JMSE **2017**, 2(1), 55–68
doi:10.3724/SP.J.1383.201003
http://www.jmse.org.cn/
http://engine.scichina.com/publisher/CSPM/journal/JMSE

Article

The Relationship between Firm-Specific Return Variation and Price Informativeness: Some Cross-Sectional Evidence

Xiao Li [1,2], Dehua Shen [1,3,*] and Silvano Cincotti [4]

[1] College of Management and Economics, Tianjin University, Tianjin 300072, China; lx713@tju.edu.cn

[2] China Center for Social Computing and Analytics, Tianjin University, Tianjin 300072, China

[3] Key Laboratory of Computation and Analytics of Complex Management Systems (CACMS), Tianjin University, Tianjin 300072, China

[4] DIME-CINEF, University of Genova, Genova 16145, Italy; silvano.cincotti@unige.it

* Correspondence: dhs@tju.edu.cn; Tel.: +86-13820038920

Received: 21 March 2017; Accepted: 22 May 2017; Published: 14 June 2017

Abstract: The progressive removal of short-selling constraints in the Chinese stock market provides us with a natural experiment to investigate the relationship between firm-specific return variation (FSRV) and price informativeness. Based on the empirical finding that idiosyncratic volatility is a satisfied proxy for FSRV when the information environment for individual firms improves, we mainly find that the FSRV is negatively related to price informativeness. This negative relationship is robust to alternative model specifications, alternative proxies for price informativeness, and alternative estimation windows. Generally speaking, our results complement the extant literature on the mixed relationships between FSRV and price informativeness by providing cross-sectional evidence.

Keywords: Firm-specific return variation; Short-selling; Idiosyncratic volatility; Price informativeness; Natural experiment

JEL Codes: G14; G15

1. Introduction

The relationship between firm-specific return variation (hereafter FSRV) and price informativeness is controversial in extant literature. While one strand of the literature considers a positive relationship between FSRV and price informativeness, while the other argues a negative relationship exists. Such controversial conclusions may originate from Roll (1988) who holds the opinion that the unexplained FSRV seems to "imply the existence of either private information or else occasional frenzy unrelated to concrete information." Identifying the relationship between FSRV and price informativeness is crucial for the following two reasons. First, studies using FSRV to quantify price informativeness should decide whether FSRV is positively or negatively related to price

informativeness. Second, the relationship between FSRV and price informativeness may have important implications for market efficiency. A positive relationship may imply that the larger the unexplained fraction of stock prices, the more the public information that has been incorporated into prices and the higher is the market efficiency as a whole; whereas a negative relationship may indicate the opposite.

In this study, we utilize the opportunity introduced by the Chinese short selling mechanism to construct a natural experiment to explore the relationship between FSRV and price informativeness using idiosyncratic volatility as a proxy. This mechanism was approved on 31 March 2010, by the China Securities Regulatory Commission (CSRC). In order to improve market efficiency, the Shanghai Stock Exchange (SSE) and Shenzhen Stock Exchange (SZSE) allow stock lending and margin trading for stocks that meet prescribed criteria. According to Diamond and Verrecchia (1987) and Chang et al. (2014), the intensified short-selling and margin-trading activities after the launch of the short selling mechanism in China are associated with more informed investors that construct strategies based on information about a firm's fundamental values. Specifically, a large number of investors involved in short-selling activities are institutional investors and only a small number of individual investors are allowed to sell short.[1] Hence, the Chinese short-selling mechanism provides us with a rare opportunity to reinvestigate the relationship between FSRV and price informativeness under a more informative environment where stock prices are driven more by fundamental value-based trading.[2] Identifying the underlying driving forces for stock prices, that is, fundamental value-based trading or noise trading, is quite crucial for investigating the aforementioned relationship. A recent study by Lee and Liu (2011) demonstrates that in a scenario where stock prices are mostly driven by noise trading, FSRV is negatively related to price informativeness, whereas in a scenario where the fundamental value-based trading dominates stock prices, there is a U-shaped relationship between FSRV and price informativeness. Since most of the prior literature mainly shows a negative relationship between FSRV and price informativeness, the U-shaped relationship seems interesting and worth reinvestigating. Although Lee and Liu (2011) prove the existence of the U-shaped relationship, they fail to identify the dominant force behind stock prices before conducting empirical studies, which makes their findings less persuasive. While Lee and Liu (2011) do not speak much about noise trading, this study utilizes the short-selling mechanism to identify the driving force behind stock prices and reduce the impact of noise trading. In a situation where stock prices are mainly driven by fundamental value-based trading, the launch of the Chinese short-selling mechanism allows us to reexamine whether the U-shaped relationship between FSRV and price informativeness still exists by constructing more purified endogenous proxies for price informativeness resulting from a more informed environment.

This study contributes toward extant literature in several ways. First, as it complements prior studies focusing on developed countries (e.g., Ali et al., 2003; Mashruwala et al., 2006; Mendenhall, 2004; Pontiff, 2006; Pontiff & Schill, 2004; Rajgopal & Venkatachalam, 2011), we provide the first piece of evidence stating the relationship between FSRV and price informativeness in the Chinese stock market by using idiosyncratic volatility as a proxy. Second, responding to Lee and Liu's (2011) study, we do not find the U-shaped relationship in the Chinese stock market. In situations where stock prices are mainly driven by fundamental value-based trading, FSRV is found to be negatively

1 Requirements set by the Shanghai Stock Exchange (SSE) and Shenzhen Stock Exchange (SZSE) mainly include the following: investors should have more than 18 months of experience in the stock market, and the market value of investors' share holdings should reach at least 500,000 RMB. The SSE and SZSE allow security companies to set other requirements to better regulate the total market risk while encouraging appropriate leverage.

