Earnings forecasts and idiosyncratic volatilities ☆

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ABSTRACT

We test the theoretical relation between idiosyncratic return volatilities and the volatilities of cash-flow news based on the expected returns on equity (ROE) for CRSP stocks over the period 1977–2008. Consistent with economic intuition, we find that using analyst forecasts of earnings is superior to using realized earnings to proxy for market expectations about future cash flow news. Our findings are consistent with a market where stock return volatilities are positively and asymmetrically related to changes in the volatilities of expectations for a fundamental driver of cash flow news (ROE). Our findings are robust after correcting for forecast biases, various fundamental variables, newly-listed and mature firms, and periods with and without earnings announcements.

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1. Introduction

A growing literature in finance examines the power of changes in realized (ex post) fundamentals to explain idiosyncratic risk. Using Campbell's (1991) return decomposition framework, Vuolteenaho (2002) finds that aggregate volatility is mainly driven by expected return news (i.e., discount rates changes). He also finds that firm-level volatilities are highly related to changes in ex post cash-flow expectations (i.e., changes in realized earnings or returns on equity (ROE)).

Similarly, Irvine and Pontiff (2009), Rajgopal and Venkatachalam (2011), Wei and Zhang (2006), Jiang and Lee (2006) and Zhang (2010) relate idiosyncratic volatilities (IV) calculated using raw or market-adjusted realized returns to various measures of realized cash-flows as proxied by earnings or ROE and/or their volatilities. The power of these tests depends upon whether or not realized (actual) earnings or their ratios are a good proxy for the fundamental news expectations that are incorporated into stock returns and their volatilities.

Our research is closest to Jiang, Xu and Yao (2009) who use unexpected earnings and the error in the quarterly forecasts of analysts at the end of each quarter to proxy for future earnings shocks to examine the predictive power and the informational content of idiosyncratic volatilities. In contrast, we study the determinants of idiosyncratic volatilities by examining the behavior and the impact of the volatilities of earnings shocks rather than the level of the shocks per se. We extend the literature on the determinants of idiosyncratic volatilities by providing an empirical framework that relates return volatilities to changes in expected cash-flow volatilities as captured by changes in the updated monthly earnings forecasts of analysts, and not changes in realized quarterly (or annual) earnings as in previous work. This is based on the belief enunciated by Campbell (1991), among others, that news about *changes in the expectations* of future cash flows and not their past levels induce subsequent return volatilities. It is also consistent with our finding that realized earnings volatilities (unlike their

expected counterparts) underestimate the volatilities of future earnings (cash-flow news), which leads to a downward bias in the relationship between idiosyncratic volatilities and the volatilities of cash-flow news. Furthermore, the use of forecasts avoids the introduction of a look-ahead bias as in other studies by invoking the very tenuous assumption that realized (actual) earnings or cash flows on an annual or quarterly basis for the next one to three years are either good predictors of their current values or are approximately equal to their currently expected values. Since the forecasts of analysts are available on a monthly basis and are part of the publicly available information set of investors at time t, this also provides for more timely and synchronous evaluations of the impact of *changes* in earnings expectations on expected returns.[2] The use of changes in the forecasts of analysts to capture cash-flow shocks also allows for an examination of whether the response of idiosyncratic volatility is asymmetric in that it depends on whether the changes in expected earnings signal bad or good news.

As is done for asset-pricing tests of whether or not idiosyncratic risk is priced (e.g., Ang, Hodrick, Xing & Zhang, 2006b; Fu, 2009), we obtain our time-varying monthly idiosyncratic volatilities using the within-month daily error terms from the one-factor (market) model and the four-factor Carhart model. We examine the robustness of the relationship between idiosyncratic volatilities and cash-flow news by controlling for periods with and without earnings announcements (Landsman & Maydew, 2002)[3] and firm characteristics such as whether the firm is newly listed or mature, size, leverage and book-to-market (Wei & Zhang, 2006). We extend the robustness tests to control for the effect on return *IV*s of realized ROE, the optimism bias of analysts using a metric based on historical forecast errors to investigate if such forecasts lead to market corrections of firm valuations,[4] forecast dispersion, asymmetry in return volatilities, earnings quality (accruals), and expected return volatilities.

We make seven contributions to the literature. First, we successfully explore a potential explanation for the time-varying pattern of stock return *IV*s, which is consistent with an ex ante fundamental view of return variances. Consistent with the pricing of fundamentals, we find that stock return volatilities are related to changes in ex ante (not ex post) cash-flow news about ex ante fundamental variables such as earnings. Second, we find that the use of earnings forecasts for up to three years as a proxy for earnings expectations provides a more realistic description of how the market adjusts to changes in future cash-flow expectations (Gleason & Lee, 2003) than using annual or quarterly observations of past reported (realized) earnings (Wei & Zhang, 2006). Third, we find that the relation between *IV*s and expected cash-flows as proxied by changes in forecast earnings is persistent through time and remains robust particularly with the inclusion of realized ROE and after controlling for earnings forecast error, volatility of expected returns, other fundamental variables (such as size, leverage and book-to-market), newly-listed and mature firms, and periods with and without earnings announcements. Fourth, we provide further evidence for the asymmetric property of *IV*s based on monthly changes in expected cash-flows and not only on news following earnings announcements as commonly reported in the literature. Fifth, by developing a methodology that uses earnings forecasts that are adjusted and unadjusted for analyst bias, we find that the market appears to adjust to the bias in earnings forecasts when forming its expectations. Sixth, our results indicate that earnings quality as measured by a firm's accruals cannot be the sole informational explanation for the time-variation in *IV*s. Seventh, our findings from panel root tests for changes in expected ROE (ΔEROE) are consistent with stationarity and our cross-sectional time-series

regressions of *IV* against ΔEROE variabilities ($V\Delta$EROE) indicate that the $V\Delta$EROE play an important role in explaining *IV* changes even after controlling for any time-trend in IV.

