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Herd Behavior and Rational Expectations: A Test of China's Market Using Quantile Regression

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ABSTRACT

This paper aims to examine whether the changes of the rational expectations of a tendency to herd among investors under different market conditions in China's market. We find that herding remains scarce during periods of market tumult. Also, herd behavior is more pronounced under rising market conditions. The results indicate that investors show different levels of rational expectations; in particular, herding strongly exists in irrational expectations. The asymmetric information effect exists in market conditions and the reactions to both fundamentals and non-fundamentals. There is no evidence of herding spillover effect from the US stock market to China's market. In spite of investors facing the financial crisis and external effects simultaneously, they still tend to follow the market consensus. This paper claims that investors' herd behavior may be obviously different due to the effectiveness of regulation, information efficiency and market integrations.

Keywords: Rational Expectations, Herd Behavior, Asymmetric Information Effect, Spillover Effect
JEL Classifications: G14, G11, G02

1. INTRODUCTION

Herding is identified as when investors opt to imitate the trading practice they consider to be better informed, rather than act on their own beliefs and private information (Chang et al., 2000), even when they disagree with its predictions (Christie and Huang, 1995). In addition, Kremer and Nautz (2013) confirm that herding and uncertainty or availability of information is interrelated and impossible to observe in an uncertain environment, limited information and the cognitive biases of investors (Holmes et al., 2013; Kallinterakis and Kratunova, 2007). In China's market, investors are less informed than institutional investors or informed traders, in particular, the existence of rational expectations for policy restrictions during high volatile periods. This study therefore investigates to see whether investors tend to follow the actions of their peers in trading activities.

In general, rational expectations derive from rational and irrational herd behavior. According to Devenow and Welch (1996), rational herding refers to rational coordinates among individuals acting on the same external information while irrational herding is referred to as the mass psychology without fundamental analysis. Bikhchandani and Sharma (2001) distinguish between investors who intentionally copy the behavior of others ("intentional" herding) and investors who face a similar information set driven by fundamentals ("spurious" herding). In others words, herding due to expectations can be considered the importance of externalities which affects the optimal decision making process.

Previous studies have made contributions to detecting herd behavior among mutual funds (Andreu et al., 2009; Grinblatt et al., 1995; Lakonishok et al., 1992; Wylie, 2005), the banking sector (Cakan and Balagyozyan, 2014) and real estate markets (Babalos et al., 2015). There are several concepts of herd behavior in the majority of earlier studies, such as the contagion effect, and the relation between volatility and herding (Blasco and Ferreruela, 2008; Blasco et al., 2012; Boyer et al., 2006; Chiang and Zheng, 2010; Galariotis et al., 2015). The herding tendency is investigated among amateurs and professional traders and the effects of firms' specific characteristics, such as volatility, share turnover, size, beta and unique risk (Lin and Lin, 2014; Venezia et al., 2011).

In recent years, China has been increasingly improving information efficiency and market integrations, indicating that China's stock market with its unique macro- and micro- structural features provides an interesting setting for the analysis of investors' herd behavior (Yao et al., 2014). Due to conformity pressures and less tolerance of risk-taking behavior, indications of herding in financial markets have been found in different contexts of avoiding deviations from investors' colleagues (Demirer et al., 2014; Kim and Nofsinger, 2005; Sias, 2004; Venezia et al., 2011; Yao et al., 2014; Zhou and Lai, 2009). This paper therefore attempts to provide new empirical evidence that helps to resolve the mixed findings of herd behavior in China's market under rational expectations.

We develop a quantitative measure of the rational expectation in herd behavior, indicating that rational level (RL) based on fundamentals and non-fundamentals can be used to test whether herding can be considered as common reactions to fundamental information or intentions (Galariotis et al., 2015). Chiang and Zheng (2010) conclude that herding asymmetry is more pronounced in Asia during bull markets. When investors face few alternatives and heavy government interventions, they tend to speculate in the stock market and then generate significant volatility (Chang et al., 2000; Tan et al., 2008). We use quantile regression (QR) (Koenker and Bassett, 1978) to test the existence of herding under rational expectations and compare different changes with high and low quantile distributions.

The paper is organized as follows: Section 2 focuses on a review of previous evidence. Section 3 explains the method and application of a QR model. Results are presented in Section 4 while Section 5 concludes a discussion of the implications.

2. LITERATURE REVIEW

2.1 Detection and Attribution of Herd behavior

The knowledge of earlier papers contributed to theoretical and practical literature of herding. We offer a brief insight into herding in financial markets. For example, the earlier definitions of herd behavior were made by several studies (Bannerjee, 1992; Bikhchandani et al., 1992; Lakonishok et al., 1992; Scharfstein and Stein, 1990). These authors define herd behavior as others beginning to ignore their own information and imitate their predecessors, thus setting in a sequence of similar decisions. Numerous researchers follow the studies of the examination of herding effects proposed by Chang et al. (2000), Christie and Huang (1995) and Lakonishok et al. (1992). A proportion of existing herding literature focuses on mutual fund managers and financial analysts due to the relative importance of institutional investors in financial markets (Choi and Sias, 2009; Grinblatt et al., 1995; Iihara et al., 2001; Lakonishok et al., 1992; Nofsinger and Sias, 1999; Sias, 2004).