2 There are significant margin total ratios and short sale total ratios and therefore support the argument that stock prices are driven more by fundamental value-based trading. The statistical data is available upon request.

related to price informativeness. Such a negative relationship still exists while using different asset pricing models to derive idiosyncratic volatility as well as applying different measurements for price informativeness. Third, since we make use of institutional holdings to quantify price informativeness, we also provide alternative evidence for the relationship between idiosyncratic volatility and institutional holdings from a time-series perspective. Contrary to the study by Xu and Malkiel (2003) that demonstrates institutional holdings as an important factor for the increase in idiosyncratic volatility, we find a negative relationship between idiosyncratic volatility and institutional holdings. This implies indirectly that a time-series increase in idiosyncratic volatility is not due to an increase in institutional holdings.

The remainder of this paper is organized as follows. Section 2 provides the literature review, and section 3 describes the data and methodology. Section 4 illustrates the models and section 5 presents the main empirical results. Section 6 describes robustness and section 7 concludes.

2. Literature Review

Current studies mainly rely on one of the following two proxies for FSRV: price synchronicity and idiosyncratic volatility. Theoretically, price synchronicity refers to the fraction of stock return variation that can only be explained by market factors, that is, the comovement between the individual stock return and the market return (Campbell et al., 2001). In that sense, studies using price synchronicity as the proxy for FSRV regard a negative relationship between the two. Price synchronicity is often calculated as the R^2 statistics in asset pricing regression models. Hence, if price synchronicity (R^2) is found to be positively related to price informativeness, then there should be a negative relationship between FSRV and price informativeness, and vice versa. In other words, price synchronicity can only represent FSRV indirectly since it accurately measures the market return variation.

Unlike price synchronicity, idiosyncratic volatility refers to the fraction of stock return variation that can only be explained by firm-specific information, namely, the part that is not associated with market returns and cannot be eliminated through portfolio diversification (e.g., Campbell et al., 2001; Goetzmann & Kumar, 2008 Merton, 1987). In regression models, idiosyncratic volatility is often calculated as the variance of residuals that measures FSRV directly. Therefore, a positive relationship between idiosyncratic volatility and price informativeness implies that FSRV is also positively related to price informativeness. Based on the concepts and indications of idiosyncratic volatility and price synchronicity, current studies investigating the relationship between FSRV and price informativeness often treat price synchronicity and idiosyncratic volatility as interchangeable proxies for FSRV. That is, there is a negative relationship between price synchronicity and idiosyncratic volatility. However, the controversial conclusion of the relationship between FSRV and price informativeness associated with using either price synchronicity or idiosyncratic volatility raises considerable doubts over the aforementioned interchangeable relationship between the two proxies. For example, recent studies by Li et al. (2014) prove that there is no interchangeable relationship between price synchronicity and idiosyncratic volatility and state that researchers should be cautious when using the two proxies to represent FSRV. In addition, Bartram et al. (2012) find that both idiosyncratic volatility and price synchronicity increase, thereby breaking the widely accepted negative relationship between the two. Specifically, Zhang et al. (2016) directly show that price synchronicity is an appropriate proxy for FSRV only in the event that the information environment for individual firms improves, while idiosyncratic volatility is a universally satisfied proxy for FSRV irrespective of whether the information environment improves or deteriorates. Hence, it is more accurate to use idiosyncratic volatility as the proxy for FSRV in different information scenarios.

Referring to the relationship between idiosyncratic volatility and price informativeness, most extant literature argues that idiosyncratic volatility is negatively related to price informativeness. For example, using earnings quality as a proxy for price informativeness, Rajgopal and Venkatachalam (2011) observe that higher idiosyncratic volatility deteriorates earnings quality. Since price informativeness is unobservable and difficult to quantify, studies often track the changes in price informativeness through financial anomalies. Efficient market hypothesis leaves no space for financial anomalies, and therefore persistent as well as strong manifestations of financial anomalies indicate low price informativeness and vice versa. Mendenhall (2004) shows a significant positive relationship between idiosyncratic volatility and the magnitude of post-earnings announcement drifts, which implies that idiosyncratic volatility is negatively related to price informativeness. Consistently, Ali et al. (2003) find that another anomaly, namely, the book-to-market effect, is also greater for stocks with higher idiosyncratic volatility. Since arbitrageurs within the market contribute toward reducing mispricing as well as improving the extent of information incorporated in stock prices through proper arbitraging activities, we may view the relationship between idiosyncratic volatility and price informativeness from the perspective of arbitrageurs. According to Pontiff (1996, 2006), idiosyncratic volatility is the major cost that can impede arbitrageurs from pushing individual stock price to the fundamental value through arbitraging. In line with Pontiff (2006), Mashruwala et al. (2006) demonstrate that idiosyncratic volatility is the source of the two major barriers faced by most arbitrageurs, that is, transaction costs and the absence of close substitute stocks. Empirically, Pontiff and Schill (2004) prove that the long-run seasoned equity offering (SEO) associated with higher levels of idiosyncratic volatility imposes higher costs on arbitrageurs. Stambaugh et al. (2015) find that stocks with relatively higher arbitrage costs, which are brought about by high idiosyncratic volatility produce lower future returns for investors compared with those with lower arbitrage costs. Reduced future returns weaken the investors' motivation to adopt arbitrage, and costs as well as barriers associated with high idiosyncratic volatility have material impact on preventing investors from arbitraging. In the event that few arbitrageurs with limited arbitraging activities are left in the market, price informativeness reduces and less information is incorporated in stock prices owing to the persistent mispricing and lack of price correction to firms' fundamental values. Therefore, the common theme that unifies all the above is that idiosyncratic volatility is negatively related to price informativeness.

