1} \left[r_{t+j} - \left(\Delta e_{t+j} - \Delta \left(e_{t+j} - d_{t+j} \right) \right) \right] \tag{26}$$

The corresponding variance decomposition is based on three factors: returns predictability, earnings predictability, and dividend-earnings ratio predictability. The sum of the last two parts is the dividend growth. The variance decomposition is then decomposed further into the same three factors and with additional splits for two different horizons, one through five, and six through ten periods ahead.

The GMM estimator is the covariance:

$$\begin{aligned} var\left(d_t - p_t\right) &= cov\left(d_t - p_t, \sum_{j=1}^{5} \rho^{j-1} r_{t+j}\right) + cov\left(d_t - p_t, \sum_{j=6}^{10} \rho^{j-1} r_{t+j}\right) \\ &\quad - cov\left(d_t - p_t, \sum_{j=1}^{5} \rho^{j-1} \Delta e_{t+j}\right) - cov\left(d_t - p_t, \sum_{j=6}^{10} \rho^{j-1} \Delta e_{t+j}\right) \\ &\quad + cov\left(d_t - p_t, \sum_{j=1}^{5} \rho^{j-1} \Delta \left(e_{t+j} - d_{t+j}\right)\right) + cov\left(d_t - p_t, \sum_{j=6}^{10} \rho^{j-1} \Delta \left(e_{t+j} - d_{t+j}\right)\right) \\ &\quad + \rho^{10} cov\left(d_t - p_t, d_{t+11} - p_{t+11}\right) \end{aligned} \tag{27}$$

Table 4 reports the results from estimating Equation (27). The results are consistent with the results reported in Table 3. The dividend yield reflects expectations for earnings and for the dividend-earnings ratio. As much as 70% of the dividend-yield variation is due to earnings growth variation. Real earnings growth generates 85% of the variation in the dividend yield. Note that in the infinite-horizon equation, Equation (24), we can replace dividends with earnings because the two are the same, and the infinite horizon dividend earnings ratio is therefore equal to 1. Therefore, in long-horizon tests it does not matter whether we use dividends or earnings. However, the results in Table 5 indicate that in short-horizon tests profitability is a more timely measure of cash flows than are dividends and consequently, changes in expected profitability are priced, while short-term changes in dividends are not.

Table 5 also reports a variance decomposition as described in Equation (27). The results are different for real and nominal values. For nominal returns and earnings, short-run (1-5 year horizon) returns generate most of the variation caused by expected returns. For earnings growth, most of the variation stems from the long-run (6-10 year horizon). For the real returns and earnings, the short-run and long-run returns seem to generate similar price volatility. However, unlike the case with nominal earnings, the short-run real earnings growth (rather than the long-run earnings growth as in the case of nominal earnings) generates most of the variation in prices.

3.4 The Determinants of the Dividend Yield

The analysis below provides additional inferences on whether dividends or earnings determine the equilibrium dividend yield. To simplify the analysis, denote $R_t^* \equiv \sum_{j=1}^{10} \rho^{j-1} r_{t+j}$, $E_t^* \equiv \sum_{j=1}^{10} \rho^{j-1} \Delta e_{t+j}$, $ED_t^* \equiv \sum_{j=1}^{10} \rho^{j-1} \Delta(e-d)_{t+j}$, and $D_t^* \equiv \sum_{j=1}^{10} \rho^{j-1} \Delta d_{t+j}$. Table 6 reports the correlations between these variables. The dividend yield is highly correlated with both expected profitability growth (-0.7) and expected returns (0.85), and long-run earnings are highly negatively correlated (Lewellen, Kothari and Warner, 2006) with long-run returns (-0.70). Yet, expected dividend growth does not seem to be correlated with the dividend yield.

The apparent strong correlation between earnings growth and returns is not surprising: investors' preferences with respect to holding risk vary with business conditions, as does expected profitability. (For example, expected returns are high and expected profitability is low in recessions.) Note that this result does not contradict the previous findings that unexpected earnings are positively associated with positive unexpected returns (e.g., Ball and Brown, 1968). This paper studies the correlation between aggregate expected returns and expected earnings whereas Ball and Brown (1968) study the correlation between unexpected earnings and unexpected returns in the cross-section.

Table 6 provides evidence of the negative relation between expected earnings and expected returns and provides insight into price volatility. Long-run earnings growth is highly negatively correlated with long-run returns at -70%. The high correlation suggests that the same factor affects both expected returns and expected profitability. As discussed above, dividend yield and expected returns vary with business conditions (e.g., Fama and French, 1989). Expected profitability is also expected to vary with business conditions. In recessions, investors expect profitability to decline below its steady-state level. From a pricing perspective, stock prices increase when expected profitability increases and/or when expected returns decline. Thus, if a single-state variable such as the business cycle affects asymmetrically both expected profitability and expected returns, volatility in this state variable would generate an even stronger volatility in prices.

An additional method of testing different determinants of the dividend yield is a simple regression analysis. In particular, Table 7 uses the following regression model:

$$d_t - p_t = \delta_0 + \delta_1 R_t^* + \delta_2 E_t^* + \delta_3 D_t^* + \delta_4 \rho^{10}(d-p)_{t+11} + \zeta_t \tag{28}$$

The results in Table 7 are consistent with the hypothesis that the dividend yield is determined by expected earnings growth but not dividend growth. The coefficient with respect to expected profitability growth is negative and statistically significant for all model specifications. The coefficient with respect to dividend growth is not statistically significant in any of the specifications. Moreover, the adjusted R^2 for the regression including earnings alone is 0.48 (or 0.51 using real earnings) compared to -0.02 (or -0.03 using real dividends) for dividends. In sum, the results in Table 7 are consistent with the hypothesis that expected earnings growth and expected returns determine the equilibrium aggregate dividend-price ratio. Furthermore, the overall adjusted R^2 is very high. Using nominal values, the variation in expected earnings and returns explains as much as 76% of the variation in the dividend-price ratio. Using real values, the variation explains as much as 80% of the variation in the dividend-price ratio.

The results in Tables 2, 3, and 6 point to the high correlation between expected returns and expected earnings. Since the dividend yield, predicts both earnings and returns (Tables 2 and 3), the two cannot be independent and, in fact, they are highly correlated (Table 6). Expected returns include a large cash-flow component as reflected by earnings. (Notice, that R_t^* is highly correlated with E_t^*.) These results suggest that variations in expected returns are due in part to variations in expected earnings growth.

