What Drives Stock Price Movement?

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Abstract

A central issue in asset pricing is whether stock prices move due to the revisions of expected future cash flows or/and of expected discount rates, and by how much of each. Using consensus cash flow forecasts, we find that cash flow news is more important than discount rate news in driving stock returns at the firm, portfolio, and aggregate levels. In addition, stock return and cash flow news are strongly positively correlated.

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1 Introduction

Understanding why stock prices move up and down is a central issue for financial economists. Do stock prices change because of new information on expected cash flows, or because of time-varying risk aversion and investor sentiment? The crucial question, as Cochrane (2006) puts, is "How much is each?" The relative importance of cash flows (CFs) and discount rates (DRs) reveals how the financial market works, and has profound implications for the major blocks of asset valuation – capital budgeting, portfolio allocation, sources of systematic risk, risk management, and so on.[1]

Since neither expected cash flows nor discount rates are observable, a common practice in the current literature is to use the dividend price ratio (dividend yield) to predict the two components, and draw conclusions on the relative importance based on their relative predictability. The idea is that the dividend yield, by definition, is equal to the expected future cash flows discounted by the expected discount rate; its variation must also reflect the revisions of the two expectation components. While this literature provides important evidence on predictability, its ability to answer the question of "What drives stock price movement?" is limited for at least two reasons.

First, dividend yield volatility is not the same as return volatility. Imagine a stock with a constant dividend yield and a constant expected dividend growth rate; price change is matched proportionally by dividend payout. Dividend growth rate is not predictable. Yet, a price increase is driven by CF news – a higher dividend payout and higher expected future cash flows (i.e., higher dividend level multiplied by a constant expected dividend growth rate). Therefore, there could be plenty of price movement and revisions of expected future cash flows (in dollars), but no dividend growth rate predictability.

Second, the predictive power on expected cash flows/discount rates is small, frequently absent. More important, as we show below, even if predictability can be detected, it is difficult to interpret its meaning.

We avoid the reliance on predictability by using direct expected cash flow measures.

[1] For example, to explain the equity premium puzzle, Campbell and Cochrane (1999) focus on modeling the time-varying expected return while Bansal and Yaron (2004) model both expected return and dividend growth.

Specifically, given stock prices, we use the market prevailing forecasts for future cash flows (from I/B/E/S), for each firm and at each point of time, to back out the firm-specific discount rates (e.g., Claus and Thomas (2001) and Pastor, Sinha, and Swaminathan (2006)). Consequently, a price change can be decomposed into two pieces: the cash flow (CF) news, defined as the price change holding discount rate constant, and the discount rate (DR) news, defined as the price change holding CF constant; this decomposition holds by definition without resorting to predictability. We then study the relation between proportional price change (i.e., capital gain return), CF news, and DR news at firm, portfolio, and aggregate levels.

What drives aggregate stock return? At the aggregate level, 57% of value-weighted quarterly return is attributed to CF news; 43% is attributed to DR news. The importance of CF (DR) news generally increases (decreases) with time horizon. At 7-year horizon, 86% (14%) of return can be attributed to CF (DR) news. Therefore, CF news is more important than DR news is in driving stock returns and is increasingly more so when time horizon expands.

Our finding appears to differ sharply from the somewhat disconcerting finding in the classic asset pricing literature that DR news dominates at the aggregate level for the postwar period (e.g., Cochrane (1992, 2001, 2006)).[2] Not necessarily so if one realizes that price volatility is not the same as dividend yield volatility. What the current literature really says is that dividend growth is not predictable by the dividend yield.[3] But, as we have argued, there could be plenty of CF news even if dividend growth rate is not predictable. The finding in the current literature provides direct evidence on predictability, but not a direct answer to "What drives stock price movement?"

In contrast, our finding says that the bulk of aggregate stock price movement is accompanied by contemporaneous revisions of market prevailing forecasts on future cash flows. This result says nothing about predictability, but is based on a test directly related to stock price movement. It largely alleviates the concern by the current literature by

[2] As Cochrane (2006) notes, "Excess return forecastability is not a comforting result. Our lives would be so much easier if we could trace price movements back to visible news about dividends or cashflows...But that is where the data have forced us, and they still do so."

[3] Lettau and Ludvigson (2005) argue that expected dividend growth rate can be predictable by variables other than dividend yield.

establishing a strong link between stock return and CF news.

Our finding that the importance of CF news increases with investment horizon is intuitive. Since the DR is stationary, its impact on the cumulative return must be minimal. That is, as investment horizon expands, return must reflect CF news increasingly more. In the long-run limit, all return news must be CF news (e.g., Hansen, Heaton, and Li (2005) and Bansal, Dittmar, and Kiku (2006)). This is a fundamental property that holds irrespective of economic models. It is thus nice to see that our results confirm this property.[4]

How is return and CF news correlated at the aggregate level? At the aggregate level, CF news and DR news are procyclical: at a good time CF forecasts go up and DR goes down. The correlation between return and CF news is 0.78 at quarterly horizon, and increases monotonically as investment horizon rises. That is, stock prices move closely with CF news, and the role of DR news, whatever it is, does not dominate this relation.

The current literature provides mixed evidence on the relation between return and *realized* CFs. Many studies find a positive relation (e.g., Roll (1988), Fama (1990), Kothari and Shanken (1992), and Stambaugh (1990)**),** while Vuolteenaho (2002) and Kothari, Lewellen, and Warner (2006) document a negative relation. A negative relation suggests that the DR not only goes up at a time when there is positive CF news, but also dominates the CF news and make return negative. As Kothari, Lewellen, and Warner (2006) point out, such a finding is counter-intuitive and puzzling.

One limitation of studying the relation between return and *realized* CFs is that it is difficult to line them up – return could have responded to earnings news ahead of time. In comparison, it is easier to match the forward-looking CF news (backed out from analyst forecasts) with stock return. Our results are intuitive and alleviate the concern by Kothari, Lewellen, and Warner (2006). The increasing correlation (with horizon) is also consistent with theoretical predictions, as explained above.

[4]On the other hand, if one believes that aggregate return is dominated by DR news, one must also explain how this DR dominance is gradually replaced by CF dominance as investment horizon expands.

What drives firm-level stock return? At the firm level, on average, 72% of quarterly return is attributed to CF news; at the 7-year horizon, 94% of return is attributed to CF news. If we take a simple average of firm returns, which is equivalent to an equally-weighted market portfolio, the proportion of the return of this portfolio attributed to CF news is close to that at the firm level: 69% at quarterly horizon and 96% at 7-year horizon. Therefore, even though the return volatility of the market portfolio is much lower than that of an average firm, such a diversification effect happens through both CF news and DR news at roughly equal pace. As a result, CF news is almost as important in driving stock returns at the firm level as at the aggregate level.

The finding that there is very limited *relative* CF/DR diversification effect when moving from individual firms to the aggregate portfolio provides a stark contrast to the prevailing view that CF news dominates at firm level, but the opposite is true at the aggregate level. We further show that this reversal role of CF news in the current literature is not caused by diversification; instead, the result is driven by the fundamental difference between cross-sectional and time-series predictability. Basically, the cross-sectional heterogeneity of CFs is persistent (e.g., Lakonishok, Shleifer, and Vishny (1994) and Fama and French (1995)) and predictable; it is thus easy to find that CF news dominates whenever a panel data – common for firm and portfolio analysis – is studied. However, in the time-series dimension, CFs are less predictable than DRs, and DR news dominates in pure time series regressions – common for the aggregate portfolio analysis.

If we want to understand why stock prices move around, which is a time series concept, then time-series tests are more suitable.[5] In this case, following the conventional methods using realized return data (and not using forecasts data), we show that DR news "dominates" at firm, portfolio, and aggregate levels; but the opposite is found whenever a panel data is used. As an extreme example, we sort the whole market into two portfolios, value versus growth, each of which is well diversified. If we apply time series analysis to each portfolio, then DR news "dominates"; if we study the panel of the two portfolios, then CF news "dominates". In other words, the conclusions based on the

[5] One can think of one example in which there is a rich cross-sectional heterogeneity but no time-series variation, – stock prices never move – and yet strong cross-sectional predictive results can be found.

conventional methods are restricted by the lack of CF predictability in the time-series dimension.

The ambiguity of inference based on predictability raises further doubts on the view that DR news dominates at the aggregate level.[6] Our strong evidence, using analysts forecasts, on the predominant role of CF news suggests that the lack of CF predictability is most likely a statistical issue – it is difficult to argue that there is no CF news when the market prevailing forecasts on future CFs move closely with stock prices.

Our research belongs to the growing literature that uses analyst forecasts to study the nature of asset valuation, including, among others, Kaplan and Ruback (1995), Botosan (1997), Claus and Thomas (2001), Gebhardt, Lee, and Swaminathan (2001), Brav, Lehavy, and Michaely (2005), Lee, Ng, and Swaminathan (2003), Hail and Leuz (2006), Botosan and Plumlee (2005), Easton, Taylor, Shroff, and Sougiannis (2002), Easton (2004), Olson and Juettner-Nauroth (2005), Pastor, Sinha, and Swaminathan (2006), and Chen and Zhang (2006). Our results are consistent with the literature documenting that stock prices respond to revisions of analyst forecasts.[7] Our approach is in the same spirit of Graham and Harvey (2005) who use surveys among CFOs to measure the expected equity premium. Our results suggest that such an approach can shed fresh light on several fundamental issues in asset valuation.