Current studies investigating the relationship between idiosyncratic volatility and price informativeness mainly focus on developed markets and not on developing markets such as the Chinese stock market. Exploring such issues in the Chinese stock market is quite important and necessary since developing markets have their own characteristics that are distinct from developed markets. Such differences may cause completely different results for the relationship between idiosyncratic volatility and price informativeness. On the one hand, the information environments for developing countries such as China are less efficient and transparent compared with developed countries: the former have larger information asymmetry and more opaque announcements (e.g., Hu & Liu, 2013; Jian & Wong, 2004; Jin & Myers, 2006; Kevin & Yuan, 2004; Morck et al., 2000). However, the Chinese stock market mainly comprises of individual investors. Compared to institutional investors, individual investors are more irrational and sensitive to behavioral biases that may reduce the market efficiency as well as have special effects on the relationship between FSRV and price informativeness (e.g., Barber & Odean, 2000; Feng & Seasholes, 2008; Lee & Liu, 2011). In other words, exploring the relationship between price informativeness and FSRV in the Chinese stock market can be regarded as a start to unfold stories behind developing markets. However, studies that investigate such issues in the Chinese stock market are limited. To the best of our knowledge, there are only two studies, Hu and Liu (2013) and Cheng et al. (2014), which use price synchronicity as a proxy for FSRV and arrive at contradictory

conclusions about the relationship between FSRV and price informativeness. Owing to the inappropriateness and limited situations of using price synchronicity, it is quite necessary to reinvestigate the relationship using idiosyncratic volatility as a proxy.

3. Data Description and Methodology

The short-selling regulation was introduced by the CSRC on 31 March 2010. Under this regulation, eligible stocks are progressively added to the designated list and allowed to be sold short. In particular, we define an addition event as a stock that is added to the designated list. Up to 22 September 2014, there were 985 addition events.[3] Table 1 illustrates the occurrence of the 985 addition events. We can see that the distribution of the addition events is not quite skewed, and therefore the empirical results are not biased by the macroeconomic conditions (e.g., Engle & Rangel, 2008; Zhang et al., 2013b). The capital data is obtained from the RESSET Financial Research Database, including the daily individual stock return, market return, trading volume, Fama–French's three factors, and the quarterly institutional holdings. In particular, we choose the CSI 300 Index return as the market return as it was the first market index launched by both the Shanghai Stock Exchange (SSE) and the Shenzhen Stock Exchange (SZSE) with the aim of representing the entire Chinese stock market. The three-month Shanghai Interbank Offered Rate (SHIBOR) is downloaded from its official website (available online: http://www.shibor.org/) and is considered a risk-free return rate. Table 2 reports the statistical properties of individual returns and market returns with the pooled analysis around effective dates (in Table 1) with pre- and post-120 trading days. The results show that the individual returns have larger skewness and kurtosis than that of the market returns.

As we consider the post period of the addition events as a more informative environment enabling us to construct a more suitable proxy for price informativeness, we adopt the event study methodology to observe the changes of idiosyncratic volatility against the proxy for price informativeness in the post period of the addition events. In the initial empirical analysis, we choose post-sixty and 120 trading days to perform the analysis, respectively.

Table 1. The Addition Events

Effective Date	Addition Events
2010/3/31	90
2010/7/1	5
2010/7/29	1
2011/12/5	189
2013/1/31	276
2013/9/16	206
2014/9/22	218

3 In fact, our sample period spans from 31 March 2010 to 4 May 2015. After the addition events on 22 September 2014, there are also 6 times changes of the designated list and they are the deletion events. Since the focus of the paper is on the additional event, we do not report the deletion events in the paper.

Table 1. *Cont.*

Effective Date	Addition Events
Cumulated	985

Note: This table reports the addition events in which stocks on the Chinese Stock Market have undergone short sale constraint changes. Column l reports the dates on which the stocks could have been sold short. Column 2 reports the chronological changes of the addition events. The last row of the table reports the cumulated number of addition events.

Table 2. Statistical Properties of Individual Returns and Market Returns

Index	N	Mean	Median	Std.	Kurtosis	Skewness	Max	Min
Individual returns	236400	0.0012	0.0004	0.0279	14.8952	0.6764	0.9110	−0.1484
Market returns	236400	0.0002	0.0001	0.0141	5.4777	−0.0925	0.0671	−0.0875

Note: This table reports the statistical properties of individual returns and market returns with the pooled analysis around effective date (Table 1) with pre- and post-120 trading days.