For the herding phenomenon, previous studies have taken into account many factors, such as reputation, market efficiency, transparency, volatility impact, market liquidity and different market fundamentals. For example, Kremer and Nautz (2013) argue that the existence of herding, especially in emerging markets, which have a greater correlation between market transparency and uncertainty due to imperfect regulatory frameworks. In addition, Uchida and Nakagawa (2011) have found that Japanese banks have low-efficiency herd behavior related to financial system reforms in terms of financial systems. Holmes et al. (2013) and Scharfstein and Stein (1990) propose that reputation may lead to rational herd behavior. Market volatility often reflects the degree of divergence among participants. For example, Balcilar et al. (2013), Kremer and Nautz (2013), and Venezia et al. (2011) have found herd behavior in a period of high volatility. Cakan and Balagyozyan (2014) argue that a high degree of information asymmetry in a market results in herd behavior when low liquidity exists. In contrast, Blasco et al. (2017) propose that herding is not only affected by culture but also associated with organizational and environmental issues such as governance, technology, education and training, business styles and conditions, and the development of equity and non-equity markets.

Recently, two aspects of herd behavior can be considered to be rationality and irrationality. According to Bikhchandani and Sharma (2001), it is important to distinguish between true (intentional) and spurious (unintentional) herding. Intentional herding may be inefficient and usually characterized by fragility and idiosyncrasy which lead to excessive volatility and systemic risk (Bikhchandani and Sharma, 2001). From a rational point of view, it is not easy to make reasonable and correct investment decisions due to the availability of limited market information or the fact that stock prices do not fully reflect all available relevant information. Rational herd behavior may also help to improve the learning processes of information and its cascades in the market (Welch, 1992). For investors, brokers, agents or managers of financial institutions, rational herd behavior ignoring self-information and beliefs even may have a better information base; for example, managers maintain their own reputation in a financial market (Devenow and Welch, 1996). In contrast, from an irrational point of view, investors tend to suppress their own beliefs and are likely to follow the market consensus, even though they are trading with their own private and diverse information (Christie and Huang, 1995). Individual investors may ignore their own information which is different from what they expect the market, and just blindly copy the market decisions (Chang et al., 2000). Empirically, it is difficult to distinguish one form of herding from another, given that the multitude of variables can sustain investment in a specific stock during a particular period of time (Vieira and Pereira, 2015). However, Galariotis et al. (2015) suggest that herding can be separated from each other regarding the rationality of its reaction to fundamental and non-fundamental information.

2.2. Herd Behavior in China

It is necessary to study herd behavior in a financial market because it may lead to inaccuracy in the calculated value of asset pricing and affect expected asset returns under risk management and investment evaluations. China's financial markets which have been widely criticized for their lack of transparency (Yao et al.,

2014) and the requirements of a list of the companies in China are significantly less stringent and well-developed than those in developed countries (Demirer and Kutan, 2006). To the best of our knowledge, there are many state-owned enterprises on the list of China's market. Besides, Lin and Lin (2014) report that the managers appointed by the government affect the information environment of the ownership structure (Kim and Nofsinger, 2005). In this case, investors may follow the market consensus because they may expect that the actions of others appear to be more informed about the market development. Simultaneously, investors may expect that the government intervene in a stock market during volatile times.

Demirer and Kutan (2006) propose that the investors in China's market are more likely to speculate in the market and follow the market consensus due to the factors of weak legal frameworks, heavy government involvement, and strong state ownership. They also find that herd behavior is similar in down markets; however it does not exist in China's market at both individual and sector levels. Furthermore, Tan et al. (2008) consider asymmetric effects and different market conditions, reporting that the evidence of herding in A- and B-share markets of Shanghai and Shenzhen under both rising and falling market conditions. However, Chiang et al. (2010) apply QR, indicating the evidence of herding in both of the Shanghai and Shenzhen A-share markets and no evidence of herding in both of their B-share markets.

Yao et al. (2014) investigate China's markets in different situations and find no evidence of herding in A-share markets, but significant evidence of herding in B-share markets over the period of 1999-2008. Luo and Schinckus (2015) argue that the influence of the US market on China's stock market, showing that there is no contagion effect between these two countries. In addition, they have found that herding is significant only in both of the Shanghai and Shenzhen A-share markets. The results are partially consistent with those of Chiang and Zheng (2010), indicating that there is a significant influence of return dispersion in the US stock market on the whole China's financial markets. In the same vein, the results proposed by Luo and Schinckus (2015) show that a bullish context generates the herd behavior of B-share markets while a bearish situation favors a crowd movement of A-share markets. In short, the evidence in China's market is mixed. Numerous studies indicate that the results of herding phenomenon in many countries are different from the measure of dynamic correlations. Chiang and Zheng (2010) examine the 18 markets and find that there is the evidence of herd behavior in many advanced stock markets and Asian markets, while there is no evidence of herding in the US and the Latin American markets. They also suggest that the impact of the US market plays a major role in herding in non-American countries. Lao and Singh (2011) investigate Chinese and Indian stock markets. In Chinese stock markets, herding depends on market conditions and it is prone to herd when the market is down and trading volume is high. In contrast, herding occurs when the market rises in terms of Indian markets. Demirer et al. (2010) distinguish the industry sectors and find that herding prevails over Taiwan's stock markets, especially in down markets. Economou et al. (2011) find the evidence which is consistent with herding and cross-market herding in South Europe, but no evidence of the herding influence of the US market on the Greece and Spain markets. Chang et al. (2000) find the evidence of herding in South Korea and Taiwan and partial evidence of herding in Japan but no evidence of herding in the US and Hong Kong. Gębka and Wohar (2013) analyze 32 countries and five sectors, observing that there is no presence of herding in global information. However, there are indicators of irrationality in basic materials, consumer services, and oil and gas sectors.