Given the results in Tables 2, 3, and 6, the determinants of the dividend yield were decomposed into two orthogonal factors of expected returns and expected cash flows for both earnings and dividends. Since expected returns include both a cash-flow component and an expected-returns component, the expected returns determinant was decomposed into returns orthogonal to cash flows as follows:

$$R_t^* = \varphi_0 + \varphi_1 D_t^* + \upsilon_t^D \tag{29}$$

was estimated for dividends and

$$R_t^* = \varphi_0 + \varphi_1 E_t^* + \upsilon_t^E \tag{30}$$

for earnings.

Consider the following linear model of the dividend yield

$$d_t - p_t = b_0^X + b_1^X X_t^* + b_2^X \upsilon_t^X + \zeta_t^X \tag{31}$$

for $X = E$ and D. Since X_t^* and υ_t^X are uncorrelated, the variance of the dividend yield can then be decomposed into

$$Var\left(d_t - p_t\right) = \left(b_1^X\right)^2 Var\left(X_t^*\right) + \left(b_2^X\right)^2 Var\left(\upsilon_t^X\right) + Var\left(\zeta_t^X\right) \tag{32}$$

Table 8 reports estimation results for Equations (31) and (32). The results support the hypothesis that the equilibrium dividend yield is determined in part by cash-flow information as reflected by earnings. However, the dividend yield does not seem to be affected by expectations of future dividend growth. Moreover, the results indicate that expected returns themselves contain information about future cash flows. That is, the expectations of returns contain information about expectations of cash flows as reflected by earnings. For instance, Table 6 shows a very high correlation between long term returns and long term earnings (Easton, Harris and Ohlson, 1992). Table 8 also shows that expected earnings growth explains as much as 50% of the variation in the dividend yield, compared to only 1% which dividends explain.

The analysis in Table 8 does not provide evidence that expected profitability explains more of the price volatility than returns do. The analysis provides evidence of the difficulties in assessing the importance of earnings versus returns in generating volatility. In contrast to previous studies (e.g., Campbell and Shiller, 1988a, 1988b), the results in Table 8 suggest that earnings might generate more volatility in prices than returns do. Due to the high correlation between these variables (-70%), however, it is difficult to assess the independent role of each component.

Hecht and Vuolteenaho (2006) finds that most of the variation in the dividend-growth variables used in Kothari and Shanken (1992) is due to variations in expected returns and contains little information about cash flows. However, the authors point out that the results are highly sensitive to their assumptions: "*The linear time series structure of the VAR may not provide a good approximation to the true return data generating process. Even if the linear assumption were reasonable, the variance decomposition results are conditional on the information set included in the state vector.*" Due to the difficulties in assessing the independent role of earnings and returns in generating volatility, I do not pursue this issue further. It is clear, however, that expected earnings and expected returns are highly correlated, which makes it difficult to identify the independent role of each component in generating stock price volatility.

Apart from the use of the assumed VAR model, Hecht and Vuolteenaho (2006) differs from this paper by using the Campbell (1991) methodology rather than the Campbell and Shiller (1988a, 1988b) variance decomposition. Campbell (1991) decomposes returns into:

$$r_t = E_{t-1} r_t + (E_t - E_{t-1}) \sum_{j=0}^{\infty} \rho^j \Delta d_{t+j} + (E_t - E_{t-1}) \sum_{j=1}^{\infty} \rho^{j-1} r_{t+j} \tag{33}$$

Thus, while dividend growth is a measure of $E_t \sum_{j=1}^{\infty} \rho^j \Delta d_{t+j}$, which is used in the Campbell and Shiller (1988a, 1988b) variance decomposition, it may not proxy for $(E_t - E_{t-1}) \sum_{j=0}^{\infty} \rho^j \Delta d_{t+j}$. This subtle yet important point led Hecht and Vuolteenaho (2006) to test whether the cash flow measures were measures of $(E_t - E_{t-1}) \sum_{j=0}^{\infty} \rho^j \Delta d_{t+j}$ or $(E_t - E_{t-1}) \sum_{j=1}^{\infty} \rho^{j-1} r_{t+j}$. Due to data limitations, Hecht and Vuolteenaho (2006) uses only dividend growth as the measure of cash flow and does not test earnings or industrial production. Yet, given their assumptions, Hecht and Vuolteenaho (2006) suggest that the Kothari and Shanken (1992) cash-flow proxies contain relatively more information about changes in expected returns than about changes in expected cash flows.

4 Stock Return Variance Decomposition

Since the level (dividend yield) and flow (returns) methodologies can yield different results, I have chosen to use the Vuolteenaho (2002) return-variance decomposition as well. The Campbell (1991) return decomposition described in Equation (33) uses the changes in expected dividend growth as the source of information about cash flows. Vuolteenaho (2002) modifies the decomposition by using the clean-surplus relation of accounting to generate the following variance decomposition:

$$r_t = E_{t-1}r_t + (E_t - E_{t-1})\sum_{j=0}^{\infty}\rho^j roe_{t+j} + (E_t - E_{t-1})\sum_{j=1}^{\infty}\rho^{j-1}r_{t+j} \tag{34}$$

where *roe* denotes return on equity (lower cases denote logs). I use both stock returns and return on equity in *excess* of the risk-free rate. The advantage of using the Vuolteenaho (2002) return decomposition, rather than the Campbell (1991) return decomposition, is the use of profitability, which should be reflected in stock prices, rather than dividends. The corresponding variance decomposition is

$$VAR(r_t - E_{t-1}r_t) = VAR(N_{cf,t}) + VAR(N_{r,t}) - 2 * COV(N_{cf,t}, N_{r,t}) \tag{35}$$

where

$$N_{cf,t} = (E_t - E_{t-1})\textstyle\sum_{j=0}^{\infty}\rho^j roe_{t+j} \quad N_{r,t} = (E_t - E_{t-1})\sum_{j=1}^{\infty}\rho^{j-1}r_{t+j} \tag{36}$$

Equation (35) decomposes returns variance into variations in changes in expected profitability and changes in expected returns.

Following Vuolteenaho (2002), I define the book value of equity as COMPUSTAT data item 60. If data item 60 is unavailable, I use data item 235. I also add short-term and long-term deferred taxes (data items 35 and 71). To use consistent data sources for both book values and market values, the market value of equity is calculated using COMPUSTAT data and is defined as data item 24 (fiscal-year close price) multiplied by data item 25 (shares outstanding). Returns are estimated for the fiscal year (January - December). The aggregate book-to-market ratio (*bm*) is defined as the cross-sectional sum of book values divided by the sum of market values. The aggregate return on equity is defined as the value-weighted (weighted by market values) return on equity. The sample period is 1951-1990.