4. Models

4.1. Measurement of Idiosyncratic Volatility

In line with the traditional method to decompose the idiosyncratic volatility from the total volatility (Dasgupta et al., 2010; Li et al., 2014; Morck et al., 2000), we calculate the idiosyncratic volatility with the capital asset pricing model (CAPM) model. In particular, we first perform the stock-level regressions and then calculate the standard deviation of the regression residuals (ε_{it}) as the idiosyncratic volatility (IV_i).

$$r_{it} = \alpha_i + \beta_i r_{mt} + \varepsilon_{it} \quad (1)$$

where r_{it} is the return for stock i on day t, r_{mt} is the CSI 300 Index return, which is considered as the market return on day t. α_i and β_i are the regression coefficients.

Therefore, the idiosyncratic volatility for stock *i* in the post period of addition events is calculated as:

$$IV_i = \frac{1}{T-1}\sum_{t=1}^{T-1} \hat{\varepsilon}_{it}^2 \quad (2)$$

where T is the number of trading days in the post-addition events.

4.2. Measurement of Price Informativeness

Following Lee and Liu (2011), we define price impact (PI) as the ratio of absolute daily return divided by the daily trading volume, averaged over certain trading days in post-addition events. This ratio represents the absolute price change per trading volume and measures the illiquidity of a stock. With a high price impact value, one has to experience a greater loss to either buy or sell the stock. Besides Chordia et al. (2008) document that illiquidity reduces arbitrage trading, which in turn results in less price informativeness. Therefore, we construct the price informativeness proxy based on the reverse measurement of price impact (RPI) with the following transformation:

$$PI_t = \frac{|Ret_t|}{TV_t} \quad (3)$$

$$RPI_t = -log(0.0001 + PI_t) \quad (4)$$

where Ret is the daily stock returns, TV is the daily trading volume, PI is the daily price impact and RPI is the reverse measurement of price impact, that is, the proxy for the price informativeness.

5. Empirical Results

We first calculate the stock-level price informativeness, that is, RPI, with 60 and 120 trading days after the addition events with models (3) and (4), respectively. Moreover, we classify the stock-level price informativeness into 10 subgroups. We then average the corresponding stock-level idiosyncratic volatility for each subgroup with d1 representing the subgroup with the lowest price informativeness and d10 representing the subgroup with the highest value. Fig. 1 illustrates the idiosyncratic volatility and RPI (the proxy for price informativeness), and it shows that with the increase in RPI, the idiosyncratic volatility becomes increasingly smaller (CAPM-60 and CAPM-120 denote the utilization of market model to calculate the idiosyncratic volatility with 60 and 120 trading days, respectively). To obtain a clear illustration, we also plot the ordinary least squares (OLS) fitted lines in Fig. 2, the downward sloping lines (the slopes for the CAPM-60 and CAPM-120 are −1.3835 and −2.8897, respectively) confirm the negative relationship.[4]

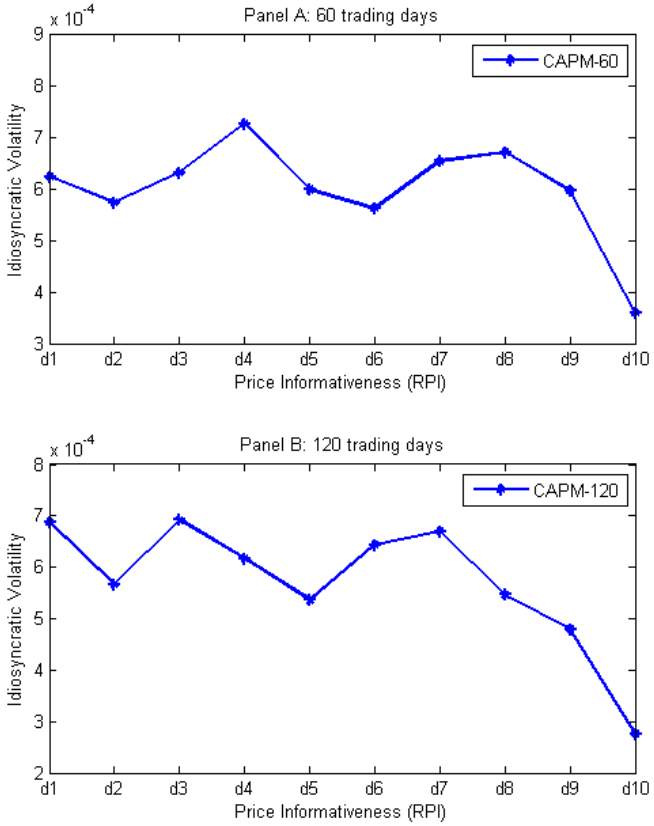

Fig. 1 Idiosyncratic Volatility and Price Informativeness (*RPI*)

4 Although the curves in Fig. 1 seem to be flat, we conclude that the firm-specific return variation is negatively related to price informativeness. The reason is that results based on other model specifications and proxies show more obvious downward tendencies.

This figure illustrates the idiosyncratic volatility against the RPI (the proxy for price informativeness). Specifically, we estimate models (3) and (4) to obtain the daily price informativeness. We then classify stocks into 10 subgroups by the value of price informativeness. Next, we plot the mean idiosyncratic volatility for each of the 10 subgroups over the sample period. Panel A and Panel B illustrate the results on the relationship with 60 trading days and 120 trading days, respectively.