According to Christie and Huang (1995) and Chang et al. (2000), the effect of herding may be more intensive during periods of market stress, which is defined as the occurrence of extreme returns in the market. Previous experiences suggest that the movement of extreme returns occurs continuously in times of crisis. Bowe and Domuta (2004) focus on Jakarta's market and find that herd behavior exacerbates the decline in the Indonesian stock market during the Asian financial crisis. Ouarda et al. (2013) report that herd behavior occurs during the global financial crisis of 2007-2008 and the Asian financial crisis as well. Their results reveal that strong evidence of herd behavior sharply contributes to a bearish situation characterized by strong volatility and trading volume. The financial crisis may result in the contagion or spillover effects, such as the Asian financial turmoil that affects herd behavior and diffuses bad news into the marketplace more comprehensively (Chiang et al., 2010). Boyer et al. (2006) have also found a high degree of co-movement with high volatility. They suggest that investors' intentional herd behavior during the financial crisis is large due to the effect of the infection rather than the fundamentals. Balcilar et al. (2013) have found herd behavior in high volatility periods. Likewise, Galariotis et al. (2015) report that during the financial crisis including Asian storms and Dotcom bubbles, there is a spillover effect from the US to the UK, and vice versa. A discussion of the findings of herd behavior is summarized in Table 1.

3. METHODOLOGY

In terms of a herding measure, Christie and Huang (1995) measure return dispersion and two dummy variables used to capture the dispersion using cross-sectional standard deviation (CSSD) during the market periods, especially in the extreme market movement. Chang et al. (2000) propose a further developed measure of return dispersion, which is called cross-sectional absolute deviation (CSAD). The aforementioned methods have been widely applied in the existing literature (Chiang et al., 2010; Demirer and Kutan, 2006; Galariotis et al., 2015; Gębka and Wohar, 2013; Lee et al., 2013; Mobareka et al., 2014; Tan et al., 2008; Yao et al., 2014). This study employs CSAD to identify herd behavior as follows:

$$CSAD_t = \frac{1}{N}\sum_{t=1}^{N} | R_{i,t} - R_{m,t} \quad (1)$$

Where $R_{m,t}$ is the equal weight of the n returns in the portfolio for day t; N represents the number of the firms; and $R_{i,t}$ gives the stock return for the stock i at time t.

Galariotis et al. (2015) suggest that investors may take similar decisions due to the fact that they react to the same change in

Table 1: A summary of the findings of herd behavior

Authors	Sample period	Markets	Types	Methods	Selected findings
Scharfstein and Stein (1990)	N/A	N/A	N/A	A theoretical herding equilibria model with reputational concerns and comparisons with efficient investment decisions	A reputation may lead to rational herd behavior
Bannerjee (1992)	N/A	N/A	N/A	A theoretical model for the rationale behind decision-making and its implications	An information cascade can influence rational individuals and lead to the creation of bubbles
Bikhchandani et al. (1992)	N/A	N/A	N/A	A theoretical framework	An information cascade occurs when it is optimal for individuals
Lakonishok et al. (hereafter LSV) (1992)	1985-1989	US	769 equity funds. (institutional trading)	The herding measures are computed for each stock-quarter and averaged across different subgroups	Pension managers do not strongly pursue these potentially destabilizing practices
Welch (1992)	N/A	N/A	N/A	A theoretical framework	A dynamic rational explanation for herd behavior is provided. The pricing decisions can reflect informational cascades
Christie and Huang (1995) (henceforth referred to as CH)	1962-1988 (daily) 1925-1988 (monthly)	US	the NYSE and Amex firms of equity returns	CSSD	Both daily and monthly returns are inconsistent with the presence of herding during periods of large price movements
Grinblatt et al. (1995)	1974-1984	US	155 mutual funds	Momentum investing/ buy-and- hold strategies	77% of mutual funds are momentum investors. Weak evidence indicates that funds tend to buy and sell the same stock at the same time
Devenow and Welch (1996)	N/A	N/A	N/A	A brief description of rational herding in financial markets	Herding typically arises either from direct payoff externalities, principal-agent problems, or informational learning
Chang et al. (2000) (hereafter CCK)	1963-1997 (US) 1981-1995 (Hong Kong, Japan) 1978-1995 (South Korea) 1976-1995 (Taiwan)	US, Hong Kong, Japan, South Korea and Taiwan	daily stock price data (from NYSE, AMEX and PACAP)	CSAD	No evidence of herding in the US and Hong Kong, partial evidence of herding in Japan and evidence of herding in South Korea and Taiwan
Bikhchandani and Sharma (2001)	N/A	N/A	N/A	N/A	An overview of the theoretical and empirical research on herd behavior in financial markets is provided

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Table 1: (*Continued*)

Authors	Sample period	Markets	Types	Methods	Selected findings
Hirshleifer and Hong Teoh (2003)	N/A	N/A	N/A	A review of theory related to payoff and reputational interactions, social learning and informational cascades	Both incentives for parties to engage in herding or cascading and the incentives for parties to protect against or take advantage of herding or cascading by others are considered
Sias (2004)	1983-1997	US	NYSE, AMEX, and NASDAQ stocks	A modified method of LSV and a theoretical framework	Institutions herding is a result of inferring information from each other's trades
Hwang and Salmon (2004) (hereafter HS)	1993-2002	US and South Korea	Daily data of S&P500 index (500 stocks) and KOSPI index (657 stocks)	(*) Considering the relationship between the beta and expected return based on the equilibrium CAMP model	The evidence of herding towards the market portfolio in both bull and bear markets is found
Kim and Nofsinger (2005)	1975-2001	Japan	Ownership data	The method of Nofsinger and Sias (1999)	There is no difference of herding between the keiretsu firms and independent firms
Wylie (2005)	1986-1993	UK	268 UK equity mutual funds	LSV	A significant amount of fund manager herding in the largest and smallest UK stocks is revealed
Boyer et al. (2006)	1996-2000	US and across countries	Weekly data of market index returns	A regime-switching model	Greater co-movement is during high volatility periods. In particular, accessible stock index returns suggests that the crisis spreads through the asset holdings of international investors rather than the changes in fundamentals
Demirer and Kutan (2006)	1999-2002	Shanghai and Shenzhen	Daily returns of 375 Chinese stocks	CSSD CSAD	Herd formation does not exist in China's market at both individual and sector levels
Kallinterakis and Kratunova (2007)	2000-2006	Bulgaria	SOFIX index	HS	Thin trading leads to an underestimated picture of herding, thus producing evidence in favor of the impact of thin trading on the measurement of herding
Blasco and Ferreruela (2008)	1998-2004	Germany, US, UK, Mexico, Japan, Spain and France	Daily stock prices	CSSD	Only Spanish market exhibits significant herd behavior
Tan et al. (2008)	1994-2003	Dual-listed Chinese A- and B-share stocks	Stock prices, trading volume, and earnings per share	CSAD	The evidence of herding within the Shanghai and Shenzhen A-share markets is found