As discussed above, this methodology requires an expectation model to identify changes in expectation. Therefore, I use a VAR model following Vuolteenaho (2002):

$$z_t = \Gamma z_{t-1} + u_t \tag{37}$$

where $z_t = \begin{bmatrix} r_t & bm_t & roe_t \end{bmatrix}$. I use demeaned variables in the VAR model. The VAR coefficient matrix, Γ, is assumed to be constant over time and the error term is assumed to have a covariance matrix, Σ, which is independent of the information at period $t-1$. Also, define a vector $e1 = \begin{bmatrix} 1 & 0 & 0 \end{bmatrix}$. This vector identifies stock returns from the vector z_t. Define

$$\lambda' \equiv e1'\rho\Gamma\left(I-\rho\Gamma\right)^{-1} \tag{38}$$

and the variance decomposition can be estimated as follows:

$$\begin{aligned} VAR\left(N_{r,t}\right) &= \lambda'\Sigma\lambda \\ VAR\left(N_{cf,t}\right) &= \left(e1'+\lambda'\right)\Sigma\left(e1+\lambda\right) \\ COV\left(N_{cf,t},N_{r,t}\right) &= \lambda'\Sigma\left(e1+\lambda\right) \end{aligned} \tag{39}$$

This variance decomposition models expected returns and expected-returns news and cash-flow news is defined as the residual.[16] The results for the VAR model and the variance decomposition are reported in Table 9.

The results for the VAR model (Panel A) are consistent with the results found using the dividend yield insofar as high book-to-market suggests both high expected returns and lower profitability. The results regarding the variance decomposition for returns (Panel B) are consistent with the results in Table 5. Changes in expected profitability and changes in expected returns generate about the same returns volatility. These results are significantly different than those reported by Campbell (1991), who uses dividends as cash-flow information and finds that most of the volatility in returns is generated from changes in expected returns. Consistent with Table 6, the results indicate that changes in expected returns are highly negatively correlated with changes in expected profitability. Note that the covariance between profitability and returns represents a significant component of the volatility in aggregate stock returns.

It is important to reiterate that the results are highly sensitive to both the VAR model and the variable definition. Both profitability and the book-to-market ratio are affected by accounting rules and conservatism. Book values and earnings are particularly affected by conservatism. Therefore, in unreported results, I use several different definitions for value weighted book-to-market and

[16] In untabulated results, I follow Vuolteenaho (2002) and model cash-flow news directly. The cash-flow news is 18% and the bulk of the volatility, consistently with Table 9, is explained by the covariance between returns and cash-flow news.

profitability. The results change significantly from one definition to another. However, under most definitions, profitability remains a significant determinant of stock-return volatility.

5 Conclusion

This paper investigates the implications of using accounting profitability instead of dividend growth as the cash-flow related information content of the dividend-price ratio. Prior studies suggest that the dividend yield does not contain information about cash flows, i.e., that the dividend yield does not predict dividend growth. However, the results presented in this paper are consistent with the predictability of accounting profitability. These results suggest that the cash-flow information embedded in the dividend-price ratio shows up in terms of profitability growth rather than dividend growth. Although it is unlikely that dividend policy is irrelevant (as suggested by Miller and Modigliani, 1961), it seems that on the aggregate level, investors are more interested in measures of future cash flow than they are in dividends. Further analysis (not reported) shows that investors are more interested in earnings than they are in free cash-flows. Investments are likely to reduce both dividends and free cash-flows, however, they should nonetheless not affect earnings. Therefore, investors' emphasis on earnings rather than free cash-flows suggests that investors are more interested in measures of performance that are not affected by the investments required to support growth.

As an approximation, over the life of a firm, earnings and dividends can be considered to be equal. It is unclear, however, how long it takes for a profitability shock to translate into dividends. Long-term dividend growth is affected by many different profitability shocks and can be difficult to predict. For example, a $100 profitability shock in any year might translate into a $4 dividend shock for 25 years: These $4 dividend shocks would be difficult to identify in the data, particularly given other past and future profitability shocks. In fact, this paper shows that the implied 40-year-ahead horizon dividend growth, as reflected in the dividend yield, is relatively weak. Thus, especially for short horizons such as ten to 15 years ahead, which is the horizon commonly used in the literature, earnings rather than dividends are more appropriate measures of cash flows and are likely to provide more insight into the information embedded in prices.

This paper also shows that expected returns are negatively correlated with expected earnings growth. Since the dividend yield predicts both profitability and returns, the two cannot be independent. This evidence suggests that variation in the dividend yield due to expectations of returns also reflects variation in expected profitability. The strong negative correlation also suggests that a little variation in the underlying factors that affect both returns and earnings will cause significant variation in stock prices.