2. Return variances and cash-flow news proxies

2.1. Return variance proxy incorporating cash-flow news expectations

From a fundamentalist view, a firm's stock return is driven by shocks to *expected* cash flows and/or discount rates. Vuolteenaho (2002) uses the Campbell (1991) return-decomposition framework and an accounting-based approach known as the clean surplus relationship that leads to the following decomposition, where ROE is used instead of dividends to represent the relationship between returns and cash-flow changes[5]:

$$r_t - E_{t-1} r_t = \Delta E_t \sum_{j=0}^{\infty} \rho^j (e_{t+j} - r_{f,t+j}) - \Delta E_t \sum_{j=0}^{\infty} \rho^j r_{t+j} + \kappa_t \qquad (1)$$

where $r_t - E_{t-1} r_t$ is the return deviation; $r_t = \log(1 + R_t + R_{ft}) - r_{ft}$ with R_t and R_{ft} represent simple excess stock returns and risk-free interest rates, respectively; $r_{ft} = \log(1 + R_{ft})$; ΔE_t denotes the change in expectations from $t-1$ to t; $e_t = \log(1 + X_t/B_{t-1})$ is the ROE from $t-1$ to t when B_{t-1} is the book-value of equity at $t-1$ and X_t is earnings from $t-1$ to t; ρ is a discount factor; and κ_t is an approximation error. When the variance of the unexpected return from Eq.(1) is decomposed into the variance of expected return news, N_r, and cash-flow news, N_{cf}, we obtain:

$$\mathrm{var}(r_t - E_{t-1} r_t) = \mathrm{var}(N_{r,t}) + \mathrm{var}(N_{cf,t}) - 2\,\mathrm{cov}(N_{r,t}, N_{cf,t}), \qquad (2)$$

and

$$N_{cf,t} \equiv \Delta E_t \sum_{j=0}^{\infty} \rho^j (e_{t+j} - r_{f,t+j}) + \kappa_t, \text{ and } N_{r,t} \equiv \Delta E_t \sum_{j=0}^{\infty} \rho^j r_{t+j}. \qquad (3)$$

To focus on changes in expected (not realized) cash flows as required by the variance decomposition, we use:

$$\mathrm{var}(r_t - E_{t-1} r_t) = \mathrm{var}\left[\Delta E_t \sum_{j=1}^{\infty} \rho^j (e_{t+j})\right] + \zeta_t \qquad (4)$$

where ζ_t contains the variances in the expected return news, the error term κ_t, the risk-free rate and all the covariance terms.[6] Unlike Wei and Zhang (2006) who use the time-series of realized quarterly earnings to measure the conditional volatilities of expected ROE, our approach uses revisions of earnings forecasts by analysts for each of the next three years for that purpose. This is grounded in the belief that the revisions and not their levels cause returns to change (Campbell, 1991). By including revisions in multi-year-ahead forecasts of earnings, we expect to explain more of the variations in stock returns (Liu & Thomas, 2000). Using the three forward-looking forecasts leads to the following approximate relationship:

$$\mathrm{var}(r_t - E_{t-1} r_t) = \sum_{j=1}^{3} \mathrm{var}\left[\Delta E_t \rho^j e_{t+j}\right] + 2\,\mathrm{cov}\left[\Delta E_t \rho e_{t+1}, \Delta E_t \rho^2 e_{t+2}\right]$$
$$+ 2\,\mathrm{cov}\left[\Delta E_t \rho e_{t+1}, \Delta E_t \rho^3 e_{t+3}\right] \qquad (5)$$
$$+ 2\,\mathrm{cov}\left[\Delta E_t \rho^2 e_{t+2}, \Delta E_t \rho^3 e_{t+3}\right] + \psi_t + \zeta_t$$

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[2] Analysts provide more timely forecasts and incorporate information beyond past earnings and financial statements, including market-wide behavior, voluntary disclosures and non-financial information.

[3] A vast literature that begins with Beaver (1968) reports increased return variances around earnings announcements. Other studies include Patell and Wolfson (1984) and Salamon and Stober (1994).

[4] See, for example, Michaely and Womack (1999), Dechow, Hutton and Sloan (1999), and Scharfstein and Stein (1990).

[5] Liu, Nissim and Thomas (2002, 2007) find that cash-flow valuations are dominated by earnings, and that earnings-based valuations are closer to traded prices than cash-flow-based valuations.

[6] Vuolteenaho finds that the error term κ_t and the covariance between cash-flow news and discount rate news are small.