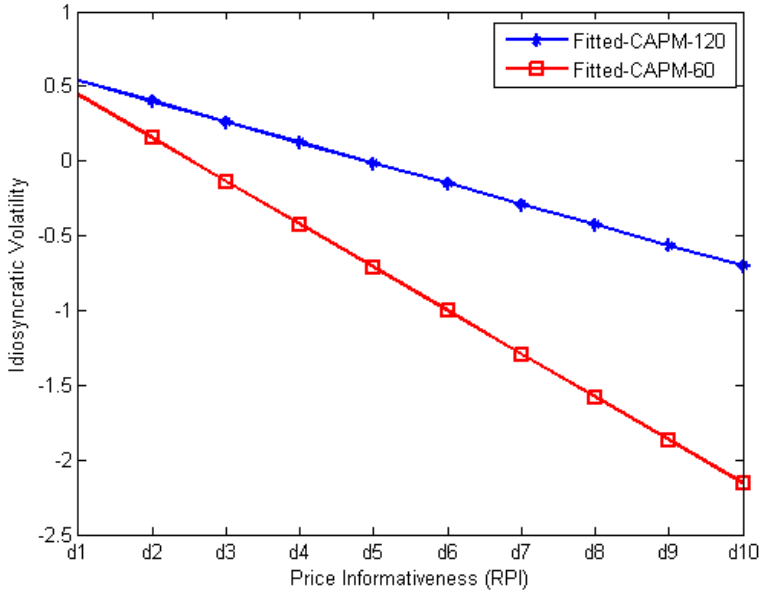

Fig. 2 Idiosyncratic Volatility and Price Informativeness (*RPI*) with Fitted Lines

6. Robustness

Given the fact that it is reasonable to adopt the difference-in-difference (DID) method to rule out the confounding factors contaminating our empirical results, we argue that the DID method does not apply to our study. Since the stocks in the addition events are prudently determined considering the daily turnover, price exchange ratio, and market capitalization, it is impossible to find a group of stocks with similar characteristics and construct the comparative group (Zhang et al., 2015).[5] Therefore, we use an alternative model specification, namely, alternative proxy for price informativeness and alternative estimation windows.

6.1. Alternative Model Specification

As the first robustness test, we employ the Fama–French three-factor model as the alternative regression model to calculate the stock-level idiosyncratic volatility, taking into consideration the market factor, the size factor, and the book-to-market factor (Ang et al., 2006; Fu, 2009; Zhang et al., 2016). The regression model is expressed as follows:

$$r_{it} - rf_t = \alpha_i + \beta_1 \ (r_{mt} - rf_t) + \beta_2 \ SMB_t + \beta_3 \ HML_t + \varepsilon_{it} \quad (5)$$

where r_{it} is the return for stock i on day t, r_{mt} is the CSI 300 Index return as the market return on day

5 For example, Zhang et al. (2015) mention that the stocks in the addition events on 31 March 2010 were the largest 50 stocks on the SSE and the largest 40 stocks on the SZSE.

t; rf_t is the three-month SHIBOR on day t; SMB_t is the return on the portfolio for size factor on day t; HML_t is the return on the portfolio for the book-to-market factor on day t; and α_i, β_i, β_1, β_2, and β_3 are the regression coefficients.

With the same grouping method, Fig. 3 illustrates that the relationship between idiosyncratic volatility and price informativeness remains negative for both 60 and 120 trading-day periods while using the Fama–French three-factor model. The fitted slopes are −1.6930 and −2.6366, respectively.

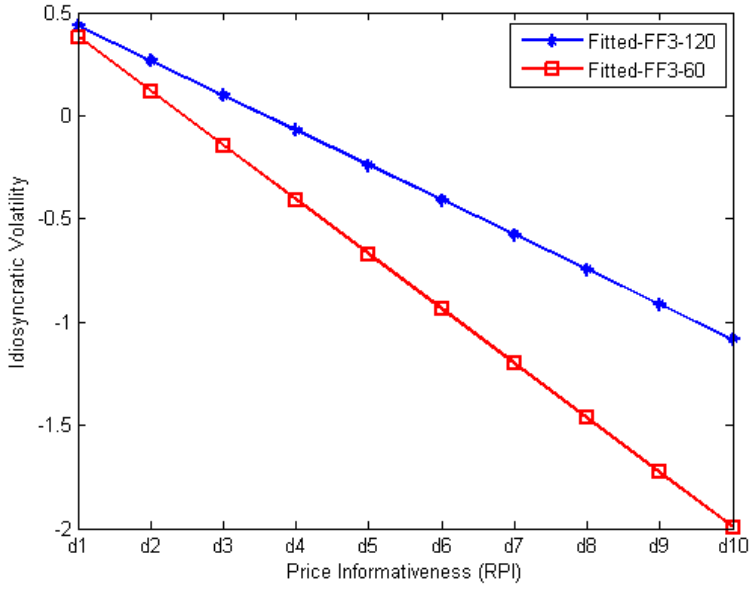

Fig. 3 Idiosyncratic Volatility Calculated by the Fama–French Three-Factor Model and Price Informativeness (*RPI*) with Fitted Lines

6.2. Alternative Proxy

We further employ the institutional ownership (IO) as an alternative proxy for price informativeness. It is widely accepted that institutional investors are more sophisticated than individual investors with respect to searching for, acquiring, and processing information (Rubin & Smith, 2009). In particular, Jiambalvo et al. (2002) document that an increase in institutional ownership improves the proportion of information reflected in stock prices, indicating a positive relationship between institutional ownership and price informativeness. Therefore, we calculate the increased rate of the institutional ownership ($IRIO$) between the nearest ex-ante institutional ownership and the nearest ex-post institutional ownership around the addition events as a proxy for price informativeness. Figures 4 and 5 illustrate the OLS fitted lines of the results obtained from the market model and Fama–French three-factor model, respectively. They show that the relationship between idiosyncratic volatility and price information is negative.