Some caveats are also in order when digesting our findings. First, the use of analyst consensus forecasts relies on the assumption that the marginal investors (who determine prices) share the same CF forecasts as analysts. We do not need such a strong assumption. So long as the marginal investors share to a significant degree the views of analysts – the professionals who are paid to provide forecasts –, most of our results are likely to go through. Second, we do not adjust for the potential biases that might affect the levels of analyst forecasts. We argue that this bias only plays a secondary role because our results depend mainly on the revisions, rather than the levels, of analyst forecasts. Importantly, we note that the above two limitations work against our finding

[6] In addition, with increasing investment horizon, stock return at firm level must also contain more and more CF news. In this sense, no matter how diversified a portfolio is, it must contain more and more CF news as investment horizon rises.

[7] This literature includes, among others, Griffin (1976), Givoly and Lakonishok (1979), Imhoff and Lobo (1984), Elton, Martin, and Gultekin (1981), Lys and Sohn (1990), Francis and Soffer (1997), and Park and Stice (2000).

of the importance of CF news; our results are likely to be stronger with more precise expected CF measures.

Finally, our findings do not diminish the importance of the literature on documenting return/cash flow predictability. This literature aims to detect the time variation of expected returns and cash flow growth rates; but it is only indirectly related to stock price volatility. Our approach complements this literature in the sense that we say nothing about predictability, but is directly related to stock price volatility.

Combining the evidence in the current literature and our results leads to the following picture: At firm, portfolio, and aggregate levels, returns are more predictable than CF growth rates in the time series dimension; but the opposite is true in the cross-sectional dimension because the cross-sectional heterogeneity of CFs is persistent. At all levels, CF news is more important than (at least as important as) DR news in driving stock price movements, and increasingly more so as investment horizon expands.

The rest of the paper proceeds as follows. In Section 2 we describe the method to construct CF news and DR news, and report the sample summary. In Section 3 we analyze the relation among return, CF news, and DR news at aggregate and firm levels. In Section 4 we provide more analysis and discussion that link our results to the current literature. In Section 5 we conduct further robustness checks. A brief conclusion is provided in Section 6.

2 The abnormal earnings model and the sample

2.1 The model

Follow Claus and Thomas (2001), we consider a present value representation in the form of an abnormal earnings model:

$$P_0 = bv_0 + \frac{ae_1}{(1+k)} + \frac{ae_2}{(1+k)^2} + \frac{ae_3}{(1+k)^3} + ..., \tag{1}$$

where P_0 is the value of stock at time 0, bv_0 is book equity at time 0, k is the discount rate, and

$$ae_t = e_t - k \times bv_{t-1} \tag{2}$$

is the expected abnormal earnings for period t, and e_t is the expected earnings forecast for time t. Since book equity is expected to grow at the rate k, ae_t is the abnormal earnings. To link back to the familiar dividend model, we note that, according to the clean surplus relation, dividend d_t is related to earnings and book equity by definition:

$$d_t = e_t - (bv_t - bv_{t-1}). \tag{3}$$

That is, the difference between earnings e_t and retained earnings $(bv_t - bv_{t-1})$ is dividend payout.[8] This means

$$ae_t = d_t + [bv_t - (1+k) \times bv_{t-1}]. \tag{4}$$

In other words, ae_t is dividend payout plus abnormal retained earnings. If we also assume that the current book equity and future abnormal retrained earnings will be converted into dividends by the terminal time, then equation (1), is nothing but an algebraic restatement of the familiar present value formula:

$$P_0 = \frac{d_1}{(1+k)} + \frac{d_2}{(1+k)^2} + \frac{d_3}{(1+k)^3} + ... \tag{5}$$

I/B/E/S contains firm-specific quarterly earnings forecasts for the next four quarters and annual earnings forecast for up to five years. Whenever missing or unavailable, we fill in the forecasts for up to the 5th year (see more details in section 2.2). Following Claus and Thomas (2001), we assume that the expected earnings growth rates converge to the 10-year Treasury rate minus three percents for all horizons beyond the 5th year, which we denote g_{ae}. (We find our conclusions are robust to alternative assumptions, as we discuss in the robustness section.) With these considerations we back out the discount rate k_t from the following equation:

$$P_t = bv_t + \sum_{i=1}^{4} \frac{ae_{t+i*1/4}}{(1+k_t/4)^{i*1/4}} + \sum_{i=2}^{5} \frac{ae_{t+i}}{(1+k_t)^i} + \frac{ae_{t+5}(1+g_{ae})}{(k_t - g_{ae})(1+k_t)^5}. \tag{6}$$

We adopt the approach by Claus and Thomas (2001) to search for the implied cost of equity that solves the equation.

[8] As Claus and Thomas (2001) point out, under U.S. accounting rules, almost all transactions satisfy the clean-surplus relation. The few violations happen ex post, and are not expected in analysts' forecasts (Frankel and Lee (1998)).

CF news and DR news We can rewrite Equation (6) as

$$\begin{aligned} P_t &= bv_t + \sum_{i=1}^{4} \frac{ae_{t+i*1/4}}{(1+k_t/4)^{i*1/4}} + \sum_{i=2}^{5} \frac{ae_{t+i}}{(1+k_t)^i} + \frac{ae_{t+5}(1+g_{ae})}{(k_t - g_{ae})(1+k_t)^5} \\ &= bv_t + f\left(ae^t, k_t\right). \end{aligned} \tag{7}$$

By construction, stock price P_t is a function of book equity bv_t, the vector of analyst forecasts available at time t (with superscript t), ae^t, and the discount rate k_t. We separate bv_t from $f\left(ae^t, k_t\right)$ to emphasize the fact that ae^t and k_t are forward-looking expectation variables; bv_t is book equity and thus is not forward-looking.

The proportional price difference between $t+j$ and t is then

$$\begin{aligned} \frac{P_{t+j} - P_t}{P_t} &= \frac{bv_{t+j} - bv_t}{P_t} + \frac{f\left(ae^{t+j}, k_{t+j}\right) - f\left(ae^t, k_t\right)}{P_t} \\ &= \frac{bv_{t+j} - bv_t}{P_t} + \frac{\left(f\left(ae^{t+j}, k_{t+j}\right) - f\left(ae^t, k_{t+j}\right)\right)}{P_t} \\ &\quad + \frac{\left(f\left(ae^t, k_{t+j}\right) - f\left(ae^t, k_t\right)\right)}{P_t} \\ &= RE_t + CF_t + DR_t, \end{aligned} \tag{8}$$

where

$$RE_t = \frac{bv_{t+j} - bv_t}{P_t}$$

is the change of asset in place (i.e., retained equity) scaled by price.

$$CF_t = \frac{\left(f\left(ae^{t+j}, k_{t+j}\right) - f\left(ae^t, k_{t+j}\right)\right)}{P_t} \tag{9}$$

is the CF news; it is so because the numerator is calculated by holding the discount rate constant at $t+j$ and the difference is driven by the CF difference between t and $t+j$. Similarly,

$$DR_t = \frac{\left(f\left(\alpha e^t, k_{t+j}\right) - f\left(\alpha e^t, k_t\right)\right)}{P_t} \tag{10}$$

is the DR news; it is so because CF does not change in the numerator, and the difference is driven by the variation of discount rates in the period. Note DR news and DR go in opposite directions.

In sum, we can decompose the capital gain return for any time horizon into retained

equity, CF news, and DR news by construction, which enables us to tackle the relation among them. Denote the capital gain return RETX, we have

$$RETX_t = RE_t + CF_t + DR_t. \tag{11}$$

We do not include RE_t in either CF news or DR news because it does not represent a revision of *expected* CFs or *expected* DRs. For this reason, we can define $RETXAD_t = RETX_t - RE_t$ as the retained-earning-adjusted capital gain, and study the variance of this return through CF news and DR news:

$$\begin{aligned} VAR\left(RETXAD_t\right) &= COV\left(CF_t, RETXAD_t\right) + COV\left(DR_t, RETXAD_t\right) \quad (12) \\ 1 &= \frac{COV\left(CF_t, RETXAD_t\right)}{VAR\left(RETXAD_t\right)} + \frac{COV\left(DR_t, RETXAD_t\right)}{VAR\left(RETXAD_t\right)}, \quad (13) \end{aligned}$$

where VAR and COV are variance and covariance operators. $\frac{COV(CF_t, RETXAD_t)}{VAR(RETXAD_t)}$ is the slope coefficient of regressing CF_t on $RETXAD_t$; $\frac{COV(DR_t, RETXAD_t)}{VAR(RETXAD_t)}$ is the slope coefficient of regressing DR_t on $RETXAD_t$. In other words, to understand the portion of return variance that is driven by CF news and DR news, one only needs to regress CF news and DR news on the earnings-adjusted capital gain return respectively, and draws inferences based on the slope coefficients.

In the rest of the paper when we talk about return we mean the retained-earning-adjusted capital gain return. We can alternatively study capital gain return, and all conclusions remain the same.

