



Investor sentiment and its nonlinear effect on stock returns—New evidence from the Chinese stock market based on panel quantile regression model



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ABSTRACT

This paper employs the panel quantile regression model to study the nonlinear effect of investor sentiment on monthly stock returns in the Chinese A-share stock market. The findings show that the influence of investor sentiment is significant from 1 month to 24 months. Its effect is asymmetric and reversal, that is, it is positive and large for stocks with high returns in the short term while negative and small in the long term. This reversal effect verifies the existence of a strong overreaction in the Chinese stock market. We also find that Chinese investors have notable cognitive bias and speculation tendency.

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1. Introduction

The past twenty years have witnessed several huge crashes in global stock markets. The crash of Hang Seng Index in 1997 led to 55.55% loss in the East Asian Financial Crisis. The crash of the Taiwan stock market resulted in 64.53% loss in 2001 of its market value from previous year. The crash of the Nikkei index in 2003 lost 78.9% of the market value in the 1989. The Internet Bubble crash in the 2000 resulted in a loss of about 70.25% of its value in 2002. The Shanghai Composite Index also suffered an 80.99% loss in 2008. These huge crashes in the global stock markets can be summarized in two features. First, unexpected slumps in the stock market can not be explained by public market information and macroeconomic conditions. Second, fluctuation of the stock market is unbalanced and asymmetric since market crash could happen in a short time while the rise to original stock price needs to take a long time.

We think that these abnormal phenomena in the stock market are very valuable and meaningful to research since they can not be explained by mainstream classical financial theories, including the efficient-market hypothesis (EMH) (Fama, 1970), and asset pricing models, such as the CAPM model (Sharpe, 1964), the macroeconomic factor model (Chen et al., 1986) and the three-factor model (Fama and French, 1993), etc. On the other hand, some scholars think that investor sentiment could explain the phenomena mentioned above, such as

Kahneman and Tversky (1979), De Long et al. (1990), Mehra and Sah (2002), Baker and Wurgler (2006), Brown and Cliff (2005), etc. They think that investor sentiment is crucial to affect stock returns because of limits of arbitrage, unexpected demand shock, unbalanced specific reference and utility functions in gain and loss. Some scholars also apply regression models to study how investor sentiment impacts stock price by using aggregate or industrial-level data in some countries, such as Schmeling (2009), McMillan (2003), Ding et al. (2004), Zhang and Semmler (2009), Lee and Chiu (2012) and Chen (2013), etc. They find that investor sentiment is one of the underlying causes of nonlinearity and asymmetry in stock returns.

However, we find that the research on the roles of investor sentiment in the Chinese stock market is rare. This difference from other countries' stock markets and the unique features in the Chinese stock market have not been paid enough attention, such as high speculation, non-rational investment behavior, limits of arbitrage, the Approval Insurance System and relatively less developed institutional investors (Burdekin and Redfern, 2009). Besides, we think that the influence of investor sentiment should be extensively investigated. For instance, some control variables should be taken into account, such as firm-based characteristics (market capitalization, book-to-market ratio, Beta) and macroeconomic variables. Therefore, it is also necessary to consider the industry features in the Chinese stock market. These make up the motivation of our paper to improve the research on the investor sentiment in the Chinese stock market.

The other contributions of this paper are to apply the penalized panel quantile regression model to examine the investor sentiment–

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stock return relationship. This method allows us to obtain further understanding towards heterogeneous effects of investor sentiment on the stock returns caused by different firm-based characteristics and industries. We also employ the panel data framework to research whether investor sentiment has a predictability on stock returns. It is beneficial for investors to understand fluctuations of the stock market, make right investment decisions and efficiently avoid investment loss in the Chinese stock market.

The remainder of this paper is structured as follows. [Section 2](#) is the literature review. [Section 3](#) is a brief introduction on the model and data. [Section 4](#) is the empirical result and analysis. [Section 5](#) is the conclusion.

2. Literature review

The ample evidence of the relationship between investor sentiment and stock returns can not be explained by classical finance theories. [Fama and MacBeth \(1973\)](#) points out that stock's value is equal to the discounted future cash flows. The deviation from fundamental values can be erased by arbitragers in a short time. Therefore, the standard analysis framework on the determinants of stock returns does not leave a large space for the investor sentiment. However, many studies concerning the investor sentiment–stock returns relationship show that the effect of investor sentiment can persist and affect stock prices both theoretically and empirically.

[Brown and Cliff \(2004\)](#) believe that investor sentiment comes from the subjective belief held by investors. It influences stock valuation and can cause biased expectations, such as the propensity to speculate and investors' optimism or pessimism on stock real valuation. [Barberis et al. \(1998\)](#) declare that investor sentiment could be reflected in underreaction/overreaction towards bad/good news. [De Long et al. \(1990\)](#) classify stock market participants into rational and noise traders. They argue that both investors play crucial roles in stocks pricing. Stock price consists of fundamental value caused by rational investors and premium risk caused by noise traders. They claim that limits of arbitrage allow the existence of noise traders and lead to deviation of stock returns. [Mehra and Sah \(2002\)](#) and [Baker and Wurgler \(2006\)](#) confirm that sentiment of both individual and institution investors are crucial to affect stock returns. Further, [Baker and Wurgler \(2006\)](#) point out that the mispricing caused by investor sentiment is attributed by unexpected demand shock and arbitrage limitations. With regard to unexpected demand shock, [Brown and Cliff \(2005\)](#) think that demand shocks can be correlated over time to make mispricing persist. [Shleifer and Vishny \(1997\)](#) think that limited arbitrage prevents traders from fixing the stock price. Besides, [Kahneman and Tversky \(1979\)](#) provide a reasonable explanation for the asymmetric patterns. The reason is that investors evaluate values from gains and losses with respect to a specific reference, and their utility functions are unbalanced in gains and losses. [Zhang and Semmler \(2009\)](#) use the prospect theory to explain the reasons why investor sentiment has an asymmetric effect.