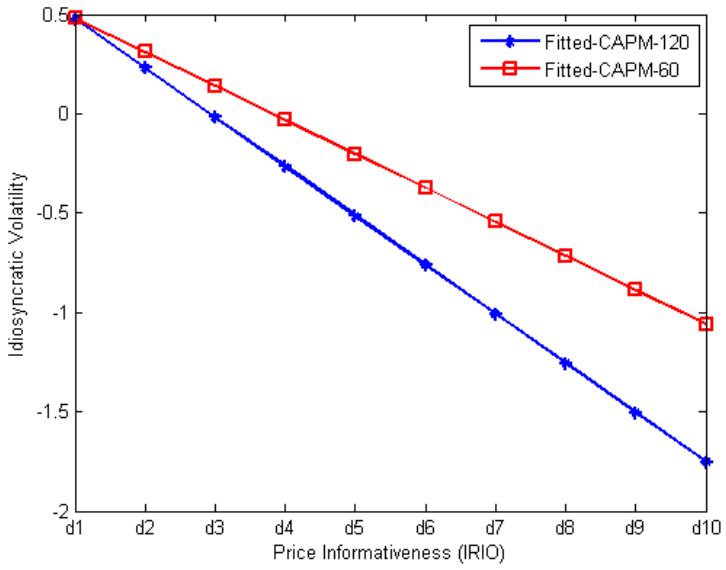

Fig. 4 Idiosyncratic Volatility Calculated by the CAPM Model and Price Informativeness (*IRIO*) with Fitted Lines

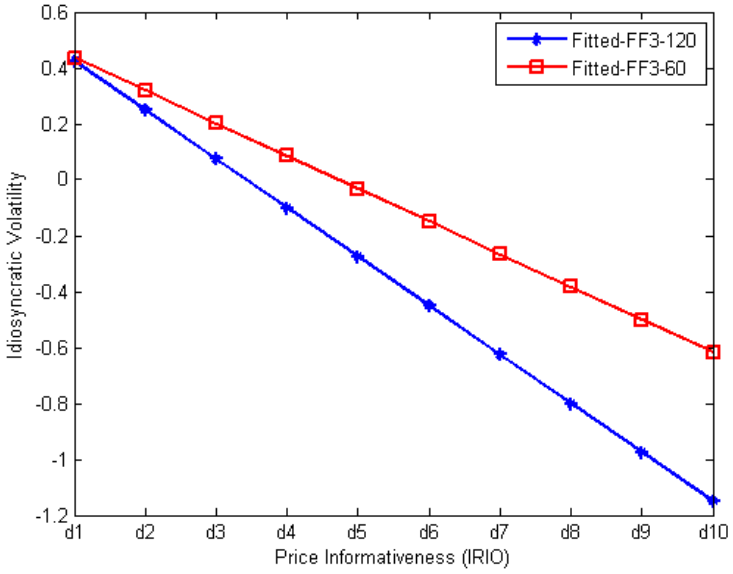

Fig. 5 Idiosyncratic Volatility Calculated by the Fama–French Three-Factor Model and Price Informativeness (*IRIO*) with Fitted Lines

6.3. Alternative Estimation Windows

Since the choice of the estimation windows, namely, 60 and 120 trading days in the initial performance, is arbitrary, we recalculate the idiosyncratic volatility with alternative estimation windows, assign stocks into 10 groups, and observe the changes of idiosyncratic volatility against proxies for price informativeness. For a clear illustration, Tables 3 and 4 summarize the estimated slopes for all the models with the proxy of RPI and $IRIO$, respectively. We can clearly see that all the slopes are negative. Therefore, the results suggest a negative relationship between idiosyncratic volatility and price informativeness. Besides, we also plot the slopes in a continuous manner from 30 to 120 trading days in Figures 6 and 7. With the exception of some positive slopes on the 32 trading days estimation window, all the slopes are negative. Therefore, we can conclude that there exists a negative relationship between idiosyncratic volatility and price informativeness.