2.2 The sample

To forecast future CFs we need data on both book equity and earnings forecasts. Book equity is obtained using the COMPUSTAT quarterly industrial file. I/B/E/S reports consensus analyst forecasts on earnings as of the middle of each month. To be consistent with book equity, we collect earnings forecast data as of March, June, September, and December of each year for all firms. We match analyst forecasts with the book equity from the last quarter (three-month lag) to ensure that the book equity is public information when analyst forecasts are released.

Besides earnings forecasts, we also collect from I/B/E/S share prices and the number

of shares outstanding. To be included in the sample, we require non-missing data for the prior quarter's book value, earnings, and dividends; we also require firms to have common equity data in CRSP. We restrict our sample to the 1985-2005 period because I/B/E/S covers too few firms before 1985.

I/B/E/S contains earnings forecasts for the next four quarters, for up to five years ahead, and a long-term growth rate (g_5), which is usually assumed to be a five-year earnings growth rate. For firms with certain quarterly forecasts missing, we fill in the missing numbers based on the seasonality of the firm's forecasted earnings in other years. For example, if the 4th quarter of a firm, on average, contribute 35% of annual earnings, and the 4th quarter earnings forecast is missing, we multiply the sum of forecasted earnings for the other three quarters by 35/65 and use the product as the earnings forecast. We have conducted robustness tests and found that including only firms with complete quarterly earnings forecast for the next four quarters do not change our conclusions. If a firm has missing forecasts for years two to five, we follow the existing literature and project earnings in those years using the long-term growth rate and the prior year's earnings forecast: $e_t = e_{t-1}(1 + g_5)$.[9]

Table 1 provides the year-by-year quarterly statistics for the final sample. The number of firms increases steadily from 796 in 1985 to 1755 in 2005. The sample features relatively larger firms as the average payout ratio, defined as the ratio of dividend to earnings, varies from 33% to 43%. Overall, our sample represents more than 60 percent of the total market capitalization. There is a general downward trend of cost of equity during the sample period, which makes sense because there is also a similar downward trend of the riskfree rate for the same period.

3 Analysis

3.1 Aggregate level evidence

We winsorize all firm-specific variables in the final sample at the 1% and 99% breakpoints. We then collapse the sample into a value-weighted aggregate time series covering 1985-2005. The purpose is to study the relation among return, CF news, and

[9] We do not use negative earnings forecast to project earnings for the missing quarter or year.

DR news for the market portfolio.

We note that return, as defined in Equation (7), does not include dividends since our primary goal is to study price volatility. In addition, dividends play a minor role anyway in the total return volatility. For example, for the postwar period the average quarterly dividend-included return for the CRSP value-weighted portfolio is 3.03% with a standard deviation of 7.99%; the average quarterly return excluding dividend is 2.12% with a standard deviation of 7.92%. During 1985-2005 the average dividend-included return is 3.33% with a standard deviation of 8.49%; the average return excluding dividend is 2.71% with a standard deviation of 8.43%. Therefore, dividend only affects the level of return, but its impact on return volatility is negligible.

In Panel A of Table 2 we report average cumulative return, CF news, and DR news, ranging from one to 28 quarters. Not surprisingly, average return increases monotonically from 1.98% at quarterly frequency to 107.21% at 7-year frequency. The majority of this increasing return is accounted for by CF news: the average CF news is 1.83% at quarterly frequency and 103.65% at 7-year frequency. CF news should be zero if forecasted cash flows do not change. In contrast, almost all of the average return here is matched by similar increases in forecasted cash flows, suggesting that CF news plays a significant role in stock price volatility. On the other hand, the mean of DR news is very small. Theoretically, since the DR must be mean-reverting, DR news is expected to be zero on average if the time series is long enough.

In the following we address three issues in sequence.

What drives aggregate stock price volatility?

In Panel B of Table 2, we report the variances, covariances, and correlations of return, CF news and DR news. The following equation should be satisfied:

$$VAR(\text{return}) = VAR(\text{ CF news}) + 2 \times COV(\text{CF news, DR news}) + VAR(\text{ DR news}). \tag{14}$$

The quarterly return variance is 0.54%, which corresponds to an annualized volatility of 14.70%, typical for the market portfolio. Of the 0.54%, 0.28% is due to CF news variance, and 0.21% is due to DR news variance – CF news is much more volatile and

plays a much bigger role. As the time horizon increases, while the variances of both CF news and DR news climb, CF news becomes more and more important. At annual frequency, The CF news variance is 0.91%, versus 0.39% for DR news; at 7-year horizon, the CF news variance is 28.11%, versus 0.90% for DR news.

The mounting importance of CF news with horizon is intuitive. Since the DR must be stationary, the cumulative impact of its revision – the difference of DR through time – must be minimal if the CFs are held constant. Put differently, S&P 500 Index fluctuates each quarter due to both CF news and DR news. However, a major reason why S&P 500 Index has been more than doubled in the past 15 years is that the top 500 companies have accumulated much wealth in the firms during the period and the earnings forecasts (in dollars) have jumped.

For the same reason, Bansal, Dittmar, and Kiku (2006) argue that the covariance between stock return and the stochastic discount factor must represent more and more the CF beta as the time horizon increases. In the long-run limit, all news must be CF news, and all beta must be CF beta (see also Hansen, Heaton, and Li (2005)). The increasing importance of CF news (with horizon) as a portion of stock return is thus a fundamental property irrespective of economic models. Despite a large literature on the relative importance of CF news and DR news, little prior evidence has been documented on this relative importance as a function of time horizon. It is thus refreshing to us to see the increasing pattern of the relative CF/DR variances as horizon increases.

We formally test the relative importance of CF news/DR news in driving price variance in Table 3. In particular we regress CF news and DR news on return respectively. The slope coefficients, as shown in equation (13), tell the portion of stock return variance that is driven by each component. Consistent with the relative variance patterns in Table 2, the CF coefficient is 0.57, versus 0.43 for DR at quarterly horizon; at 7-year horizon, the CF coefficient is 0.86, versus 0.14 for DR.[10] The slope coefficients are estimated with high precision with large Newey-West t-statistics. This is expected because the combined CF news and DR news, by construction, must explain 100% of the return variation.

[10] Throughout the paper, the CF and DR coefficients might not add up exactly to one because of the winsorization and value-weighting. There are also similar minor biases in variances, but these biases do not affect any conclusion we draw.

In sum, for the aggregate portfolio, CF news is more important than DR news in driving stock price movement, and increasingly more so as time horizon rises. This evidence seems to differ dramatically from the one widely documented in the classic asset pricing literature that DR news dominates CF news (e.g., Cochrane (1992, 2006) and Campbell and Ammer (1993)). We provide further link to this literature in section 4.

How are CF news and stock return related?

Standard asset pricing theory predicts that aggregate return, CF news, and DR news are all positively correlated: stock prices go up when expected future CFs go up; in the meantime, DRs are likely to go down because investors can become less risk averse or carry positive sentiment at such a good time.

Consistent with this prior, in Panel B of Table 2, aggregate return has a large correlation of 0.78 with CF news and 0.69 with DR news. That is, stock return goes up with positive CF news but goes down when DR increases. Since return increasingly represents CF news as investment horizon increases, their correlation also increases monotonically – at seven year horizon, they are almost perfectly correlated.[11]

Prior evidence on these correlations is mixed. Many studies find a positive relation between stock return and *realized* CF news (e.g., Roll (1988), Fama (1990), Kothari and Shanken (1992), and Stambaugh (1990)). On the other hand, Kothari, Lewellen, and Warner (2006) document the robust and yet surprising finding that aggregate return is negatively related to *realized* earnings news. Since the CF news is positive in this case, the DR must have gone up to such an extent that it dominates CF news and makes return negative. As Kothari, Lewellen, and Warner (2006) point out, this finding is counter-intuitive and against the asset pricing theory. While it is not hard to imagine that the CF news and DR news can be negatively related at times – this happens when CF news rises more than price – it is difficult to believe that the DR news can dominate at good times and reverse the positive relation between CF news and DR news.

To understand this issue, in Panel A of Graph 1 we plot the time series of quarterly

[11] On the other hand, the correlation between return and DR news also increases with horizon, though at a lower degree than CF news. This increasing correlation between return and DR news is likely caused by the fact that the DR has reduced substantially in our sample period.

aggregate return and CF news. The obvious pattern is that return and CF news move almost in lock steps: in pretty much every quarter, return goes up when CF news goes up, and they go down together. The immediate conclusion is that even if the DR news could be negative at a time when the CF news is positive, it is of secondary nature and is far from dominating the relation between the return and the CF news. The overwhelming evidence is that return and CF news are positively related.

In Panel B we plot the time series of return and DR news. They again tend to move in the same direction more often than not. This, combined with the fact that return almost always moves in the same direction of CF news, suggests that return goes up with positive CF news, and the DR tends to go down at the same time, pushing the return further up. Even in the periods when the return and the DR news go in the opposite directions, it is clear that the DR news has little impact on the positive relation between the return and the CF news.