Besides theoretical research, some literature apply regression models to study how investor sentiment impacts stock pricing with aggregate or industrial-level data in some countries' stock market. [Mehra and Sah \(2002\)](#) construct various investor sentiment indices and investor sentiment-based pricing models to investigate how investor sentiment affects returns of portfolios. [Brown and Cliff \(2005\)](#) study the U.S. stock market in the period of 1963–2001 and point out that those newly formed, small size, high B/M ratio, unprofitable and non-dividend companies' stocks are prone to investor sentiment. The reasons are that stocks with the features above are difficult to price and hence are vulnerable to investor sentiment. However, the firms which have long earning history and stable dividends are much less subjective and less likely to be affected by investor sentiment. This similar result is support by [Baker and Wurgler \(2006\)](#). [Lemmon and Portniaguina \(2006\)](#) find that investor sentiment has a negative effect on value stocks, but has no significant effect on growth stocks. [Schmeling \(2009\)](#) finds that investor sentiment affects monthly stock

returns in 18 industrialized countries from 1985 to 2005 by using panel regression model.

Some researchers think that external environment is also influential. [Chiou et al. \(2010\)](#) declare that legal development affects stock performance and excess returns. [Chui et al. \(2008\)](#) propose that cultural factors may play different roles in behavioral biases between countries. [Chang et al. \(2012\)](#) suggest that a better domestic legal and information environment is associated with weaker local and stronger global sentiments' effects. It means that an environment which has a different arbitrage activity in the stock markets can result in the different influence of investor sentiment. Since the unique legal, culture environment and investors' behavior in China, it is meaningful and necessary to study the investor sentiment–stock returns nexus in the Chinese stock market.

Regardless of a lot of prior literature, studies on the asymmetric features of investor sentiment–stock returns connections are sparse. In theory, the prospect theory in behavioral finance, proposed by [Kahneman and Tversky \(1979\)](#), provides a reasonable explanation for the asymmetric pattern, where investors evaluate values from gains and losses with respect to a specific reference, and their utility functions are unbalanced in gains and losses. In the empirical studies, there exists overwhelming evidence on nonlinearity in the asset price across many stock markets. [Scheinkman and LeBaron \(1989\)](#) and [Hsieh \(1991\)](#) provide the early results on the existence of nonlinear phenomena in stock markets. They insist that more information can be obtained from asset pricing models consisting of linear and nonlinear relationships. [Kim and Kim \(2010\)](#) and [Lee and Chiu \(2012\)](#) try to describe the nonlinear features of stock price using the threshold model developed by [Hansen \(1999\)](#). They argue that the threshold models can specify different regimes in the stock returns. [Dridi and Germain \(2004\)](#) declare that the impact of investor sentiment on price is nonlinear in the bullish/bearish market. The stock returns' response towards optimism is much stronger than the response to pessimism ([Ding et al., 2004](#); [Zhang and Semmler, 2009](#)). It indicates that the existence of loss aversion could lead to investment losses. Furthermore, [Chen \(2013\)](#) construct a threshold model to study the asymmetric effects of both local and global sentiments on the industry level stock returns among 11 Asian countries. The results show that global optimism makes industry returns overvalued while global pessimism makes them undervalued. Local sentiment could more enhance the returns of several industries, including basic materials, telecom and utilities, etc.

However, studies on the relationship between investor sentiment and stock returns in the emerging economies, such as China, are quite rare. [Burdekin and Redfern \(2009\)](#) use Shanghai A-share data to examine the effect of investor sentiment on asset allocation decisions and discounts attached in the Chinese A-shares, B-shares and ADRs for foreign investors. They find out that investor sentiment in Chinese stock market appears to have significant negative impacts on returns and Chinese savings account growth. [Huang et al. \(2009\)](#) construct the investor sentiment index by principle component analysis and implement the EGARCH model to find that upward investor sentiment positively affect stock returns and downward investor sentiment negatively affect stock returns in the Chinese stock market. Meanwhile, returns of small market capital, penny stocks and unprofitable stocks are more susceptible to investor sentiment volatility. Similarly, excess stock returns are attributed to optimistic environment ([Jiang and Wang, 2010](#)). But there are few comprehensive studies towards investor sentiment's effect on the cross sections of Chinese stock returns within an asymmetric framework. We believe this paper could fill this blank. [Fig. 1](#) shows our research structure in this paper.

3. Model and data

3.1. Penalized panel quantile regression with fixed effect

Quantile regression, proposed by [Koenker and Bassett \(1978\)](#), is helpful to investigate asymmetric features of stock return distribution.

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