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Idiosyncratic volatility: An indicator of noise trading?

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ABSTRACT

We investigate the market efficiency implications of firm-specific return variation measured by absolute idiosyncratic volatility. We find that the absolute idiosyncratic volatility (the variance of the residual from an asset-pricing model) displays a positive and robust relationship to mispricing, which reflects an increasing role of noise traders. Previous literature has produced similar – or opposing – results. We deepen our understanding of the previous conflicting results by showing that (1) market volatility by itself is associated with mispricing, (2) absolute idiosyncratic volatility is associated with mispricing even when controlling for market volatility, (3) the strength of the association between absolute idiosyncratic volatility and mispricing depends on the level of market volatility, and (4) absolute and relative measures of idiosyncratic volatility have opposing associations with mispricing. Our findings contribute to the existing literature by reconciling the mixed results for the relationship between idiosyncratic volatility and mispricing displayed in the previous literature.

1. Introduction

What is the essence of idiosyncratic volatility? Based on asset-pricing models, idiosyncratic volatility measures the part of the variation in returns that cannot be explained by the particular asset-pricing model used. However, beyond the stale econometric definition of idiosyncratic volatility, there is little consensus regarding the meaning of firm-specific return variation in the context of market efficiency. Previous studies have argued that idiosyncratic volatility can reflect either capitalization of private information into stock prices or noise trading. Roll (1988) first pointed out that U.S. firms' stock returns display low R-squared values when estimated by common asset pricing models; the average R-squared is about 20% for daily returns' models and about 35% when monthly returns are used. In the conclusion (p. 566) of his article, Roll suggested that his evidence seems to imply that idiosyncratic volatility is indicative of either "informed trading" or "occasional frenzy" unrelated to concrete information. Over the years since Roll (1988), the debate on which of the two aforementioned views of idiosyncratic volatility is more appropriate has been fueled by numerous studies often exposing contradicting views.

We contribute to this stream of the literature by exploring a fundamental question: how does idiosyncratic volatility relate to equity mispricing? Our contribution is twofold. First, we show that absolute idiosyncratic volatility (the variance of the residual from an asset-pricing model) displays a positive and robust relationship to multiple measures of mispricing (based on either accounting information or alternatively abnormal stock returns). Thus, we find that larger values of absolute idiosyncratic volatility reflect an increasing role of noise traders. Second, we show that the interaction between market volatility, idiosyncratic volatility, and R-squared is an important aspect for understanding the mixed results in the previous literature. Specifically, we show that market volatility by itself is associated with mispricing in such a way that (1) the magnitude of the association between absolute idiosyncratic volatility and mispricing depends on the level of market volatility and (2) absolute and relative measures of idiosyncratic volatility show opposing associations with mispricing.[3]

Using cross-country data, Morck et al. (2000) find that stocks in countries with stronger property rights have higher absolute idiosyncratic volatility. They argue that strong property rights promote informed arbitrage, leading to more firm-specific information and thus high absolute idiosyncratic volatility. Durnev et al. (2003) find that firms and industries with greater relative idiosyncratic volatility display greater stock price informativeness. They

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[3] Since we distinguish absolute and relative measures of idiosyncratic volatility, we will use two terms, "absolute" and "relative" throughout the paper.

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define informativeness as the amount of information stock prices contain about future earnings, which they estimate from a regression of current stock returns against future earnings changes. They argue that if relative idiosyncratic volatility reflects the capitalization of private information into prices, high relative idiosyncratic volatility is a sign of active trading by informed arbitrageurs and implies that the stock price is tracking its fundamental value closely. In addition, Jin and Myers (2006) in a study involving stock returns from 40 countries over the 1990–2001 period test whether limited information (lack of transparency) can affect the division of risk bearing between inside managers and outside investors. They provide evidence consistent with the notion that if a firm is less transparent, insiders will be able to capture more firm-specific risk. Greater opaqueness leads to lower amounts of firm-specific risk absorbed by outside investors and therefore to lower levels of idiosyncratic volatility, i.e. high levels of R-squared. In this context, opaqueness (reflected in low levels of idiosyncratic volatility) limits the ability of outside investors to evaluate changes in cash flows, and consequently their equity valuation will be less accurate. The *informed trading hypothesis* predicts that idiosyncratic volatility and mispricing are negatively related because high idiosyncratic volatility levels are associated with more trading by informed investors who trace the firm's fundamental value.