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Table 1: (*Continued*)

Authors	Sample period	Markets	Types	Methods	Selected findings
Zhou and Lai (2009)	2003-2004	Hong Kong	Intraday data	LSV	Herding tends to be more prevalent with small stocks in economic downturns, and investors are more likely to herd when selling rather than buying stocks
Andreu et al. (2009)	2000-2007	Spain	Pension funds	LSV	Spanish pension managers are involved into herd behavior. A phenomenon is reinforced when important movements of the strategic allocations are required
Chiang and Zheng (2010)	1998-2009	18 countries	Daily data	CSAD	The evidence of herding in advanced and Asian markets except the US market is found. Also, herding is present in both up and down markets even though herding asymmetry is more pronounced in Asia during bull markets
Chiang et al. (2010)	1996-2007	China	Daily returns	CSAD Quantile regression	Herd behavior in both A-share and B-share investors is found conditional on the dispersions of returns in the lower quantile region
Demirer et al. (2010)	1995-2006	Taiwan	Daily returns	CSSD and the state-space based on the model of Hwang and Salmon (2004)	The evidence of herd formation exists in all sectors. The herding effect is more prominent during the periods of market losses
Lao and Singh (2011)	1999-2009	Shanghai A-Share, Bombay Stock Exchange index	Daily and weekly data	CSAD	Herding is greater when the market is falling and the trading volume is high in China's market while herding occurs during up-swings in India's market
Venezia et al. (2011)	1994-1997	Israel	Database transactions of the largest banks	The method of Grinblatt et al. (1995) LSV	Herding depends on the firm's systematic risk and size, and the professionals are less sensitive to these variables. Herd behavior is positively correlated with the volatility of stock market returns
Blasco et al. (2012)	1997-2003	Spain	The Ibex-35 index	The information cascade model of Bikhchandani et al. (1992)	Herding has a direct linear impact on volatility for all of the volatility measures even though the corresponding intensity is not always the same

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Table 1: (*Continued*)

Authors	Sample period	Markets	Types	Methods	Selected findings
Balcilar et al. (2013)	2006-2011	Gulf Arab stock market	Daily data	Regime switching model CSAD	Herd behavior under the crash regime for all of the markets is found in addition to the Qatar Stock Market which is under high volatility regime
Gębka and Wohar (2013)	1998-2012	Global stock market (32 countries)	Daily data of indices on both of the national and sector levels	CSAD	An analysis of national indices world-wide unveils virtually no instances of global information cascades, as price patterns largely adhere to the predictions of the rational pricing models. The basic materials, consumer services, and oil and gas indices reveal that price patterns are indicative of traders' irrationality
Holmes et al.(2013)	1998-2005	Portugal	Monthly holdings data	LSV	To analyze herding under different market conditions is intentional
Kremer and Nautz (2013)	2006-2009	German stock market	Daily data	LSV	Herding measures based on anonymous transactions can lead to misleading results about the behavior of institutional investors during the recent financial crisis
Lee et al. (2013)	2001-2011	A-share market	Daily data	CSAD	Industry herding is more prevalent in the Shenzhen stock market, while some sectors in the Shanghai Stock Exchange herding are more prevalent during the condition of bull markets
Ouarda et al. (2013)	1998-2010	174 shares listed in the Euro Stoxx 600	Monthly data	CSAD	Strong evidence of herd behavior sharply contributes to a bearish situation characterized by strong volatility and trading volume
Zhou and Anderson (2013)	1980-2010	U.S. Equity REITs	Daily, weekly and monthly data	CSAD	Herding is more likely to occur and become stronger in declining markets than in rising markets. The REIT investors are more likely to herd in the modern era during the period of which herding usually occurs when the market becomes tumultuous
Cakan and Balagyozyan (2014)	2007-2012	Turkish banking sector	Daily data	CSAD	Herd behavior shows asymmetric effects while and investors herd only in rising markets

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Table 1: (*Continued*)