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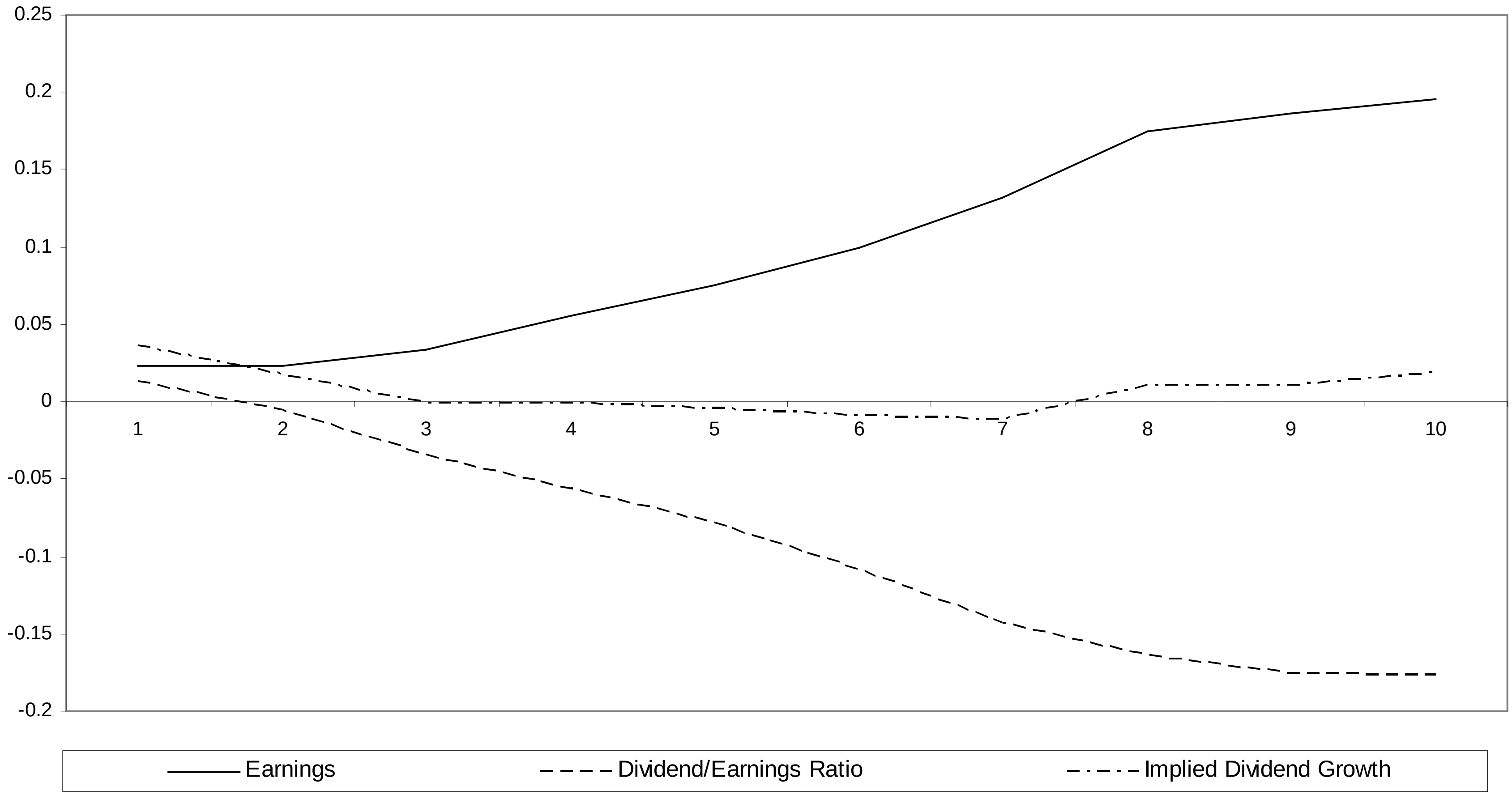

Figure 1: Expected Earnings, Earnings-Dividend ratio, and Implied Dividend Growth. This figure plots the expected earnings growth, the expected change in the dividend-earnings ratio, and the implied expected dividend growth. The market's expectation is estimated for a one standard-deviation decline in the log dividend-price ratio. The plot is based on predicted values based on the regressions, $ln\Delta E_{t+i} = \alpha + \beta ln(D/P_t) + \varepsilon_{t+i}$ and $(ln\Delta D_{t+i} - ln\Delta E_{t+i}) = \alpha + \beta ln(D/P_t) + \varepsilon_{t+i}$. Expected dividend growth is the sum of the expected earnings growth and expected dividend payout. i denotes the horizon.