On the other hand, in line with Roll's alternative interpretation of idiosyncratic volatility as "occasional frenzy", idiosyncratic volatility can reflect noise trading. For example, Bhagat et al. (1985) show that firms with higher equity issuing costs have higher firm-specific daily stock return volatility, which is a proxy for asymmetric information between firm insiders and outsiders. Krishnaswami and Subramaniam (1999) use absolute idiosyncratic volatility as a measure of information asymmetry and find that firms engage in spin-offs to reduce information asymmetry. Kelly (2014) provides evidence that a low market model R-squared (i.e., high relative idiosyncratic volatility) is indicative of a poor information environment with greater impediments to informed trade. If higher levels of idiosyncratic volatility reflect greater impediments to informed trades and/or informational asymmetry, then they should be associated with noise trading. Furthermore, Pontiff (2006) shows that risk-averse arbitrageurs assign smaller portfolio weights to stocks with higher absolute idiosyncratic volatility due to the difficulty in hedging idiosyncratic volatility of individual stocks as argued by Shleifer and Vishny (1997). De Long et al. (1990) show that the unpredictability of noise traders' beliefs generates a risk in the asset price that hinders rational arbitrageurs from aggressively betting against them. Dontoh et al. (2004) find that noisy trading activity reduces the association between stock prices and accounting information such as earnings and book values. In this view, named the *noise trading hypothesis* and supported by numerous empirical studies,[4] it is predicted that the relationship of idiosyncratic volatility and mispricing is positive because in the presence of noise trading and arbitrage costs, stock prices will deviate from fundamental value.

To test the relationship between stock mispricing and idiosyncratic volatility, we use an absolute measure of idiosyncratic volatility.[5] Thus, in our study, absolute idiosyncratic volatility is the main independent variable in an empirical model of stock mispricing, which is measured based on accounting information or alternatively abnormal stock returns. Theoretically, the level of mispricing can be affected by either noise trading and/or the rate of private information that gets absorbed into prices. Our empirical tests provide strong and robust evidence in support of the noise trading hypothesis. When we classify firms into groups by independently sorting on absolute idiosyncratic volatility and mispricing levels, we find that average mispricing levels tend to monotonically increase as one compares stocks with low levels of absolute idiosyncratic volatility to those with high levels of absolute idiosyncratic volatility. In our multiple regression analysis, we first estimate a linear regression model of different mispricing proxies on absolute idiosyncratic volatility and find that mispricing increases in absolute idiosyncratic volatility, consistent with the noise trading hypothesis.

Our results are not driven by the model of returns used to estimate the absolute idiosyncratic volatility measures or by the choice of estimation methodology. We conduct various robustness tests based on alternative absolute idiosyncratic volatility measures, constructed by adding industry returns, including the Fama–French (1993) three factors, the Carhart (1997) four-factor model, and using weekly returns in lieu of daily returns. We also use ex-ante measures of mispricing and show the results do not change, consistent with the view that there is high alpha persistence. In addition, we re-estimate models using several other estimation methods, such as a time-series average of regressions (Fama and MacBeth, 1973), a firm-fixed effect regression, and a cluster-correcting model. Throughout these different robustness checks, our results remain unaltered.

We furthermore show that outliers do not drive our results. First, we transform the absolute idiosyncratic volatility measure into ranks from 0 to 1 and then test the relationship between ranks and mispricing measures. Second, we exclude thinly traded stock. Third, we sort absolute idiosyncratic volatility into deciles by assigning dummy values and we control for these dummies instead of our original measure of absolute idiosyncratic volatility in the main regression model. Again, throughout all three robustness tests our results remain unaltered.

Finally, we test for a potential non-linear relationship between absolute idiosyncratic volatility and mispricing. A multivariate regression shows that the inflection point of the inverted U-shaped curve is beyond the 99th percentile, which indicates that for all practical purposes we confirm the noise trading hypothesis.

In the second part of the paper, we deepen our understanding of the reasons for the lack of consensus in the existing literature by investigating the interaction between market volatility, idiosyncratic volatility, and R-squared - the denominator of the relative idiosyncratic volatility, which is an alternative measure, often used in the literature. First, we show that market volatility by itself is associated with mispricing and that absolute idiosyncratic volatility is associated with mispricing even when controlling for market volatility. Second, we show that the strength of the association between absolute idiosyncratic volatility and mispricing depends on the level of market volatility. Finally, we show that - due to the above interaction between market volatility, idiosyncratic volatility, and R-squared - absolute and relative measures of idiosyncratic volatility have opposing associations with mispricing.

[4] Examples of studies that argue or show that more firm-specific return variation captures noise are: Xu and Malkiel (2003), Hou et al. (2005), Kelly (2014), Mashruwala et al. (2006), Pontiff (2006), Ashbaugh-Skaife, Gassen, and LaFond (2006), Chan and Hameed (2006), Griffin, Kelly, and Nadari (2007), and Teoh, Yang and Zhang (2008).

[5] To test the relationship between stock mispricing and idiosyncratic volatility, one can use either an absolute or a relative measure of idiosyncratic volatility. As addressed in Li et al. (2014), choosing between relative and absolute idiosyncratic volatility is crucial in research settings addressing the determinants of idiosyncratic volatility because absolute and relative idiosyncratic volatility have often provided conflicting evidence that can be interpreted either as in support of a noise or an information hypothesis. In fact, although most studies using relative idiosyncratic volatility seem to adopt an information view, their perspective is not unchallenged (e.g., see Kelly (2014)). Similarly, the absolute idiosyncratic volatility measure has not been always viewed as a measure of private information incorporation into prices but also as a measure of arbitrage risk (e.g. see Doukas et al. (2010)). We use an absolute measure of idiosyncratic volatility in our main analysis but in our elaborations we will show why the two measures may provide conflicting results.