Authors	Sample period	Markets	Types	Methods	Selected findings
Demirer et al. (2014)	1995-2011	19 countries	Daily data on 305 ADRs	CSAD	Herding is more prevalent at the sector level than the country level for the markets for the ADRs
Lin and Lin (2014)	2000-2009	Taiwan	Daily returns	LSV HS	Herding is associated with market conditions, types of traders and firms' characters. Margin buyers and short sellers tend to trade together in a high-volatility stock. Government policies play an important role in affecting trading behavior
Mobareka et al. (2014)	2001-2012	Germany, France, Portugal, Italy, Ireland, Greece and Finland	Daily returns	CSAD	Herding effect is pronounced in most continental countries during the global financial crisis and Nordic countries during the Eurozone crisis
Yao et al. (2014)	1999-2008	Shanghai and Shenzhen	Daily and weekly data	CSSD, CSAD	Herding strongly exists in the B-share market and is more prevalent at the industry level. Herd behavior is also more pronounced under the conditions of declining markets
Babalos et al. (2015)	2004-2013	US REITs	Daily returns	A three-state Markov switching model CSAD	A shift is from negative herd behavior during low and high volatility regimes to positive herd behavior under crash regime for almost all REITs sectors
Galariotis et al. (2015)	1989-2011	US and UK	Daily data (S&P100 and FTSE100)	CSAD	The US investors tend to herd during the period of which important macro data are released. There have been herding spillover effects from the US to the UK during earlier financial crisis
Luo and Schinckus (2015)	2006-2012	Shanghai and Shenzhen	Daily data	CSAD	The influence of the US market on China's stock markets is confirmed. However, there is no contagion effect between these two countries
Luo and Schinckus (2015)	2006-2012	Shanghai and Shenzhen	Daily data	CSAD	A bullish context generates herd behavior for B-shares while a bearish situation favors a crowd movement for A-shares

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Table 1: (*Continued*)

Authors	Sample period	Markets	Types	Methods	Selected findings
Vieira and Pereira (2015)	2003-2011	Portugal	PSI-20 index	CSSD	To apply causality tests into the impact of sentiment on herd behavior, less evidence indicates that sentiment influences herding
Blasco et al. (2017)	2000-2015	35 international markets	Daily and seasonal data	CSAD	Herd behavior is affected not only by the cultural variables discussed in the literature but also by other variables associated with organizational and environmental issues such as governance, technology, education and training, business style and conditions, and the development of equity and non-equity markets

* $HM_{i,t} = |P_{i,t} - E[P_{i,t}]| - E|P_{i,t} - P_{i,t}|$, where $P_{i,t}$ is the proportion of all mutual fund trading stock-quarter i; and t is a buyer

fundamental information (Bikhchandani and Sharma, 2001). In addition, they divide the CSAD measure into the reactions to fundamental and non-fundamental deviations. This measure is regressed against the return factors, namely, four-factor asset pricing model proposed by Fama and French (1995) and Carhart (1997). Specifically, investors may rationally make their decisions under the state of the market. Otherwise, they may tend to imitate others intentionally. The rationality of investors was defended by rational asset pricing as the capital asset pricing model (CAPM) could be contested (Christie and Huang, 1995). In order to measure the rational expectations of investors, we identify RL based on the study of Galariotis et al. (2015). To compute the RL, the mean difference between fundamentals and non-fundamentals is used as a benchmark. The RL of herding intensity statistic was built based on the methods used in the studies of Christie and Huang (1995), Chang et al. (2000) and Galariotis et al. (2015) as follow:

$$RL_{p,t} = \frac{H^{\bar{\varepsilon}}_{p,t} - H^{\varepsilon}_{p,t}}{\sigma(\text{Raw}\ \Delta_{r,t})},\ \text{where}\ \sigma(\text{Raw}\ \Delta_{r,t}) = \sqrt{\frac{1}{n-1}\sum_{t=1}^{n}(R_{p,t} - R_{m,t})^2}, \quad (2)$$

$R_{p,t}$ denotes portfolio return for time period t, $R_{m,t}$ denotes benchmark return of market index for time period t. $H^{\bar{\varepsilon}}_{p,t}$ represents fundamental information and is used to test spurious herding; and $H^{\varepsilon}_{p,t}$ is a deviation due to other reasons and used for the proxy of intentional herding, as suggested by Galariotis et al. (2015). This specification allows us to take care of the investors' reactions to herd behavior under different market conditions. The ratio of RL can be viewed as the relation between expectation dispersion and herding.

Note the $H^{\bar{\varepsilon}}_{p,t} = CSAD_t - \varepsilon_t$ and $H^{\varepsilon}_{p,t} = \varepsilon_t$. Thus, the RL is examined based on fundamentals and non-fundamentals after the CSAD is computed by estimating the CSAD regression as follows:

$$CSAD_t = \alpha + \beta_1(R_{m,t} - R_f) + \beta_2(HML_t) + \beta_3(SMB_t) + \beta_4(MOM_t) + \varepsilon_t \quad (3)$$

Where $R_{m,t} - R_f$ is the risk premium factor; HML_t is the high minus low return factor, SMB_t is the small minus big return factor; and MOM_t is the momentum factor.

As mentioned above, the equation proposed by Chang et al. (2000) is widely used to test herd behavior. The CSAD is preferred over the CSSD because it is less sensitive to return outliers and considered as inherent nonlinearity in the relationship between deviations and market returns (Zhou and Anderson, 2013). With the measure of stock return dispersions, the original equation proposed by Chang et al. (2000) and Chiang et al. (2010) is as follows:

$$CSAD_t = \gamma_0 + \gamma_1|R_{m,t}| + \gamma_2 R^2_{m,t} + \varepsilon_t \quad (4)$$

In this study, we also replace the independent variable (CSAD) with the RL using the following regression equation with a non-linear model, which is estimated as follows:

$$RL_t = \alpha + \gamma_1|R_{m,t}| + \gamma_2 R^2_{m,t} + \varepsilon_t \quad (5)$$

Where RL_t is a measure of return dispersion due to the reaction driving from fundamentals and non-fundamentals; $R_{m,t}$ is the value of an equally weighted realized return of all firms indexes on day t; $|R_{m,t}|$ is the absolute term; and $R^2_{m,t}$ is the squared term.

In general, the linear relationship between return dispersions and market returns is based on the CAPM. Herding is said to occur when the linear relationships are not held. The statistical significance of a negative coefficient of the non-linear term, γ_2, denotes the existence of herd behavior as argued in the case of Chang et al. (2000).