Why do we get results so different from those in Kothari, Lewellen, and Warner (2006)? In untabulated results, we confirm their finding that, when realized earnings news is used, the contemporaneous correlation between return and earnings news is not positive. Therefore, the difference must mainly stem from our use of analyst forecasts, which we believe contain a clear advantage. In particular, both return and CF news should be forward-looking incorporating expected cash flows in all future periods. However, realized earnings news is backward-looking; with information constantly updated in the financial market, returns could have reflected future earnings news long before this news is formally reported and realized. In comparison, because both return and analyst forecasts are forward-looking, it is easier to line them up with respect to time. Therefore, by using forward-looking measures, we are able to reach an intuitive conclusion and alleviate the concern by Kothari, Lewellen, and Warner (2006).

The cyclical property of CF news and DR news

Standard asset pricing theory predicts that investors adjust cash flow forecasts and required rates of return based on macroeconomic conditions. Aggregate CF news is expected to be procyclical – the economic outlook, which is essentially the outlook of future cash flows, is likely to be downwardly adjusted at a bad time, resulting in

lower CF-related returns; DR news is also expected to be procyclical – investors, being risk-averse, could require a higher rate of return at a bad time, which is achieved by downwardly adjusting stock prices.

We tests these hypotheses by regressing macroeconomic variables on CF news and DR news separately:

$$\text{MACRO}_t = \alpha + \sum_{i=0}^{2} \beta_i \times \text{NEWS}_{t-i} + \varepsilon_t. \tag{15}$$

We choose three variables representing the macroeconomic conditions: the industrial production growth rate, the real consumption growth rate, and the change of aggregate Baa over Aaa spread, all obtained from the Federal Reserve Board. For the first two variables, we include both the current and lagged news (either CF or DR) as independent variables because financial variables tend to lead the real economy. Because the Baa over Aaa spreads are also from the financial market, the lag term is not included.

We report the combined slope coefficients ($\sum_{i=0}^{1} \beta_i$) and their Newey-West t-statistics (with up to three lags) in table 4. As expected, both CF news and DR news are positively related to the industrial production growth rate; the combined CF coefficient is 0.07, with a t-statistic of 1.75 and R-squared of 0.06; the combined DR coefficient is 0.16, with a t-statistic of 2.43 and R-squared of 0.09. That is, CF forecasts go up when production grows faster, and the DR goes down. CF news is also positively, albeit insignificantly, related to the real earnings growth rate; DR news, on the other hand, is significantly related to it with a t-statistic of 2.38.

Many previous studies assume that the expected market equity premium is linearly related to the aggregate Baa over Aaa spread (e.g., Jagannathan and Wang (1996) and Petkova and Lu (2005)). Chen, Collin-Dufresne, and Goldstein (2007) provide theoretical justification on why the spread is likely a good proxy for equity premium. A positive change of Baa over Aaa spread can be then regarded as an upward revision of the discount rate. In table 4, the change of Baa over Aaa spread is significantly negatively related to both CF news and DR news: the CF coefficient is -0.95, with t-statistic of 2.06 and R-squared of 0.08; the DR coefficient is -1.09, with t-statistic of 2.59 and R-squared of 0.07.

Overall, confirming our theoretical prior, both CF news and DR news are procyclical, and the DR moves with the Baa over Aaa spread, a common proxy for the expected market risk premium.

3.2 Firm level evidence

Results

How are return, CF news, and DR news related at firm level? If return is driven by both CF news and DR news at the firm level, which component is relatively more diversified away when an increasingly more diversified portfolio is held? These are important issues that help us understand the nature of the financial market and portfolio management. The widely cited view, based on Vuolteenaho (2002) and the literature on the aggregate portfolio, is that CF news dominates at firm level, but a large proportion of it can be diversified away, leading to the dominance of DR news at the aggregate level; this is consistent with the intuition that CF news is more related to firm-specific risk, but DR news is more related to systematic risk.[12]

We conduct the same time series analysis, as we have done for the aggregate portfolio, for each firm separately. To do so, we require that each firm should have at least 16 quarters of data. We then report the cross-sectional average of firm-specific results in Panel A of Table 5. The average firm return variance is 4.58% at quarterly frequency, equivalent to an annualized volatility of 42.80%. The average variance of quarterly CF news is 3.78% and the variance of quarterly DR news is 1.70%. Accordingly, The slope coefficients indicate that 72% of quarterly stock price movement is driven by CF news, 28% by DR news; and the CF coefficient increases monotonically with time horizon. At 7-year horizon, 94% of price movement is driven by CF news. Therefore, CF news appears to be much more important than DR news does, consistent with prior studies. In addition, the average correlation between return and CF news is 0.79 at quarterly horizon, and steadily increases to 94% at 7-year horizon. Consistent with what we have learned from the aggregate portfolio, return and CF news move essentially in lock steps.

[12] When summarizing the results in Vuolteenaho (2002), Cochrane (2001) points out, "Much of the expected cashflow variation is idiosyncratic, while the expected return variation is common, which is why variation in the index book/market ratio, like variation in the index dividend/price ratio, is almost all due to varying expected excess returns."

In Panel B, we first average, cross-sectionally, the return, CF news, and DR news of all firms, which is equivalent to an equally-weighted market portfolio. For this market portfolio, the variances of quarterly return, CF news, and DR news are 0.82%, 0.46%, and 0.14%; the comparable numbers at firm level are 4.58%, 3.78%, and 1.70%. Therefore, aggregate return variance is much smaller, through reduction of variances for both components. The slope coefficients for quarterly CF news and DR news are 0.69 and 0.30 respectively; in comparison, the corresponding coefficients at firm levels are 0.72 and 0.28 respectively. At 7-year horizon, the CF and DR coefficients are 0.96 and 0.05 respectively; in comparison, the corresponding statistics at firm level are 0.94 and 0.06 respectively. Simply put, there is little sign indicating that the CF news is diversified more than the DR news, contrary to what has been documented. CF news is more important at both firm and aggregate levels.[13]

Our finding contrasts with the current view that CF (DR) news dominates at the firm (aggregate) level. Our results provide an interesting and plausible alternative for the following reasons.

First, it is a fact that, as investment horizon rises, stock return should increasingly represent CF news. In other words, the bulk of five-year stock return is likely to represent CF news at firm level. Therefore, the variation of the aggregate five-year return must be mainly driven by CF news. If one believes that the aggregate return is mainly due to DR news, one also has to explain how this dominance of DR news diminishes as horizon increases. In comparison, our results do not have this problem.

Second, if one believes that CF news dominates at the firm level but DR news dominates at the aggregate level, one has to explain at which level of diversification this flip happens. As we show in the next section, this flip does not exist. Rather, the current view is established due to the estimation methods that do not necessarily carry clear economic interpretations.

[13]Comparing Table 3 with Table 5, one can see that CF news is more important for the equally-weighted portfolio than for the value-weighted portfolio. As we show in the robustness section, this is not driven by diversification per se, but by the fact that CF news is relatively less important for larger firms.

How does one diversify DR news?

Since we find that both CF news and DR news can be diversified, one natural question is how to diversify the DR news. This can be done through at least two channels. First, depending on the nature of systematic risk, the DRs of different firms can change in different directions given the same macro shocks. As such, even if DR news is all driven by systematic risk, one can still diversify this risk by holding more stocks.

Second, the hypothesis that DR news is more "systematic" than CF news is based on the assumption that marginal investors hold diversified portfolios. To understand this, imagine that each stock is solely held by a separate investor, in which case both CF news and DR news are likely to be investor/firm-specific. Whether DR news is more "systematic" is related to the degree of diversification, and there is ample evidence suggesting that many investors hold undiversified portfolios (e.g., Goetzmann and Kumar (2005) and Statman (2004)). In addition, given that investors must make cash flow forecasts based on macroeconomic conditions, and that the operational performances of most firms are cyclical, CF news, even at firm level, could be quite systematic. Indeed, there is a growing literature stressing the systematic nature of CF risk at firm and portfolio levels (e.g., Campbell and Vuolteenaho (2004), Bansal, Dittmar, and Lundblad (2005), and Lettau and Watcher (2005)). For these reasons, whether CF news and DR news is more systematic at firm level, and which one is more likely to be diversified away, is an empirical issue. By using direct firm-specific CF news and DR news measures, our results suggest that both CF news and DR news can be diversified away. As a result, CF news is more important at both firm and aggregate levels.

4 Link to the literature

We have provided three pieces of evidence that run counter to the current literature. First, CF news is more important than DR news at the aggregate level, and increasingly more so as the investment horizon expands. Second, aggregate return and CF news are strongly positively correlated. Third, CF news is more important than DR news at firm level, and this relative importance does not diminish when one holds more diversified portfolios.

Large discrepancy demands careful examination. Our results are only meaningful to the extent that we can place it properly in the current literature.