Table 3. Summaries of the Slopes of the RPI Proxy for Price Informativeness

Number of Post-Trading Days	CAPM	FF3 Model
30	–0.4358	–0.7184
40	–0.3431	–0.7446
50	–0.7786	–1.3441
60	–1.3835	–1.6930
70	–2.0061	–2.0979
80	–2.3101	–2.3288
90	–2.1625	–2.1519
100	–2.7189	–2.5534
110	–3.0957	–2.8194
120	–2.8897	–2.6366

Table 4. Summaries of the Slopes of the $IRIO$ Proxy for Price Informativeness

Number of Post-Trading Days	CAPM	FF3 Model
30	–2.3479	–1.7817
40	–2.2581	–1.6182
50	–2.1459	–1.4366
60	–2.4827	–1.7495
70	–2.3381	–1.6771
80	–2.1182	–1.5167
90	–1.6576	–1.0922
100	–1.6455	–1.0891
110	–1.7046	–1.1648
120	–1.7112	–1.1693

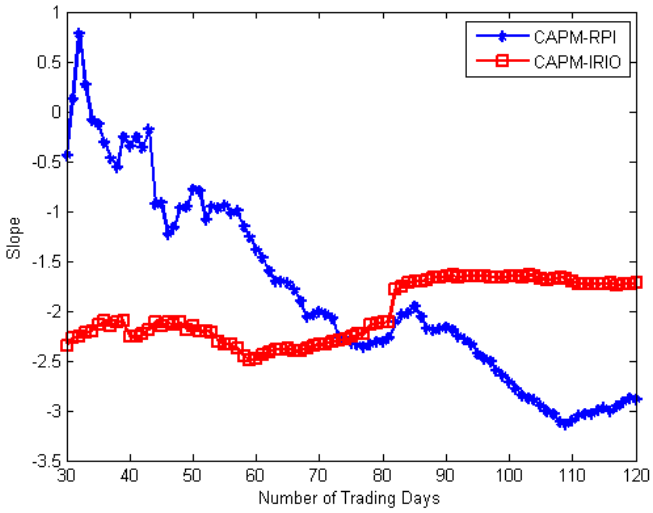

Fig. 6 Idiosyncratic Volatility Calculated by the CAPM Model and Price Informativeness with Alternative Windows

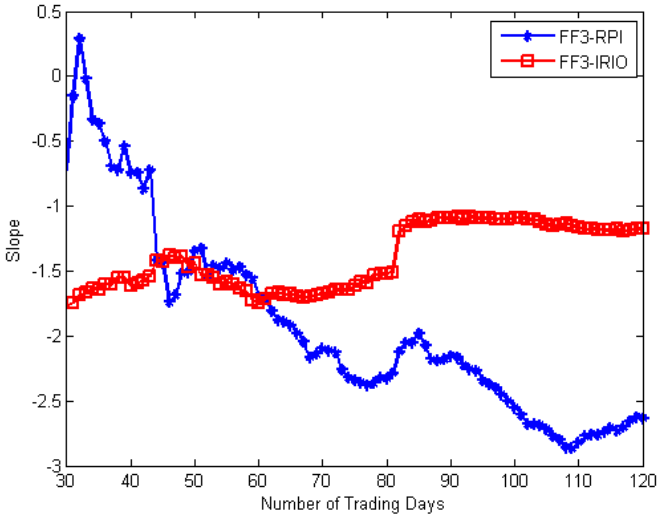

Fig. 7 Idiosyncratic Volatility Calculated by the Fama–French Three-Factor Model and Price Informativeness with Alternative Windows

7. Conclusions

The progressive removal of short-selling constraints in the Chinese Stock Market provides us with a natural experiment to investigate the relationship between firm-specific return variation and price informativeness. On the basis of the empirical finding that idiosyncratic volatility is a satisfied proxy for FSRV when the information environment for individual firm improves (Li et al., 2014; Zhang et al., 2016), the empirical result shows that the firm-specific return variation is negatively related to price informativeness. This negative relationship is robust to

alternative model specifications, alternative proxies for price informativeness, and alternative estimation windows. These results complement the extant literature by providing evidence for this negative relationship in emerging markets. However, we must alert researchers in adopting our findings for other stock markets, because other factors, such as the rate of information arrivals (Shen et al., 2016; Zhang et al., 2014) and information diffusion speed (Hong et al., 2000; Zhang et al., 2013a), can also cause changes in firm-specific return variation.

Acknowledgments: This work is supported by the National Natural Science Foundation of China (Grant Number: 71320107003).
Conflicts of Interest: The authors declare no conflict of interest.

References

Ali, A., Hwang, L.S., Trombley, M.A., 2003. Arbitrage risk and the book-to-market anomaly. Journal of Financial Economics 69, 355–373.

Ang, A., Hodrick, R.J., Xing, Y., Zhang, X., 2006. The cross-section of volatility and expected returns. Journal of Finance 61, 259–299.

Barber, B.M., Odean, T., 2000. Trading is hazardous to your wealth: The common stock investment performance of individual investors. Journal of Finance 55, 773–806.

Bartram, S.M., Brown, G., Stulz, R.M., 2012. Why are U.S. stocks more volatile? Journal of Finance 67, 1329–1370.

Campbell, J.Y., Lettau, M., Malkiel, B.G., Xu, Y., 2001. Have individual stocks become more volatile? An empirical exploration of idiosyncratic risk. Journal of Finance 56, 1–43.

Chang, E.C., Luo, Y., Ren, J., 2014. Short-selling, margin-trading, and price efficiency: Evidence from the Chinese market. Journal of Banking & Finance 48, 411–424.

Cheng, L.T.W., Leung, T.Y., Yu, W., 2014. Information arrival, changes in R-square and pricing asymmetry of corporate news. International Review of Economics & Finance 33, 67–81.

Chordia, T., Roll, R., Subrahmanyam, A., 2008. Liquidity and market efficiency. Journal of Financial Economics 87, 249–268.