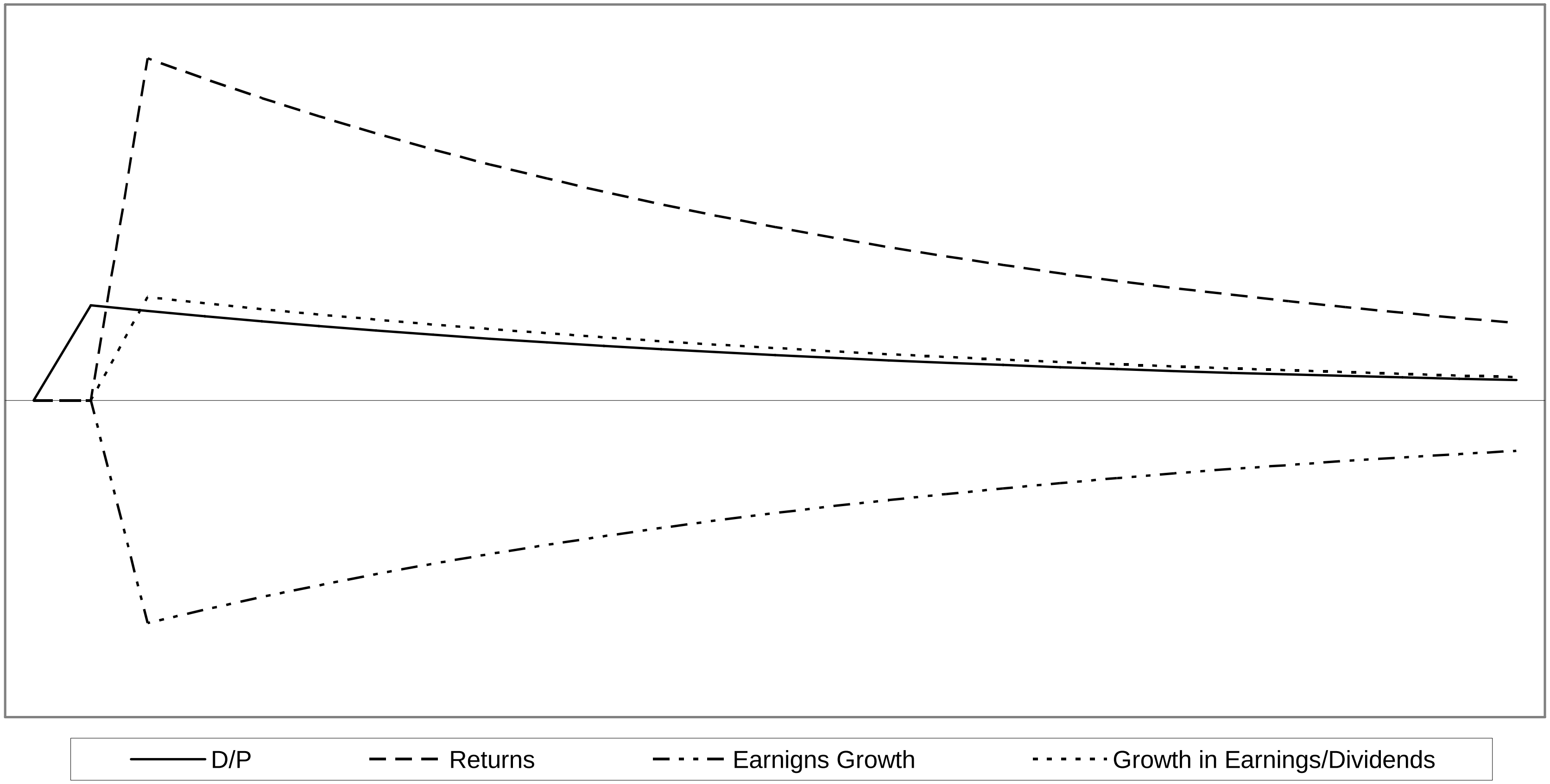

Figure 2: Impulse Response Function. The figure plots the impulse response function of the following set of equations: $D/P_{t+1}=\rho\cdot D/P_t+\varepsilon_{1,t}$, $E_{t+1}/E_t=\rho\cdot D/P_t+\varepsilon_{2,t}$, $R_{t\rightarrow t+1}=\rho\cdot D/P_t+\varepsilon_{3,t}$, $(E/D)_{t+1}/(E/D)_t=\rho\cdot D/P_t+\varepsilon_{4,t}$. The figure plots the response to a one standard-deviation increase in the dividend yield.

Table 1

Summary Statistics

The table reports the mean, median, and standard deviation for selected variables. $R_{t\rightarrow t+i}$ is the cumulative annual excess return from April year $t+1$ through March year $t+1+i$. D_{t+i}/D_t is the change in dividends during the period beginning in April year $t+1$ through March year $t+1+i$. D/P_t is the dividend-price ratio at time t. The table reports summary statistics for a value-weighted index. $E_{i,t}$ is the sum of the fiscal year earnings of all firms in the sample, which includes all firms in the CRSP and COMPUSTAT annual databases for the period 1952 – 2001 with fiscal year ending in December.

Value-Weighted Market Index						
	D/P_t					
Mean	0.042					
Median	0.040					
Standard Deviation	0.010					
	$R_{t\rightarrow t+1}$	$R_{t\rightarrow t+2}$	$R_{t\rightarrow t+3}$	$R_{t\rightarrow t+4}$	$R_{t\rightarrow t+5}$	$R_{t\rightarrow t+10}$
Mean	0.071	0.142	0.155	0.296	0.379	0.897
Median	0.066	0.127	0.120	0.246	0.326	0.865
Standard Deviation	0.153	0.215	0.236	0.348	0.425	0.838
	D_{t+1}/D_t	D_{t+2}/D_t	D_{t+3}/D_t	D_{t+4}/D_t	D_{t+5}/D_t	D_{t+10}/D_t
Mean	1.068	1.129	1.189	1.254	1.326	1.730
Median	1.064	1.112	1.149	1.258	1.326	1.676
Standard Deviation	0.165	0.191	0.187	0.200	0.219	0.348
	E_{t+1}/E_t	E_{t+2}/E_t	E_{t+3}/E_t	E_{t+4}/E_t	E_{t+5}/E_t	E_{t+10}/E_t
Mean	1.087	1.186	1.297	1.424	1.563	2.516
Median	1.117	1.196	1.286	1.436	1.614	2.510
Standard Deviation	0.127	0.196	0.240	0.281	0.314	0.646
	$(D_{t+1}/E_{t+1})/(D_t/E_t)$	$(D_{t+2}/E_{t+2})/(D_t/E_t)$	$(D_{t+3}/E_{t+3})/(D_t/E_t)$	$(D_{t+4}/E_{t+4})/(D_t/E_t)$	$(D_{t+5}/E_{t+5})/(D_t/E_t)$	$(D_{t+10}/E_{t+10})/(D_t/E_t)$
Mean	0.988	0.973	0.943	0.905	0.874	0.736
Median	0.965	0.964	0.894	0.886	0.852	0.689
Standard Deviation	0.151	0.210	0.208	0.179	0.184	0.252

Table 2

Predicting Returns and Dividends with the Dividend-Price Ratio

The table reports results for the following regression models: $D_{t+i}/D_t = \delta_0 + \delta_1 \cdot D/P_t + \varepsilon_{t+i}$ and $R_{t\rightarrow t+i} = \delta_0 + \delta_1 \cdot D/P_t + \varepsilon_{t+i}$. D_{t+i}/D_t is the cumulative annual change in dividends during the period April year $t+1$ through March year $t+1+i$. D/P_t is the value-weighted dividend-price ratio at time t. $R_{t\rightarrow t+i}$ denotes the cumulative annual excess returns measured from April year $t+1$ through March at year $t+1+i$. The sample includes all firms in the CRSP and COMPUSTAT annual databases during the period 1952 – 2001 with fiscal year ending in December. The regressions utilize 41 observations. The dividend yield is estimated through 1991 and the subsequent returns and dividends are measured with data ending in 2001. The table reports the coefficients and their corresponding (Newey-West with 9 lags) *t*-statistic (below) and the adjusted R^2. The risk-free interest rate is extracted from the Fama and French database in WRDS. The real values are estimated using the GDP deflator for the period beginning 1957 (35 observations).

	Returns Excess of the Risk-free Rate			Real Returns		
	Intercept	D/P_t	R^2	Intercept	D/P_t	R^2
$R_{t\rightarrow t+1}$	-0.179	5.923	0.137	-0.168	5.876	0.093
	(-2.57)	(4.33)	-	(-1.88)	(3.18)	-
$R_{t\rightarrow t+2}$	-0.271	9.749	0.198	-0.211	8.748	0.141
	(-2.07)	(3.27)	-	(-1.26)	(2.48)	-
$R_{t\rightarrow t+3}$	-0.130	6.731	0.063	-0.320	13.227	0.194
	(-0.65)	(1.26)	-	(-1.53)	(3.07)	-
$R_{t\rightarrow t+4}$	-0.668	22.766	0.439	-0.536	20.589	0.301
	(-2.84)	(3.95)	-	(-1.89)	(3.49)	-
$R_{t\rightarrow t+5}$	-0.894	30.076	0.519	-0.699	26.874	0.343
	(-2.84)	(3.82)	-	(-2.04)	(3.95)	-
$R_{t\rightarrow t+10}$	-1.691	61.140	0.552	-1.819	70.846	0.463
	(-2.84)	(4.13)	-	(-2.50)	(4.53)	-
	Nominal Dividend Growth			Real Dividend Growth		
D_{t+1}/D_t	1.212	-3.410	0.020	1.223	-5.010	0.043
	(28.13)	(-3.98)	-	(23.58)	(-3.32)	-
D_{t+2}/D_t	1.207	-1.836	-0.016	1.176	-3.585	0.002
	(25.30)	(-1.71)	-	(14.00)	(-1.66)	-
D_{t+3}/D_t	1.179	0.220	-0.026	1.128	-2.024	-0.019
	(18.62)	(0.15)	-	(8.09)	(-0.67)	-
D_{t+4}/D_t	1.248	0.138	-0.026	1.117	-1.405	-0.026
	(13.49)	(0.06)	-	(6.56)	(-0.39)	-
D_{t+5}/D_t	1.294	0.747	-0.024	1.122	-1.241	-0.027
	(12.39)	(0.34)	-	(5.58)	(-0.28)	-
D_{t+10}/D_t	1.871	-3.331	-0.016	1.061	1.483	-0.027
	(9.82)	(-0.98)	-	(5.06)	(0.37)	-