Current method

The method generally used in the current literature can be explained using Campbell and Shiller's (1988) loglinearization. They show that the log dividend price ratio, suppressing a constant, can be proxied as

$$p_t - d_t = \sum_{j=0}^{\infty} \rho^j \left(\triangle d_{t+1+j} - r_{t+1+j} \right), \tag{16}$$

where p_t and d_t are log price and dividend respectively, and $\triangle d_{t+1+j}$ and r_{t+1+j} are log dividend growth and return respectively. If we take expectation on both sides, repeat the same exercise for the k-period forward equation, and take the difference, we obtain

$$\begin{aligned} p_{t+k} - p_t &= (d_{t+k} - d_t) + \left(E_{t+k} \left(\sum_{j=0}^{\infty} \rho^j \triangle d_{t+k+1+j} \right) - E_t \left(\sum_{j=0}^{\infty} \rho^j \triangle d_{t+1+j} \right) \right) \\ &\quad - \left(E_{t+k} \left(\sum_{j=0}^{\infty} \rho^j r_{t+k+1+j} \right) - E_t \left(\sum_{j=0}^{\infty} \rho^j r_{t+1+j} \right) \right). \end{aligned} \tag{17}$$

Following Vuolteenaho (2002), a similar presentation can be shown involving book equity and return on equity (ROE):

$$\begin{aligned} p_{t+k} - p_t &= (bv_{t+k} - bv_t) + \left(E_{t+k} \left(\sum_{j=0}^{\infty} \rho^j roe_{t+k+1+j} \right) - E_t \left(\sum_{j=0}^{\infty} \rho^j roe_{t+1+j} \right) \right) \\ &\quad - \left(E_{t+k} \left(\sum_{j=0}^{\infty} \rho^j r_{t+k+1+j} \right) - E_t \left(\sum_{j=0}^{\infty} \rho^j r_{t+1+j} \right) \right), \end{aligned} \tag{18}$$

where bv_t is log book equity and roe_{t+1+j} is log return on equity (i.e., earnings divided by the last period book equity.)

There are two ways to interpret these equations. First, they say that the k-period cumulative capital gain (i.e., proportional price movement) is equal to the k-period dividend growth rate plus the revision of the expectation of future dividend growth rates minus the revision of the expectation of discount rates. Second, if we move log dividends (book equity) to the left hand side, then they say that the change of log price-dividend ratio (market-to-book) must reveal the revision of the expectation of future

dividend growth (roe) and/or the revision of the expectation of discount rates.

What the current method does and does not do

The second interpretation has been the rationale behind most studies in the current literature that use the dividend price ratio (book-to-market) to predict future returns and dividend growth rates (ROE).[14] Besides the importance of examining predictability, some of them also study the relative importance of expected returns and expected cash flow growth rates in driving dividend price ratio (book-to-market) changes.

While this literature provides important evidence on predictability, it is only indirectly related to stock price volatility for the following reason. Consider a firm with constant dividend yield (book-to-market), constant expected discount rate, and constant expected CF growth rate; realized CF grows at the constant expected growth rate plus a noise. For such a firm the CF growth rate is not predictable, and there is no CF news in terms of revisions of expected CF growth rate.

However, this firm's stock price can still change a lot, and all changes are solely driven by news about CFs. The stock price changes reflect two things. First, they reflect the changes of realized CFs.[15] For this reason, there is a literature that studies the role of CF news by examining the relation between stock return and realized CFs (e.g., Roll (1988), Fama (1990), Stambaugh (1990), and Kothari and Shanken (1992)).

Second, the stock price changes reflect changes of expected future CFs. For example, further assume that at time t the firm has a book value at \$50 and a market value at \$100; and at time $t+k$ the firm has a book value at \$100 and market value at \$200. The cumulative capital gain is 100%, 50% of which comes from book equity change scaled by price at time t (\$100-\$50)/\$100), and 50% of which comes from expected future CFs. This is because, even though the expected CF growth rate is the same, it starts from a much higher base at $t+k$ (\$100 rather than \$50); so the expected CFs will double.

Therefore, there could be plenty of CF news even though the CF growth rate is

[14] A partial list includes Keim and Stambaugh (1986), Fama and French (1988), Harvey (1989), Campbell and Shiller (1988, 1998), Ferson and Harvey (1991), Cochrane (1992, 2006), Pesaran and Timmermann (1995), Kothari and Shanken (1997), Pontiff and Schall (1998), Lettau and Ludvigson (2001), Lewellen (2004), Campbell and Yogo (2005), Campbell and Thompson (2005), Ang (2002), Goyal and Welch (2003, 2005), Lettau and Ludvigson (2005), Larrin and Yogo (2006), Ang and Bekaert (2007), and Chen (2007).

[15] That is, price changes match changes in dividend payout (book equity).

unpredictable. In addition, the above example says that there might not be CF news in terms revisions of the expected CF growth rate, but there could still be lots of CF news in terms of revisions of expected future CFs in dollars. To answer the question of stock price volatility, the crucial measure is not the expected CF *growth rate* per se, but the expected CFs in dollars.

Most of previous studies (e.g., Cochrane (1992, 2001, 2006)) examine the ability of the dividend yield to predict return/CF growth rate. They provide direct evidence on predictability, and on the time variation of expected return and expected CF growth rate. But they do not provide direct evidence on stock price volatility. As explained above, CF news could drive stock price changes despite no predictability. Our approach says nothing about predictability, but provide direct evidence related to stock price movement.

Theoretically, one can use Equation (17) or Equation (18) to decompose return into CF news and DR news. Empirically, since neither expected CFs nor DRs are observable, they are estimated with noise, in which case return can be decomposed into CF news, DR news, and noise news. Since it is difficult to interpret the nature of the noise news, many studies avoid this problem by only estimating the DR news and define CF news as the difference between return and DR news (e.g., Campbell (1991), Campbell and Ammer (2003), and Campbell and Vuolteenaho (2004)). Since this approach is residual based, it is extremely sensitive to model specifications (see Chen and Zhao (2006) for a critique).

In comparison, since we use direct expected CF measures, we can decompose return into CF news and DR news by definition. The downside is that we assume that investors and analysts share similar views on expected CFs. We discuss this limitation in the robustness section.

This discussion is not meant to diminish the importance of the current studies. These studies provide direct evidence on predictability and the time variation of expected cash flow growth rate and return, which has important practical and modeling implications; but results based on predictability do not fully explain stock price movement. Our approach complements this literature in the sense that it says nothing about predictability, but provides direct answers to the question of "What drives stock

price movement?"

Ambiguity of predictability

Finally, most studies draw conclusions regarding the relative importance of expected cash flow growth rate and return based on their relative predictability. But predictability is small, frequently absent. More important, even if predictability can be detected, it is difficult to interpret its meaning. In particular, we show below that the flip of the importance of CF news through diversification, as widely documented in the current literature, has little to do with diversification. Rather, it is driven by the fundamental difference between cross-sectional and time-series predictability. Put differently, the conventional view is mainly due to a statistical issue and should not be interpreted as it is.

The difference between cross-sectional and time-series predictability is sometimes mentioned in the current literature, but never given enough attention. Basically, the cross-sectional heterogeneity in earnings is persistent, a fact widely documented with respect to value versus growth stocks (e.g., Lakonishok, Shleifer, and Vishny (1994), Fama and French (1995), and Cohen, Polk, and Vuolteenaho (2003)). It is thus relatively easy to predict CF growth cross-sectionally – growth firms tend to have higher CF growth in the following period. As a result, panel data studies, as usually used for firm and portfolio analysis, tend to find that CF news is more important. On the other hand, CF is difficult to predict in a pure time series regression, and this lack of CF predictability results in the finding that DR news dominates, a conclusion often found at the aggregate level. We show below that if pure time series regressions are used, DR news "dominates" at all three levels using the traditional methods. In other words, the existing conclusions at various levels are not comparable, because they are more related to the cross-sectional and time-series differences than related to diversification.

To illustrate this point, following Vuolteenaho (2002), we first rewrite equation (18) as

$$e_{t+1} = (\mathrm{E}_{t+1} - \mathrm{E}_t) \sum_{j=0}^{N} \rho^j roe_{t+1+j} - (\mathrm{E}_{t+1} - \mathrm{E}_t) \sum_{j=1}^{N} \rho^j r_{t+1+j}, \tag{19}$$

where e_{t+1} is the unexpected equity return. We then assume that the vector, $z_t =$

$[r_t \; roe_t \; bm_t]'$, following a first order VAR:

$$z_{t+1} = \Gamma z_t + u_{t+1}.$$

We choose the vector because these variables are mechanically related and it is consistent with the literature on the aggregate portfolio (e.g., Cochrane (1992, 2006)). Return and ROE can then be predicted through the VAR and the DR news and CF news can be estimated.[16] We report the following statistics: (i) the VAR coefficient of r_t on bm_{t-1} and its z-statistic; (i) the VAR coefficient of roe_t on bm_{t-1} and its z-statistic; (iii) the DR news variance; (iv) the CF news variance; and (vi) the ratio of DR/CF variance.

Following Vuolteenaho (2002) and Cohen, Polk, and Vuolteenaho (2003), we combine the COMPUSTAT annual tape with the CRSP annual data. We include in this analysis only firms that have at least 16 year's available data, and firms that have at least one of the z-statistics (for either return or ROE) above 1.8 since we do not want to draw inference on the firms in which case neither return nor roe is predictable.

We first conduct a time-series analysis for each firm and then report the cross-sectional mean of the above statistics in the first row of Panel A of Table 6. The cross-sectional mean z-statistic for return is 1.92 and the mean z-statistic for ROE is -1.26. That is, return is much more likely to be predictable relative to ROE. Accordingly, the mean variance ratio is 2.93. Therefore, at the firm level, when pure time-series analysis is conducted, return is more predictable and DR news is more important. We next repeat the above analysis using a panel VAR, as in the current literature, and report the results in the second row of the same panel. There the ROE coefficient is much larger and more significant, and the variance ratio become 0.16 – one would conclude that CF news dominates at firm level, exactly opposite to the time-series analysis.