Dasgupta, S., Gan, J., Gao, N., 2010. Transparency, price informativeness, and stock return synchronicity: Theory and evidence. Journal of Financial and Quantitative Analysis 45, 1189–1220.

Diamond, D.W., Verrecchia, R.E., 1987. Constraints on short-selling and asset price adjustment to private information. Journal of Financial Economics 18, 277–311.

Engle, R.F., Rangel, J.G., 2008. The Spline-GARCH model for low-frequency volatility and its global macroeconomic causes. Review of Financial Studies 21, 1187–1222.

Feng, L., Seasholes, M.S., 2008. Individual investors and gender similarities in an emerging stock market. Pacific-Basin Finance Journal 16, 44–60.

Fu, F., 2009. Idiosyncratic risk and the cross-section of expected stock returns. Journal of Financial Economics 91, 24–37.

Goetzmann, W.N., Kumar, A., 2008. Equity portfolio diversification. Review of Finance 12, 433–463.

Hong, H., Lim, T., Stein, J.C., 2000. Bad news travels slowly: Size, analyst coverage, and the profitability of momentum strategies. Journal of Finance 55, 265–295.

Hu, C., Liu, S., 2013. The implications of low R^2: Evidence from China. Emerging Markets Finance and Trade 49, 17–32.

Jiambalvo, J., Rajgopal, S., Venkatachalam, M., 2002. Institutional ownership and the extent to which stock prices reflect future earnings. Contemporary Accounting Research 19, 117–145.

Jian, M., Wong, T.J., 2004. Earnings Management and Tunneling through Related Party Transactions: Evidence from Chinese Corporate Groups. Working paper, Chinese University of Hong Kong, Hong Kong, China.

Jin, L., Myers, S.C., 2006. R^2 around the world: New theory and new tests. Journal of Financial Economics 79, 257–292.

Kevin, C.W.C., Yuan, H., 2004. Earnings management and capital resource allocation: Evidence from China's accounting-based regulation of rights issues. Accounting Review 79, 645–665.

Lee, D.W., Liu, M.H., 2011. Does more information in stock price lead to greater or smaller idiosyncratic return volatility? Journal of Banking & Finance 35, 1563–1580.

Li, B., Rajgopal, S., Venkatachalam, M., 2014. R^2 and idiosyncratic risk are not interchangeable. Accounting Review 89, 2261–2295.

Mashruwala, C., Rajgopal, S., Shevlin, T., 2006. Why is the accrual anomaly not arbitraged away? The role of idiosyncratic risk and transaction costs. Journal of Accounting and Economics 42, 3–33.

Mendenhall, R., 2004. Arbitrage risk and post-earnings-announcement drift. Journal of Business 77, 875–894.

Merton, R.C., 1987. A simple model of capital market equilibrium with incomplete information. Journal of Finance 42, 483–510.

Morck, R., Yeung, B., Yu, W., 2000. The information content of stock markets: Why do emerging markets have synchronous stock price movements? Journal of Financial Economics 58, 215–260.

Pontiff, J., 2006. Costly arbitrage and the myth of idiosyncratic risk. Journal of Accounting and Economics 42, 35–52.

Pontiff, J., 1996. Costly arbitrage: Evidence from closed-end funds. Quarterly Journal of Economics 111, 1135–1151.

Pontiff, J., Schill, M.J., 2004. Long-Run Seasoned Equity Offering Returns: Data Snooping, Model Misspecification, or Mispricing? A Costly Arbitrage Approach, Working Paper, Boston College, Chestnut Hill, MA, USA.

Rajgopal, S., Venkatachalam, M., 2011. Financial reporting quality and idiosyncratic return volatility. Journal of Accounting and Economics 51, 1–20.

Roll, R., 1988. R^2. Journal of Finance 43, 541–566.

Rubin, A., Smith, D.R., 2009. Institutional ownership, volatility and dividends. Journal of Banking & Finance 33, 627–639.

Shen, D., Zhang, W., Xiong, X., Li, X., Zhang, Y., 2016. Trading and non-trading period Internet information flow and intraday return volatility. Physica A: Statistical Mechanics and its Applications 451, 519–524.

Stambaugh, R.F., Yu, J., Yuan, Y.U., 2015. Arbitrage asymmetry and the idiosyncratic volatility puzzle. Journal of Finance 70, 1903–1948.

Xu, Y., Malkiel, B., 2003. Investigating the behavior of idiosyncratic volatility. Journal of Business 76, 613–645.

Zhang, W., Li, X., Shen, D, Teglio A., 2016. R^2 and idiosyncratic volatility: Which captures the firm-specific return variation? Economic Modelling 55, 298–304.

Zhang, W., Shen, D., Zhang, Y., Xiong, X., 2013a. Open source information, investor attention, and asset pricing. Economic Modelling 33, 613–619.

Zhang, Y., Feng, L., Jin, X., Shen, D., Xiong, X., Zhang, W., 2014. Internet information arrival and volatility of SME PRICE INDEX. Physica A: Statistical Mechanics and its Applications 399, 70–74.

Zhang, Y., Feng, L., Jin, X., Shen, D., 2013b. The impact of interest rate on information flow interpretation: Evidence from ChiNext. Procedia Computer Science 17, 641–646.

Zhang, Y., Liu, K., Shen, D., Zhang, W., 2015. Short selling and intraday volatility: Evidence from the Chinese market. SpringerPlus 4, 1–9.