Table 3

Predicting Earnings and Earnings-Dividends Ratio with the Dividend-Price Ratio

The table reports results for the following regression models: $E_{t+i}/E_t = \delta_0 + \delta_1 \cdot D/P_t + \varepsilon_{t+i}$ and $(E_{t+i}/D_{t+i}) / (E_t/D_t) = \delta_0 + \delta_1 \cdot D/P_t + \varepsilon_{t+i}$. E_{t+i}/E_t is the change in earnings from year t to year $t+i$. D/P_t is the value-weighted dividend-price ratio at time t. $(D_{t+i}/E_{t+i}) / (D_t/E_t)$ denotes the cumulative annual change in the dividend-earnings ratio from year t to year $t+i$. The sample includes all firms in the CRSP and COMPUSTAT annual database during the period 1952 – 2001 with fiscal year ending in December. The regressions utilize 41 observations. The dividend yield is estimated through 1991 and the subsequent returns, earnings and dividends are measured with data ending in 2001. The table reports the coefficients and their corresponding (Newey-West with lag i-1) t-statistic (below) and the adjusted R^2. The real values are estimated using the GDP deflator for the period beginning 1957 (35 observations).

	A: Nominal Earnings Growth			B: Real Earnings Growth		
	Intercept	D/P_t	R^2	Intercept	D/P_t	R^2
E_{t+1}/E_t	1.181	-2.223	0.008	1.220	-4.471	0.068
	(24.99)	(-2.50)	-	(26.95)	(-4.07)	-
E_{t+2}/E_t	1.288	-2.403	-0.009	1.327	-5.971	0.048
	(15.71)	(-1.54)	-	(15.72)	(-3.08)	-
E_{t+3}/E_t	1.458	-3.816	0.002	1.527	-9.596	0.123
	(12.41)	(-1.59)	-	(13.26)	(-3.66)	-
E_{t+4}/E_t	1.725	-7.104	0.044	1.794	-14.712	0.243
	(9.72)	(-1.81)	-	(12.65)	(-4.71)	-
E_{t+5}/E_t	1.994	-10.195	0.089	2.024	-18.781	0.332
	(7.94)	(-1.81)	-	(12.08)	(-5.32)	-
E_{t+6}/E_t	2.367	-15.327	0.146	2.213	-21.495	0.307
	(7.97)	(-2.42)	-	(11.92)	(-5.71)	-
E_{t+7}/E_t	2.832	-22.302	0.254	2.434	-25.042	0.352
	(8.06)	(-2.90)	-	(12.17)	(-6.07)	-
E_{t+8}/E_t	3.462	-32.850	0.428	2.749	-31.004	0.470
	(8.03)	(-3.35)	-	(12.93)	(-7.14)	-
E_{t+9}/E_t	3.899	-38.077	0.425	2.955	-34.123	0.468
	(7.47)	(-3.02)	-	(10.40)	(-5.57)	-
E_{t+10}/E_t	4.343	-43.179	0.460	3.085	-35.415	0.441
	(7.97)	(-3.16)	-	(8.25)	(-4.43)	-

	C: Change in Dividend-Earnings Ratio			D: Change in Dividend-Earnings Ratio		
$(D_{t+1}/E_{t+1})/(D_t/E_t)$	1.045	-1.330	-0.017	1.022	-0.857	-0.028
	(18.03)	(-1.26)	-	(18.02)	(-0.66)	-
$(D_{t+2}/E_{t+2})/(D_t/E_t)$	0.946	0.634	-0.025	0.867	2.600	-0.019
	(11.74)	(0.37)	-	(12.22)	(1.26)	-
$(D_{t+3}/E_{t+3})/(D_t/E_t)$	0.811	3.113	-0.001	0.658	7.136	0.050
	(7.05)	(1.13)	-	(8.87)	(3.14)	-
$(D_{t+4}/E_{t+4})/(D_t/E_t)$	0.716	4.450	0.041	0.484	10.533	0.202
	(4.47)	(1.12)	-	(7.86)	(5.60)	-
$(D_{t+5}/E_{t+5})/(D_t/E_t)$	0.614	6.162	0.096	0.361	12.736	0.291
	(3.70)	(1.44)	-	(5.25)	(5.90)	-
$(D_{t+6}/E_{t+6})/(D_t/E_t)$	0.487	8.643	0.124	0.257	14.639	0.230
	(3.23)	(2.19)	-	(3.02)	(5.78)	-
$(D_{t+7}/E_{t+7})/(D_t/E_t)$	0.350	11.195	0.161	0.037	19.304	0.311
	(1.71)	(2.08)	-	(0.32)	(6.40)	-
$(D_{t+8}/E_{t+8})/(D_t/E_t)$	0.257	12.661	0.223	-0.095	21.900	0.419
	(1.09)	(2.00)	-	(-0.71)	(6.25)	-
$(D_{t+9}/E_{t+9})/(D_t/E_t)$	0.188	13.544	0.289	-0.152	22.583	0.487
	(0.78)	(2.06)	-	(-0.87)	(5.10)	-
$(D_{t+10}/E_{t+10})/(D_t/E_t)$	0.183	13.063	0.266	-0.151	21.960	0.457
	(0.78)	(2.05)	-	(-0.95)	(5.44)	-

Table 4

Cash, Capital Expenses and Dividends

The table reports correlations of the following variables: E_{t+i}/E_t is the change in earnings from year t to year $t+i$. $(D_{t+i}/E_{t+i}) / (D_t/E_t)$ denotes the cumulative annual change in the dividends-earnings ratio from year t to year $t+i$. $CAPEX_t$, $Cash_t$, and $Assets_t$ are the period t cumulative capital expenditures (Data 128), cash balance (Data 1) and total assets (Data 6), respectively. $CAPEX_{t+1}/E_t$ and $Cash_t / Assets_t$ are detrended using an AR(2) model. The sample includes all firms in the CRSP and COMPUSTAT annual database during the period 1952 – 2001 with fiscal year ending in December. The sample size is 46 observations.