However, the framework of ordinary least squares regressions for the linear estimation does not provide a more detailed description of tails of the distribution and flexibility in modeling data with heterogeneous conditional distributions. We then use the QR (Koenker and Bassett, 1978) to find out the existence of herding between rational expectations and different changes of quantile distributions. The QR model can be written as:

$$y_i = x_i^{'}\beta_q + u_{qi}, \text{ where } q \in (0,1) \tag{6}$$

Where y_i is a dependent variable, β_q is a vector of parameters for independent variables of a vector of x_i; and u_{qi} is an error term. The subscript $q \in (0,1)$ denotes that $\theta_q(y_t|x_t) = x_t^{'}\beta_q$ is the θ^{th} conditional quantile of y_t given x_i. As q increases continuously, the conditional distribution of y_i given x_i is traced out. By minimizing a weighted sum of absolute errors, the QR estimator $(\hat{\beta}_q)$ can be found in the equation as follows:

$$Q(\beta_q) = \sum_{i:y_i {}^3 x_i\beta}^{N} q|y_i - x_i^{'}\beta_q| + \sum_{i:y_i < x_i\beta}^{N} (1-q)|y_i - x_i^{'}\beta_q \tag{7}$$

Moreover, we use the model to analyze the sensitivity of herding to changes in rational expectations and distinguished between changes in fundamentals and non-fundamentals. Thus, equation 5 is expressed as follows:

$$Q_r(q|RL_t) = \alpha_{0,q} + \gamma_{1,q}|R_{m,t}| + \gamma_{2,q}R_{m,t}^2 + \varepsilon_{q,t} \tag{8}$$

Where $\alpha_{0,q}$, $\gamma_{1,q}$, and $\gamma_{2,q}$ are the QR estimated coefficients, and q is the quantile of QR from 0.1 to 0.9.

A financial crisis may easily disrupt the market order, deepen the uncertainty of risk, and make irrational and intensified herd behavior. Also, herd behavior may have some negative consequences in financial markets, tend to dilute the quality of stock price information, and exacerbate volatility and instability in capital markets, which may lead to bubbles and collapse (Hirshleifer and Hong Teoh, 2003; Hwang and Salmon, 2004; Scharfstein and Stein, 1990).

In addition to the baseline specification above, we consider the extreme volatility of the financial crisis into the model, which allows us to estimate the impacts of changes on expectations of herding as follows:

$$Q_r(q|RL_t) = \alpha_{o,q} + \gamma_{1,q}|R_{m,t}| + \gamma_{2,q}R_{m,t}^2 + \gamma_{3,q}R_{m,t}^2 \times CRISIS_t + \varepsilon_{q,t} \tag{9}$$

Where CRISIS denotes the dummy during the financial crisis t.

4. DATA AND EMPIRICAL RESULTS

We collected the daily returns of all listed companies in China from January 2, 2008 to November 27, 2015. All the data are obtained from the database of Taiwan Economic Journal and the China Stock Market and Accounting Research.

Table 2 shows that descriptive statistics for average number of stocks (observe), mean and SD of CSAD. We provide a summary of three markets, including the Shanghai and Shenzhen and composite markets. Each market also contains the stocks listed on both A- and B-share markets. In order to understand how investors' expectations of the policy can affect herd behavior and how they are different or consistent in both of the markets, we re-estimated first and then combined all of the stocks considered in this paper. We used daily returns of each stock and return dispersion to compute the CSAD. We then observe that the average number of firms for the composite market is 1568 through 1903 over the period of 2008-2015 and the highest average daily volatility is in the period of 2015.

Table 3 reports the estimates of herd behavior of the RL at the levels of quantile for the RL-based model in equation 8. The RL is a measure of return dispersion due to reactions driving from fundamentals and non-fundamentals. Given high quantile denotes that more reactions to fundamentals with higher accumulation of return volatility, and vice versa. In general, rational herd behavior can be the expected imitation of a highly volatile market in order to reduce uncertainty. We find that herd behavior is more prevalent at low quantile (τ = 100%) regions in the composite, Shanghai and Shenzhen markets, as shown in the significant and negative coefficient γ_2. The study's results show that when the market is in the lower quantile or less volatility, herd behavior is more irrational. However, there is no evidence of herding at high quantile, indicating that it results from more expectations of the market during extreme moves of the market. Instead, investors tend to make a decision in accordance with fundamentals rationally.

Table 4 shows the estimates of herd behavior for the RL conditions in the CSAD-based model of equation 4. Several researchers (Bikhchandani and Sharma, 2001; Devenow and Welch, 1996; Galariotis et al., 2015; Vieira and Pereira, 2015) provide two aspects of rationality of herding. Herding can be irrational and caused by the herding instinct through several groups of investors

Table 2: Descriptive statistics of CSAD

Year	Composite		Shanghai		Shenzhen	
	Observe	Mean±SD	Observe	Mean±SD	Observe	Mean±SD
2008	1568	3.561±1.867	853	0.176±0.213	715	0.113±0.089
2009	1606	2.759±1.560	855	0.122±0.156	751	0.111±0.090
2010	1717	2.585±1.066	868	0.083±0.093	849	0.084±0.080
2011	1769	2.241±1.128	900	0.089±0.076	869	0.124±0.118
2012	1800	2.569±7.706	931	0.100±0.117	869	0.101±0.255
2013	1809	2.320±0.451	943	0.103±0.111	866	0.050±0.049
2014	1824	2.370±0.971	959	0.145±0.175	865	0.049±0.044
2015	1903	3.611±1.142	1039	0.335±0.318	864	0.113±0.097