Panel B reports similar comparisons at the portfolio level. In Panel B1, we first sort firms into ten book-to-market portfolios and repeat the time-series analysis for each of them. Except for the growth firms, (in which case the variance ratio is 0.60, suggesting that CF news is more important), the variance ratio is between 2.14 and 16.50 for the other nine portfolios. In other words, for most portfolios DR news plays a bigger role at the portfolio level if time-series analysis is conducted. We then conduct the panel

[16] For details see Vuolteenaho (2002), Campbell and Vuolteenaho (2004), and Chen and Zhao (2006).

analysis using the ten portfolios as a set of panel data, and report the results in the last row of panel B1. Here again ROE becomes much more predictable and the variance ratio is 0.60 – one would conclude that CF news is more important at the portfolio level if panel data is used.

In Panel B2, we sort firms into two book-to-market portfolios. The variance ratio for the growth firms is 7.14 and for the value firms is 6.94 – DR news dominates in both time series. When we pool the two portfolios as a panel, the variance ratio is 0.75; the result is again reversed. Finally, we analyze the market portfolio in panel B3; there the variance ratio is 5.12 – DR news dominates for the aggregate portfolio.

It is now clear that previous results are mainly driven by whether a panel or time-series analysis is conducted. If panel data is used, then CF news is always more important; if time-series analysis is conducted, then DR news is more important at the firm, portfolio, and aggregate level. These results have little to do with diversification. When the market is divided into two portfolios, each portfolio is very diversified, and yet we still find that CF news is more important if a panel regression is used.

Therefore, if the purpose is to study why stock prices move, which is more in a time series sense, then one would conclude, using conventional methods and realized return data, that DR news is more important at all levels. But this does not seem to make sense. It is reasonable to believe that CF news is at least important at the firm level. In addition, if one believes that DR news is more important, one also has to explain how this dominance of DR news goes away with increasing investment horizon.

What do we learn? The current literature can be reconciled with our new evidence on the following grounds. First, one should distinguish cross-sectional predictability from time-series predictability. Second, the current literature is more about predictability and less about stock price movement. Combining the current evidence and our results leads to the following picture: At firm, portfolio, and aggregate levels, returns are more predictable than CF growth rates in the time series dimension; but the opposite is true in the cross-sectional dimension because the cross-sectional heterogeneity of CFs is persistent. At all levels, CF news is more important than (at least as important as) DR news in driving stock price movements, and increasingly more so as investment horizon expands.

5 Robustness check

Size portfolios

We find that CF news is more important for the equally-weighted market portfolio than for the value-weighted market portfolio. This propels us to study size portfolios. Following Fama and French (1993), in June of each year, we sort firms into ten size portfolios, based on the market capitalization in June. The sorting then applies to the next four quarters. Using analyst data, we then study the relation among return, CF news, and DR news for each of the ten portfolios.

In Figure 2, the variance of quarterly CF news drops almost monotonically from small to large firms. In comparison, the variance of DR news is much smaller than the variance of CF news and is relatively flat. Therefore, CF news is more important in driving returns than DR news is, but much more so for small stocks. Accordingly, there is a clear downward trend, from small to large firms, of the CF slope coefficients: the coefficient is 0.86 for the smallest firms and around 0.50 for the largest firms. In addition, as we have found for the aggregate portfolio and an average firm, the return and CF news are strongly positively related across the portfolios. These patterns are also reported in Table 7.

Therefore, holding more stocks per se does not reduce the importance of CF news; holding proportionally more bigger stocks does. However, as shown in Table 3, even for the value-weighted portfolio that emphasizes on bigger stocks, CF news becomes completely dominant as investment horizon expands.

Alternative model

Our alternative model is based on Gehhardt. Lee, and Swaminathan (2001), Lee, Ng, and Swaminathan (2003), and Pastor, Sinha, and Swaminathan (2006). It has the following present value formula

$$P_t = bv_t + \sum_{i=1}^{4} \frac{ae_{t+i*1/4}}{(1+k_t/4)^{i*1/4}} + \sum_{i=2}^{T+1} \frac{ae_{t+i}}{(1+k_t)^{i}} + \frac{ae_{t+T+1}}{(1+k_t)^{T}},$$

where $T = 15$ years, ae_t is the abnormal earnings, and k_t is the implied cost of equity. The forecasts on earnings between year $t+1$ and $t+3$ are based on analyst forecasts,

and the forecasts for year $t+4$ to $t+T+1$ are based on the assumption that the year $t+3$ earnings growth rate mean reverts exponentially to its steady-state value by year $t+T+2$, where the steady-state growth rate is equal to the long-run nominal GDP growth rate. Starting from year $t+T+2$, there is no growth in abnormal earnings. Therefore, this approach differs from the earlier approach (from Claus and Thomas (2003) in that this formula has a longer forecast horizon (15 years), assumes a different pattern of change in growth rates over the forecast horizon, and a different steady-state growth rate (no growth in the steady state).

Table 8 reports the results using their approach. We reach the same conclusions: CF news is more important than DR news in driving stock price movement, and even more so at longer horizons. This conclusion holds at both firm and aggregate levels. In addition, return and CF news are strongly positively related at the aggregate level.

Monthly frequency

We have used quarterly frequency so far. Using annual frequency would lead to the same conclusions, but we do not report them because of the short time series. Since analyst forecasts are provided in each month, we can also estimate CF news and DR news at monthly frequency. We follow the same procedure as before and trails the quarterly book equity data by at least three months. The results are reported in Table 9. The main conclusions remain unchanged.

Reliability of data

Ljungqvist, Malloy, and Marston (2007) find abnormal analyst stock recommendation changes for the I/B/E/S data, which raises concerns for the reliability of data. While caution needs to be exercised, we believe this concern is likely to be secondary for our results. First, we use analyst forecasts for earnings growth, not recommendations. Second, we find consistent and strong results at firm, portfolio, and aggregate levels. It seems unlikely that such consistent results are driven by bad data on certain stocks.

A key assumption of our approach is that marginal investors (who determine prices) and financial analysts share similar views on expected future CFs. We do not need them to have identical forecasts on CFs; so long as the changes of the forecasts of the two

groups are significantly related, our main message – CF news is important in driving stock returns – is likely to get through. And this is a reasonable assumption since the financial analysts are the professionals paid to predict CFs. It is difficult to imagine that their forecasts on CF changes deviate completely from investors' forecasts.

Nor do we assume that stock prices respond to changes in analyst forecasts. It could be the other way around. So long as the changes of financial analyst forecasts pick up changes of expected CFs as projected by investors, our results will go through.

Finally, since we decompose return into CF news and DR news by definition, any bias/imprecision in the expected CF measures will be forced into the "DR news" and work against our finding of the importance of CF news. With more precise CF measures, our conclusions can be even stronger.

6 Conclusion

A central issue in asset pricing is whether stock prices move due to the revisions of expected future cash flows or/and of expected discount rates, and by how much. Since neither expectation item is observable, the traditional literature usually relies on return and cash flow predictability to draw inference on their relative importance. While this literature provides important evidence on predictability, such evidence usually does not fully explain stock price movement. For example, stock price movement may contain revisions of expected future cash flows even if cash flow growth rates are unpredictable. In addition, tests based on predictability are challenged by the small, usually absent, predictive power, and are sensitive to the fundamental difference between cross-sectional and time-series predictability.

We avoid the reliance on predictability by using direct expected cash flow measures. In particular, we use firm-specific market consensus analyst forecasts, coupled with price, to back out the discount rates; in this way the cash flow news and discount rate news can be identified by construction without resorting to predictability. We find that the cash flow news is more important at the firm, portfolio, and aggregate levels; that stock returns and cash flow news are strongly positively related; and that there is little relative diversification effect (of the two components) when a more diversified portfolio is used.

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Table 1 : Sample Summary by Year

The sample consists of firms, at quarterly frequency, on the I/B/E/S Summary files with earnings forecasts for the next three quarters, years +1, +2, and a five-year earnings growth estimate. Book values of equity for quarter 0 are obtained from the COMPUSTAT quarterly file. All per share numbers are multiplied by the number of shares outstanding (from I/B/E/S) to obtain amounts at the firm level. This table reports the aggregate amount at the market level for each year. Cost of equity is estimated using the earnings residual model. All amounts, except for dividend payout and cost of equity, are in millions of dollars.