	E_t/E_{t-1}	$(D_t/E_t)/(D_{t-1}/E_{t-1})$	$CAPEX_{t+1}/E_t$	$Cash_t/Assets_t$
E_t/E_{t-1}	1			
$(D_t/E_t)/(D_{t-1}/E_{t-1})$	-0.44	1		
$CAPEX_{t+1}/E_t$	0.35	-0.36	1	
$Cash_t/Assets_t$	0.18	0.05	0.40	1

Table 5

Variance Decomposition for the Dividend-Price Ratio

The table reports the variance decomposition of the dividend-price ratio. $d_t\text{-}p_t=ln(D/P_t)$, where D/P_t is the value-weighted dividend yield at the end of year t (March year $t+1$). $r_t=ln(1+R_t)$, where R_t is the value-weighted market return for the period beginning at April year t ending at March year $t+1$. $\Delta d_{t+i}= ln(D_{t+i}/D_t)$, where D_t denotes the dividends during year t measured from April year t-1 till March year t. $\Delta(d\text{-}e)_{t+i}=ln((D_{t+i}/E_{t+i})/ (D_t/E_t))$, where E_t denotes the yearly corporate earnings before extraordinary items during year t (April t-1 till March t). $\Delta e_{t+i}= ln(E_{t+i}/E_t)$. $\rho\approx0.96$. Standard errors (Newey-West with 9 lags) for the percentage are reported below in parentheses.

	Nominal Values			Real Values		
$Var(d_t\text{-}p_t)$	0.054	0.054	0.054	0.054	0.054	0.054
	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
$Cov(d_t\text{-}p_t,\sum\rho^{j-1}\ \Delta d_{t+j})$ years 1-10	-0.003			0.002		
	-6.48%			3.43%		
	(7.10)			(12.62)		
$Cov(d_t\text{-}p_t,\sum\rho^{j-1}\ r_{t+j})$ years 1-10	0.066	0.066		0.080	0.080	
	122.45%	122.45%		148.25%	148.25%	
	(18.33)	(18.33)		(30.31)	(30.31)	
$Cov(d_t\text{-}p_t,\sum\rho^{j-1}\ \Delta e_{t+j})$ years 1-10		-0.038			-0.046	
		-70.14%			-85.14%	
		(21.19)			(19.76)	
$Cov(d_t\text{-}p_t,\sum\rho^{j-1}\ \Delta(d\text{-}e)_{t+j})$ years 1-10		0.034			0.034	
		63.12%			88.57%	
		(23.94)			(15.83)	
$Cov(d_t\text{-}p_t,\sum\rho^{j-1}\ r_{t+j})$ years 1-5			0.047			0.041
			86.60%			76.20%
			(11.34)			(21.74)
$Cov(d_t\text{-}p_t,\sum\rho^{j-1}\ r_{t+j})$ years 6-10			0.019			0.039
			35.85%			72.05%
			(18.33)			(24.43)
$Cov(d_t\text{-}p_t,\sum\rho^{j-1}\ \Delta e_{t+j})$ years 1-5			-0.016			-0.032
			-29.57%			-58.99%
			(13.45)			(10.20)
$Cov(d_t\text{-}p_t,\sum\rho^{j-1}\ \Delta e_{t+j})$ years 6-10			-0.022			-0.014
			-40.57%			-26.15%
			(11.82)			(17.88)
$Cov(d_t\text{-}p_t,\sum\rho^{j-1}\ \Delta(d\text{-}e)_{t+j})$ years 1-5			0.016			0.027
			30.16%			50.89%
			(16.53)			(12.23)
$Cov(d_t\text{-}p_t,\sum\rho^{j-1}\ \Delta(d\text{-}e)_{t+j})$ years 6-10			0.018			0.020
			32.96%			37.68%
			(10.18)			(12.37)
$Cov(d_t\text{-}p_t,\rho^{j}\ (d\text{-}p)_{t+j})$ years 11-	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009
	-16.21%	-16.21%	-16.21%	-16.21%	-16.21%	-16.21%
	(16.08)	(16.08)	(16.08)	(16.08)	(16.08)	(16.08)

Table 6
Correlation Matrix

The table reports the pairwise correlations for selected variables. r_{t+i} is the log annual returns from April year $t+i-1$ through March year $t+i$. Δd_{t+i} is the log change in dividends for the period April year $t+i-1$ until March year $t+i$. Δe_{t+i} $(\Delta(d\text{-}e)_{t+i})$ is the log change in earnings (dividend-earnings ratio) for the period April year $t+i-1$ until March year $t+i$. d_t-p_t is the log dividend price ratio at time t. $E^*_t=\sum_1^{10}\rho^{j-1}\Delta e_{t+j}$. $R^*_t=\sum_1^{10}\rho^{j-1}r_{t+j}$. $D^*_t=\sum_1^{10}\rho^{j-1}\Delta d_{t+j}$. $DE^*_t=\sum_1^{10}\rho^{j-1}\Delta(d\text{-}e)_{t+j}$. The sample includes all firms in the CRSP and COMPUSTAT annual database for the period 1952 – 2001 with fiscal year ending in December.

	d_t-p_t	R^*_t	E^*_t	DE^*_t	D^*_t	$\rho^{-11}(d\text{-}p)_{t+11}$
d_t-p_t	1					
R^*_t	0.8550 (0.000)	1				
E^*_t	-0.7051 (0.000)	-0.6942 (0.000)	1			
DE^*_t	0.5491 (0.0002)	0.4867 (0.0013)	-0.7729 (0.000)	1		
D^*_t	-0.0876 (0.5861)	-0.1706 (0.2861)	0.1342 (0.4028)	-0.5250 (0.0004)	1	
$\rho^{-11}(d\text{-}p)_{t+11}$	-0.1788 (0.2634)	-0.4113 (0.0076)	0.2293 (0.1492)	-0.117 (0.4665)	0.4925 (0.0011)	1