CSAD is the cross-sectional absolute deviation of returns as a measure of return dispersion. Average number of stocks (observe), mean and standard deviations of CSAD.
CSAD: Cross-sectional absolute deviation, SD: Standard deviations

facing similar decisions, and it may be rational and result from the deliberate intention of investors to mimic each other. In terms of the findings shown in Table 3, we further examine the RL variable in the model controlled by dummy variables, as shown in the following equation:

$$Q_r(q|CSAD_t) = \alpha_{0,q} + \gamma_{1,q}(1-D)\cdot R_{m,t} + \gamma_{2,q} D\cdot R_{m,t} + \gamma_{3,q}(1-D)\cdot R^2_{m,t} + \gamma_{4,q} D\cdot R^2_{m,t} + \varepsilon_{q,t} \quad (10)$$

Where D equals 1, if $H^{\bar{\varepsilon}}_{p,t}$-$H^{\varepsilon}_{p,t}$, and zero otherwise. This equation offers us to observe the degree of herding, changes in fundamentals, and the given market conditions. This may also reflect behind the psychological expectations of investors. γ_3 and γ_4 denote the herd behavior of non-fundamentals and fundamentals respectively. We find that the non-linear term, γ_3, is statistically significant at the 1% level in the Shanghai and Shenzhen markets, indicating strong evidence of herding. It is noted that either a lower or higher quantile for γ_4 is existent; however, we do not find the evidence of herding for γ_4. The aforementioned findings refer to the decision based on fundamentals due to rational herd behavior, which leads to the higher expectation effects limiting their trading activities. In other words, irrational herding results in less expectations of the market, thus tending to follow market consensus. Besides, we also examine herd behavior existing in different reactions to the rational expectations driven by market fundamentals. The Wald test is then used to test asymmetric effects in this equation. We find that Chi-square is statistically significant, implying that herding occurs in an asymmetric reaction.

Table 3: Estimates of herd behavior under levels of quantile

Quantile regression	α	γ_1	γ_2	R^2
Panel A: Composite				
τ=10	0.04 (2.52)***	0.00 (2.04)**	−0.00 (−1.99)*	0.013
τ=50	2.05 (15.55)***	0.15 (0.89)	−0.00 (−0.04)	0.032
τ=90	14.87 (3.14)***	0.13 (0.06)	−0.03 (−0.16)	0.059
Panel B: Shanghai				
τ=10	2.80 (6.91)***	0.08 (2.16)**	−1.29 (−6.91)***	0.059
τ=50	7.84 (10.45)***	0.03 (4.60)***	−0.36 (2.88)***	0.073
τ=90	34.56 (11.57)***	−0.05 (−1.64)	0.90 (1.52)	0.010
Panel C: Shenzhen				
τ=10	4.39 (5.20)***	0.06 (2.24)**	−1.31 (−1.94)*	0.028
τ=50	20.49 (19.28)***	−0.37 (−2.92)***	0.10 (0.54)	0.029
τ=90	54.14 (9.32)***	0.29 (0.25)	−0.18 (−0.62)	0.041

This table indicates the estimates for the equation as follows: $Q_r(q|RL_t)=\alpha_{0,q}+\gamma_{1,q}|R_{m,t}|+\gamma_{2,q}R^2_{m,t}+\varepsilon_{q,t}$. A significant and negative estimate γ_2 implies herding (t-ratios in parentheses). ***P<1%, **P<5%, *P<10%

Table 4: Estimates of herd behavior for the RL conditions

Quantile regression	α	γ_1	γ_2	γ_3	γ_4	W test	R^2
Panel A: Composite							
τ=10	0.005**	−0.002	−0.002***	0.000	0.008***	36.75***	0.007
	(2.40)	(−1.05)	(−16.70)	(0.81)	(6.47)		
τ=50	0.046***	−0.023***	−0.001***	0.003***	0.087***	22.14***	0.077
	(11.46)	(−5.71)	(−6.75)	(4.29)	(11.63)		
τ=90	1.702***	−1.253***	0.008***	0.231***	0.243	11.68***	0.288
	(4.77)	(−4.08)	(9.27)	(3.52)	(0.87)		
Panel B: Shanghai							
τ=10	0.009***	0.197***	−0.096	−0.249***	0.489	13.854***	0.175
	(5.28)	(8.54)	(−0.44)	(−3.71)	(0.13)		
τ=50	0.073***	0.030***	−1.208**	−0.405***	0.195**	59.56***	0.277
	(15.79)	(17.09)	(−2.57)	(−12.09)	(2.21)		
τ=90	0.205***	0.542***	−0.662	−0.595***	0.254	26.93***	0.433
	(22.32)	(14.38)	(−0.40)	(−12.63)	(0.63)		
Panel C: Shenzhen							
τ=10	0.010***	0.127***	−0.001	−0.020***	0.000	9.230***	0.152
	(6.36)	(5.46)	(−0.70)	(−2.98)	(0.95)		
τ=50	0.057***	0.162***	−0.005	−0.024***	0.001	40.268***	0.218
	(13.06)	(11.60)	(−1.10)	(−5.97)	(1.14)		
τ=90	0.168***	0.204***	−0.023***	−0.029***	0.004***	22.58***	0.331
	(28.37)	(12.57)	(−4.52)	(−9.35)	(4.54)		

This table indicates the estimates for the equation as follows: $Q_r(q|CSAD_t)=\alpha_{0,q}+\gamma_{1,q}(1\text{-}D)\times R_{m,t}+\gamma_{2,q}D\times R_{m,t}+\gamma_{3,q}(1\text{-}D)\times R^2_{m,t}+\gamma_{4,q}D\times R^2_{m,t}+\varepsilon_{q,t}$. Significant and negative estimates γ_3 and γ_4 imply herding (t-ratios in parentheses). W. test is the Chi-square statistic for the joint $\gamma_3 = \gamma_4$ significance based on the Wald test. ***P<1%, **P<5%, *P<10%