Year	Number of Firms	Quarterly Earnings	Dividend Payout	Book Value	Market Capitalization	Cost of Equity
1985	796	17,722	38%	644,709	941,368	13.54%
1986	903	20,822	40%	800,537	1,264,741	11.22%
1987	816	24,745	38%	824,382	1,525,315	11.20%
1988	820	31,216	34%	870,625	1,369,705	12.61%
1989	892	29,516	35%	952,954	1,586,368	12.28%
1990	929	27,448	38%	1,026,251	1,720,210	12.72%
1991	982	25,593	43%	1,060,641	1,971,887	11.53%
1992	1,148	27,522	40%	1,172,466	2,395,071	10.54%
1993	1,334	36,531	38%	1,236,211	2,765,951	9.93%
1994	1,451	48,377	36%	1,382,590	2,997,120	10.55%
1995	1,604	59,389	33%	1,561,172	3,604,479	10.81%
1996	1,783	70,286	33%	1,810,664	4,651,745	10.41%
1997	1,961	73,472	33%	2,006,535	6,298,032	9.88%
1998	2,149	75,880	34%	2,152,197	7,442,635	9.92%
1999	2,020	89,452	34%	2,323,660	8,485,980	10.32%
2000	1,602	94,915	34%	2,633,611	8,275,137	11.41%
2001	1,562	59,686	37%	3,092,984	9,899,081	9.76%
2002	1,646	91,681	34%	3,425,911	9,218,086	9.20%
2003	1,826	129,817	34%	3,822,431	9,346,218	8.58%
2004	1,783	156,154	33%	4,447,136	11,184,540	7.92%
2005	1,755	181,327	33%	4,955,376	12,166,490	7.99%

Table 2 : Aggregate Cash Flow News and Discount Rate News

Panel A reports, for the value-weighted market portfolio, the mean of cumulative capital gain return (CG), cash flow (CF) news, discount rate (DR) news, from one quarter up to 28 quarters. Panel B reports the variances, covariances, and correlations of these three components. The means, variances, and covariances are all in percentage. The correlations are in actual digits. The sample is quarterly from 1985 to 2005.

Panel A: Means of aggregate return and components (%)

	Horizons (Quarters)								
	1	2	4	8	12	16	20	24	28
CG return	1.98	4.12	8.21	17.33	28.06	43.28	60.72	81.91	107.21
CF news	1.83	4.01	8.17	16.98	27.53	42.54	59.20	79.62	103.65
DR news	0.15	0.11	0.03	0.35	0.53	0.74	1.52	2.29	3.56

Panel B: Variance and covariances of aggregate return components

	Horizons (Quarters)								
	1	2	4	8	12	16	20	24	28
Var(CG)	0.54	1.04	1.91	4.84	9.83	16.80	23.98	29.21	37.91
Var(CF)	0.28	0.59	0.91	2.39	5.57	10.33	15.61	20.09	28.11
Var(DR)	0.21	0.27	0.39	0.60	0.80	0.99	1.09	1.11	0.90
Cov(CF, DR)	0.02	0.09	0.30	0.92	1.73	2.74	3.64	4.00	4.45
Corr(CF, DR)	0.10	0.24	0.51	0.77	0.82	0.86	0.88	0.85	0.86
Corr(CG, CF)	0.78	0.87	0.92	0.97	0.99	0.99	1.00	0.99	1.00
Corr(CG, DR)	0.69	0.68	0.80	0.89	0.90	0.91	0.93	0.90	0.92

Table 3 : Aggregate Return Decomposition

For the value-weighted market portfolio, we report the proportion of aggregate return variance that is explained by cash flow (CF) news and discount rate (DR) news respectively. This is obtained by regressing CF news and DR news on return respectively. We report the slope coefficients, Newey-West t-statistics (controlling for four lags), and R-squared, for regressions ranging from one quarter to 28 quarters.

	Horizons (Quarters)								
	1	2	4	8	12	16	20	24	28
CF news	0.57	0.66	0.64	0.68	0.74	0.78	0.80	0.82	0.86
T-stat	8.33	11.59	15.36	30.47	26.49	37.92	54.47	44.87	79.02
R-squared	0.61	0.76	0.85	0.95	0.97	0.98	0.99	0.99	0.99
DR news	0.43	0.35	0.36	0.32	0.26	0.22	0.20	0.18	0.14
T-stat	6.37	6.10	8.71	14.02	9.19	10.83	13.40	9.52	12.99
R-squared	0.47	0.46	0.64	0.80	0.81	0.83	0.86	0.80	0.84

Table 4 : Cyclicality of Cash Flow News and Discount Rate News

We regress the macroeconomic variables on cash flow (CF) news and discount rate (DR) news separately:

$$\text{MACRO}_t = \alpha + \sum_{i=0}^{1} \beta_i \times \text{NEWS}_{t-i} + \varepsilon_t.$$

We choose three variables representing the macroeconomic conditions: the industrial production growth rate, the real earnings growth rate, and the change of aggregate Baa over Aaa spread. We report the combined slope coefficients ($\sum_{i=0}^{2} \beta_i$), their Newey-West t-statistics (with up to three lags), and the R-squared in the table.

Statistics	Industrial Growth	Consumption Growth	Change of Baa over Aaa
Panel A: Cash flow news			
Coefficient	0.08	0.09	-0.94
T-stat	1.75	0.58	-2.06
R-squared	0.06	0.01	0.08
Panel B: Discount rate news			
Coefficient	0.16	0.65	-1.09
T-stat	2.44	2.38	-2.59
R-squared	0.09	0.08	0.07

Table 5 : Cash Flow News and Discount Rate News at Firm Level

Panel A reports the average firm-specific variances, covariances, and correlations of return, cash flow (CF) news, discount rate (DR) news, from one quarter up to 28 quarters; it then reports the slope coefficients of regressing CF news and DR news on return respectively. The variances and covariances are in percentage, and the correlations are in actual digits. In panel B we first calculate the cross-sectional average of return, CF news, and DR news, thus creating an equally-weighted market portfolio. We then repeat the reporting as in panel A.

	Horizons (Quarters)								
	1	2	4	8	12	16	20	24	28
Panel A: Firm level									
Var(CG)	4.58	9.09	17.81	39.64	63.86	91.36	132.93	180.79	262.77
Var(CF)	3.78	7.89	15.59	36.16	59.69	85.70	126.26	172.05	253.10
Var(DR)	1.70	2.72	3.68	4.43	4.77	4.98	5.07	4.77	4.83
Cov(CF, DR)	-0.45	-0.76	-0.73	-0.48	-0.30	0.34	0.80	1.99	2.42
Corr(CF, DR)	-0.13	-0.11	-0.05	-0.02	-0.02	-0.01	0.02	0.02	0.01
Corr(CG, CF)	0.79	0.83	0.86	0.91	0.92	0.93	0.94	0.94	0.94
Corr(CG, DR)	0.43	0.39	0.39	0.33	0.29	0.27	0.27	0.26	0.24
CF news	0.72	0.77	0.81	0.87	0.90	0.91	0.93	0.94	0.94
DR news	0.28	0.23	0.19	0.13	0.10	0.09	0.08	0.06	0.06
Panel B: Equally-weighted portfolio									
Var(CG)	0.82	1.45	1.95	3.46	5.14	6.24	10.98	14.19	24.10
Var(CF)	0.46	0.90	1.10	2.27	3.69	4.94	9.11	12.86	22.09
Var(DR)	0.14	0.19	0.25	0.24	0.29	0.24	0.27	0.23	0.22
Cov(CF, DR)	0.11	0.18	0.30	0.47	0.58	0.53	0.80	0.55	0.89
Corr(CF, DR)	0.43	0.44	0.56	0.64	0.56	0.49	0.51	0.32	0.40
Corr(CG, CF)	0.93	0.95	0.96	0.98	0.98	0.99	0.99	0.99	1.00
Corr(CG, DR)	0.73	0.71	0.78	0.78	0.71	0.63	0.62	0.43	0.48
CF news	0.69	0.74	0.72	0.80	0.84	0.88	0.91	0.95	0.96
DR news	0.30	0.25	0.28	0.20	0.17	0.13	0.10	0.05	0.05

Table 6 : Cash Flow News and Discount Rate News Using Return Data

The unexpected equity return can be presented as

$$e_{t+1} = (\mathrm{E}_{t+1} - \mathrm{E}_t) \sum_{j=0}^{N} \rho^j roe_{t+1+j} - (\mathrm{E}_{t+1} - \mathrm{E}_t) \sum_{j=1}^{N} \rho^j r_{t+1+j},$$

where e_{t+1} is the unexpected equity returns, roe is log return on equity, and r is log return. We assume that a vector of [r ROE Log of book-to-market] following a first order VAR:

$$z_{t+1} = \Gamma z_t + u_{t+1}.$$

Then both the cash flow news and discount rate news can be estimated. We report the VAR coefficient of R and ROE on lagged book-to-market and their z-statistics respectively. We then report the discount rate (DR) news variance, cash flow (CF) news variance, and the DR/CF variance ratio. In panel A we conduct the above exercise for every firm separately, and report the cross-sectional means of the above statistics. To be included a firm should have at least 16 quarters of data and at least one of the r and roe coefficients has a z-statistic over 1.80. We then estimate a panel VAR with all firms included and report the results. In panel B2 we sort firms into ten book-to-market portfolios. As in panel A we report the analysis for each portfolio and for the panel of portfolios. In panel B2 we sort firms into two book-to-market portfolios and repeat the analysis. In panel B3 we report the results for the value-weighted market portfolio.