Table 7
Regression Analysis

The table reports OLS coefficients and *t*-statistics. r_{t+i} is the log annual returns for April year $t+i-1$ until March year $t+i$. Δd_{t+i} is the log-change in dividends for the period April year $t+i-1$ until March year $t+i$. Δe_{t+i} ($\Delta(d-e)_{t+i}$) is the log-change in earnings (dividend-earnings ratio) for the period April year $t+i-1$ until March year $t+i$. $d_t p_t$ is the log dividend price ratio at time t. $E^*_t=\sum_1^{10}\rho^{j-1}\Delta e_{t+j}$. $R^*_t=\sum_1^{10}\rho^{j-1}r_{t+j}$. $D^*_t=\sum_1^{10}\rho^{j-1}\Delta d_{t+j}$. $DE^*_t=\sum_1^{10}\rho^{j-1}\Delta(d-e)_{t+j}$. The sample includes all firms in the CRSP and COMPUSTAT annual database for the period 1952 – 2001 with fiscal year ending in December. Standard errors (Newey-West with 9 lags) for the percentage are reported below in parentheses.

Nominal Values							
Dependant Variable	Intercept	R^*_t	E^*_t	DE^*_t	D^*_t	$\rho^{-11}(d-p)_{t+11}$	adj-R^2
d_t-p_t	-3.14				-0.12		-0.02
	(-34.92)				(-0.84)		
d_t-p_t	-2.66		-0.71				0.48
	(-29.83)		(-6.79)				
d_t-p_t	-2.66		-0.71		0.01		0.47
	(-24.29)		(-6.93)		(0.12)		
d_t-p_t	-3.04	0.56	-0.19		-0.04	0.23	0.76
	(-20.78)	(4.63)	(-2.23)		(-0.29)	(2.55)	
d_t-p_t	-3.04	0.56	-0.23	-0.04		0.23	0.76
	(-20.79)	(4.63)	(-2.38)	(0.28)		(2.55)	

Real Values							
Dependant Variable	Intercept	R^*_t	E^*_t	DE^*_t	D^*_t	$\rho^{-11}(d-p)_{t+11}$	adj-R^2
d_t-p_t	-3.24				0.05		-0.03
	(-38.66)				(0.25)		
d_t-p_t	-3.00		-0.61				0.51
	(-56.72)		(-7.01)				
d_t-p_t	-3.00		-0.62		0.12		0.50
	(-59.45)		(-7.55)		(1.28)		
d_t-p_t	-2.91	0.38	-0.35		-0.05	0.17	0.80
	(-21.89)	(5.50)	(-3.41)		(-0.49)	(2.06)	
d_t-p_t	-2.91	0.38	-0.23	-0.04		0.23	0.80
	(-21.89)	(5.49)	(-3.65)	(0.49)		(2.06)	

Table 8
Analysis of the Dividend Yield Variance

The table reports OLS coefficients and *t*-statistics below (Panel A) and an analysis of variance (Panel B). r_{t+i} is the log annual returns from April year $t+i-1$ till March year $t+i$. Δd_{t+i} is the log change in dividends from April year $t+i-1$ to March year $t+i$. Δe_{t+i} is the log change in earnings for the period April year $t+i-1$ until March year $t+i$. d_t-p_t is the log dividend price ratio at time t. $E^*_t=\sum_1^{10}\rho^{j-1}\Delta e_{t+j}$. $R^*_t=\sum_1^{10}\rho^{j-1}r_{t+j}$. $D^*_t=\sum_1^{10}\rho^{j-1}\Delta d_{t+j}$. υ^X_t is estimated for $X=E^*$ and $X=D^*$ as follows: $R^*_t=\varphi_0+\varphi_1 X^*_t+\upsilon^X_t$. The sample includes all firms in the CRSP and COMPUSTAT annual database for the period 1952 – 2001 with fiscal year ending in December. Standard errors (Newey-West with 9 lags) for the percentages are reported below in parentheses.

Panel A: OLS results

Dependant Variable	Intercept	$E^*_t\ (b^E_1)$	$D^*_t\ (b^D_1)$	$\upsilon^E_t\ (b^E_2)$	$\upsilon^D_t\ (b^D_2)$	adj-R^2
d_t-p_t	-3.14		-0.12		0.60	0.72
	(-29.36)		(-0.57)		(7.00)	
d_t-p_t	-2.66	-0.71		0.49		0.74
	(-42.18)	(-9.92)		(3.56)		

Panel B: Analysis of Variance

Dependant Variable	Total	$(b^E_1)^2\cdot Var(E^*_t)$	$(b^D_1)^2\cdot Var(D^*_t)$	$(b^E_2)^2\cdot Var(\upsilon^E_t)$	$(b^D_2)^2\cdot Var(\upsilon^D_t)$	Error
$Var(d_t$-$p_t)$	0.054		0.000		0.039	0.014
	(100%)		(1%)		(73%)	(27%)
$Var(d_t$-$p_t)$	0.054	0.027		0.014		0.013
	(100%)	(50%)		(26%)		(24%)

Table 9
Stock Return Variance Decomposition

The table reports OLS coefficients and standard errors (Newey-West with 1 lag) below (Panel A), and the variance decomposition (Panel B). r_t is the log annual returns for the fiscal year. roe_t is the log return on equity. bm_t is the log change book-to-market at the fiscal year end. $N_{cf,t}=\Delta E_t\sum\rho^j roe_{t+j}$ and $N_{r,t}=\Delta E_t\sum\rho^{j-1} r_{t+j}$. The sample includes all firms in the CRSP and COMPUSTAT annual database for the period 1951 – 1991 with fiscal year ending in December.

Panel A

	r_{t-1}	bm_{t-1}	roe_{t-1}
r_t	-0.054	0.097	-0.031
	0.178	0.091	0.723
bm_t	0.051	0.896	0.485
	0.163	0.081	0.567
roe_t	0.021	-0.066	-0.063
	0.037	0.029	0.350

Panel B

$Var(r_t - E_{t-1} r_t)$	$Var(N_{r,t})$	$Var(N_{cf,t})$	$-2*cov(N_{r,t}, N_{cf,t})$
1.098	0.275	0.306	-2*(-0.2585)=0.517
	Percentage		
100%	25.02%	27.90%	47.09%