	Coe(r)	Z(r)	Coe(roe)	Z(roe)	Var(DR)	Var(CF)	Var Ratio
Panel A: Firm level analysis							
Mean	0.31	1.92	-0.12	-1.26	4.35	4.50	2.93
Panel	0.07	34.70	-0.11	-73.85	0.03	0.16	0.16
Panel B: Portfolio analysis							
Panel B1: Ten book-to-market portfolios							
Growth	0.16	1.66	-0.27	-5.47	0.02	0.03	0.60
2	0.13	1.90	-0.03	-1.79	0.02	0.01	2.14
3	0.08	1.27	0.00	-0.10	0.02	0.00	16.50
4	0.11	1.40	0.04	1.86	0.05	0.01	5.80
5	0.11	1.67	-0.02	-1.03	0.01	0.00	4.78
6	0.18	2.59	0.00	0.24	0.02	0.00	12.10
7	0.22	3.08	0.02	0.95	0.03	0.00	7.10
8	0.30	4.01	0.00	-0.17	0.02	0.00	7.34
9	0.33	3.64	0.01	0.40	0.03	0.00	7.83
Value	0.08	1.56	-0.01	-0.54	0.02	0.01	3.76
Panel	0.06	4.86	-0.07	-13.78	0.01	0.01	0.60
Panel B2: Two book-to-market portfolios							
Growth	0.13	1.85	0.00	-0.29	0.02	0.00	7.14
Value	0.18	2.64	0.00	-0.25	0.02	0.00	6.94
Panel	0.08	2.42	-0.03	-4.38	0.01	0.01	0.75
Panel B3: Value-weighted market portfolio							
	0.15	2.06	0.00	-0.09	0.02	0.00	5.12

Table 7 : Variance Decomposition as a Function of Firm Size

We sort firms into ten size portfolios. For each portfolio, we report the variances, covariances, and correlations of quarterly return, cash flow (CF) news, and discount rate (DR) news. The variances and covariances are in percentage, but the correlations are in actual digits. We also report the slope coefficients and Newey-West t-statistics (four lags) of regressing CF news on return.

	Var(cf)	Var(dr)	Cov(Cf,DR)	Corr(Cf,Dr)	Corr(CG,Cf)	Corr(CG,Dr)	CF Coef	T-stat
Small	1.19	0.17	0.02	0.05	0.94	0.41	0.86	23.57
2	0.88	0.18	0.10	0.26	0.93	0.59	0.78	16.01
3	0.78	0.22	0.08	0.20	0.91	0.60	0.74	16.55
4	0.54	0.21	0.15	0.44	0.92	0.77	0.66	26.27
5	0.50	0.22	0.10	0.30	0.88	0.72	0.65	13.59
6	0.46	0.17	0.08	0.28	0.90	0.68	0.69	15.46
7	0.36	0.18	0.08	0.31	0.88	0.73	0.63	14.44
8	0.43	0.20	0.05	0.16	0.85	0.65	0.66	11.55
9	0.40	0.15	0.03	0.11	0.86	0.59	0.70	10.26
Large	0.26	0.27	0.01	0.02	0.71	0.72	0.49	7.31

Table 8 : Robustness Check Using an Alternative Model

We use a model based on Gehhardt. Lee, and Swaminathan (2001), Lee, Ng, and Swaminathan (2003), and Pastor, Sinha, and Swaminathan (2006) to back out the implied cost of equity. Panel A reports, for the value-weighted market portfolio, the slope coefficients of regressing cash flow (CF) news and discount rate (DR) news on return respectively. Panel B reports the correlation between return and CF news. Panel C reports the average firm-level slope coefficients of regressing CF news and DR news on return respectively.

	Horizons (Quarters)								
	1	2	4	8	12	16	20	24	28
Panel A: Slope coefficients for the value-weighted market portfolio									
CF news	0.77	0.83	0.80	0.84	0.86	0.87	0.89	0.91	0.91
DR news	0.23	0.17	0.20	0.16	0.14	0.13	0.11	0.10	0.09
Panel B: Correlation between return and CF news for the value-weighted portfolio									
Corr(CG, CF)	0.96	0.98	0.98	0.99	1.00	1.00	1.00	1.00	1.00
Panel C: Slope coefficients for an average firm									
CF news	0.93	0.93	0.93	0.95	1.00	0.98	1.01	1.00	1.01
DR news	0.07	0.07	0.07	0.05	0.01	0.02	-0.01	0.01	0.00

Table 9 : Robustness Check Using Data at Monthly Frequency

We use the Claus and Thomas (2001) model with analyst forecast data at monthly frequency. Panel A reports, for the value-weighted market portfolio, the slope coefficients of regressing cash flow (CF) news and discount rate (DR) news on return respectively. Panel B reports the correlation between return and CF news. Panel C reports the average firm-level slope coefficients of regressing CF news and DR news on return respectively.

	Horizons (Months)								
	1	3	6	12	24	36	48	60	72
Panel A: Slope coefficients for the value-weighted market portfolio									
CF news	0.57	0.60	0.66	0.64	0.68	0.74	0.77	0.81	0.83
DR news	0.43	0.40	0.34	0.36	0.32	0.27	0.23	0.19	0.17
Panel B: Correlation between return and CF news for the value-weighted portfolio									
Corr(CG, CF)	0.80	0.82	0.88	0.93	0.97	0.99	0.99	1.00	0.99
Panel C: Slope coefficients for an average firm									
CF news	0.71	0.74	0.78	0.81	0.86	0.89	0.90	0.90	0.92
DR news	0.28	0.25	0.22	0.19	0.14	0.11	0.10	0.10	0.08

Figure 1 : Aggregate Return, Cash Flow News, and Discount Rate News

We plot the quarterly return, cash flow news and discount rate news for the value-weighted market portfolio for the 1985-2005 period.

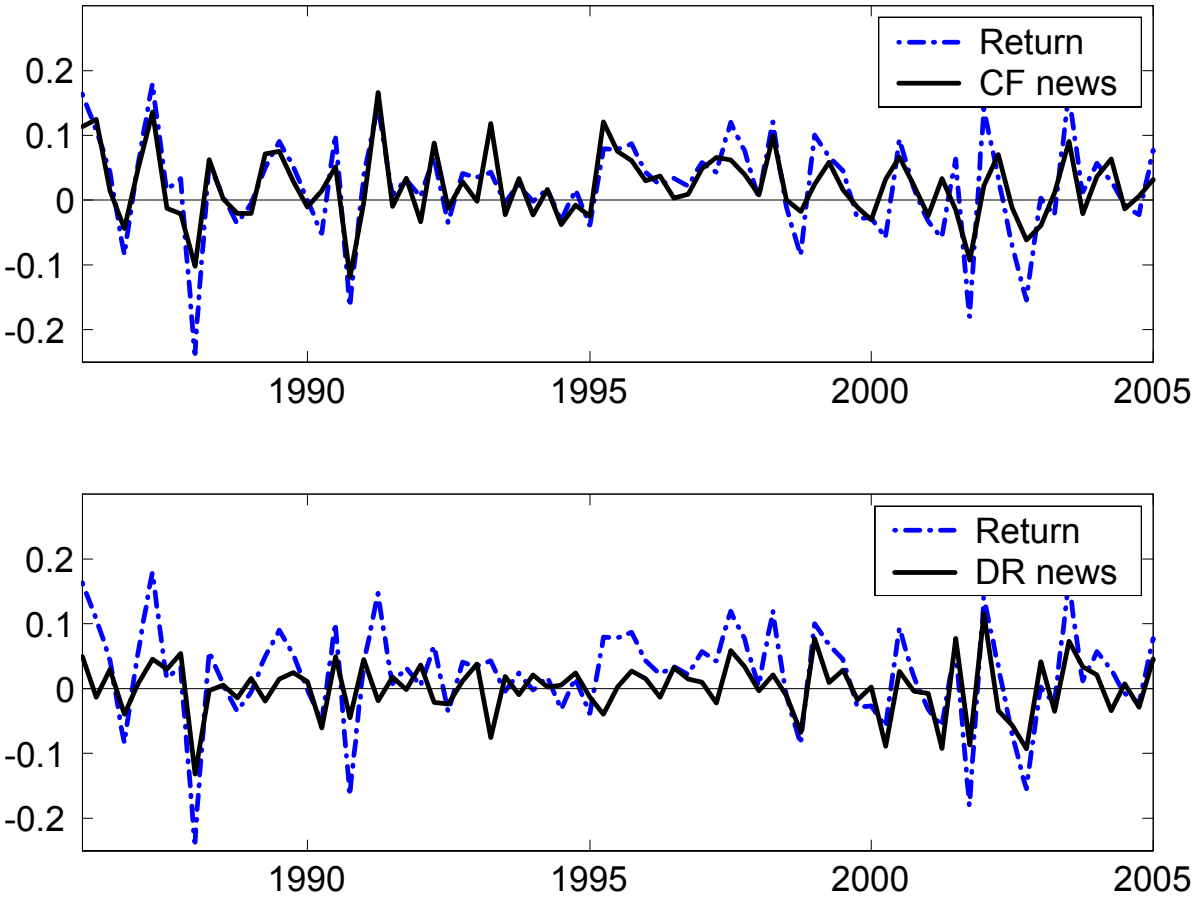

Figure 2 : Cash Flow News and Discount Rate News for Size Portfolios

We sort firms into ten size portfolios. We then plot the variances and covariances of quarterly cash flow (CF) news and discount rate (DR) news, and the correlation between return and CF news across portfolios. We also plot the slope coefficient of regressing CF news on return.