Table 5 shows the results of herd behavior under different market conditions. Likewise, we test whether the asymmetric effect exists in market scenarios. Previous studies have provided the evidence of herding in extreme market conditions (Chiang and Zheng, 2010; Luo and Schinckus, 2015; Tan et al., 2008). Therefore, we constructed the model by considering different reactions during periods of increasing and decreasing markets as follows:

$$Q_r(q|RL_t)=\alpha_{o,q}+\gamma_{1,q}|R_{m,t}^{down}|+\gamma_{2,q}R_{m,t}^2\times DM_t^{down} +\gamma_{3,q}|R_{m,t}^{up}|+\gamma_{4,q}R_{m,t}^2\times DM_t^{up}+\varepsilon_{q,t} \quad (11)$$

Where DM_t^{down} and DM_t^{up} are dummy variables. DM_t^{down} is defined as the falling market (R_m<0), where DM_t^{down} = 1, otherwise 0; and DM_t^{up} = 1, otherwise 0, if the market is rising (R_m>0). In the equation, significantly negative values of γ_2 and γ_4 indicate that herding occurs in extreme markets. In addition to the aforementioned statements, quantiles here are also defined as the 10% and 90% criteria of lower and higher tails in the distribution of market returns.

The coefficient γ_4 is significantly negative in three markets; however, γ_2 in panel C is statistically significant. The mixed results show that in the composite and Shenzhen markets, herding occurs in both rising and falling markets. Instead, herding is only observed when the market in Shanghai is rising. This finding is similar to the study of Luo and Schinckus (2015), indicating that a bullish context generates herd behavior for A-shares. Overall, the results imply that the bullish market is prone to irrational herding due to the reduction of psychological expectation effects; for example, external policies intervene in the government less when the market situation is better. Conversely, the increasing influence of psychological expectations on herding results in less irrational herding in the declining market. This result can be possibly explained by Luo and Schinckus (2015), maintaining that investors are more likely to follow the trend when they face a bullish context while they can reduce their herd behavior in a bearish context using technical/analytical tools allowing them not to follow the crowd behavior. Again, during periods of rising and falling markets, an asymmetric effect of herding appears from the significant coefficient using the Wald test.

Table 6 shows the results of herd behavior for the spillover effects and financial crisis. The situation like global financial crisis may affect an investor's judgement, expectation and decision-making. For that situation, we expanded the dummy variable of CRISIS in equation 9 and then included two dummy variables for $R_{US,t-1}^2$ and $R_{US,t-1}^2\times CRISIS$ into the QR analysis. Specifically, the expanded equation is shown as follows:

$$Q_r(q|RL_t)=\alpha_{0,q}+\gamma_{1,q}|R_{china,t}|+\gamma_{2,q}R_{china,t}^2+\gamma_{3,q}R_{US,t-1}^2 +\gamma_{4,q}R_{m,t}^2\times CRISIS_t+\gamma_{5,q}R_{US,t-1}^2\times CRISIS_{t-1}+\varepsilon_{q,t} \quad (12)$$

Where $R_{US,t-1}^2$ refers to the US market returns with one lagged period for China's market; and CRISIS is referred to as European debt crisis. To test the spillover effect and the impact of financial crisis, we use the daily returns of the Standard and Poor's index and European debt crisis during the period of October 2009 - November 2011. An interaction between the spillover effect and the financial crisis is first illustrated for the impact of herding of the US market during the financial crisis. The significant and negative coefficient γ_3 indicates herd behavior

Table 5: Results of quantile regression for RL under market conditions

Quantile regression	α	γ_1	γ_2	γ_3	γ_4	Wald test	R^2
			Panel A: Composite				
τ=10	0.010***	−0.001***	−0.000	0.115***	−0.183***	8.52***	0.149
	(3.15)	(−16.21)	(−0.24)	(7.08)	(−2.96)		
τ=50	0.917***	−1.004***	−0.045***	0.215***	−0.270***	37.68***	0.042
	(11.40)	(−27.84)	(−3.64)	(12.19)	(−8.78)		
τ=90	0.590***	−1.032***	−0.094***	0.127***	−1.564***	29.09***	0.021
	(5.63)	(−12.8)	(−4.06)	(5.95)	(−5.99)		
			Panel B: Shanghai				
τ=10	−0.023***	−0.389	0.477	1.795***	−0.311***	8.78***	0.004
	(−6.20)	(−0.72)	(0.42)	(4.19)	(−3.19)		
τ=50	0.067***	−0.660	0.329	0.840***	−0.840***	22.58***	0.020
	(10.22)	(−1.06)	(0.32)	(4.69)	(−4.69)		
τ=90	0.305***	0.279	−0.273	0.376***	−0.376***	9.69***	0.023
	(11.28)	(−0.63)	(−0.38)	(2.91)	(−2.91)		
			Panel C: Shenzhen				
τ=10	−3.032***	−0.018	−0.124	0.022***	−0.355***	37.5***	0.002
	(−4.55)	(−1.28)	(−0.299)	(3.32)	(−2.76)		
τ=50	0.176***	2.265*	−0.639***	0.023***	−0.139***	58.68***	0.020
	(15.99)	(1.87)	(−2.77)	(5.88)	(−9.52)		
τ=90	0.472***	0.175***	−0.026***	0.051***	−0.312***	51.01***	0.013
	(8.03)	(2.69)	(−3.45)	(4.31)	(−6.11)		

This table indicates the estimates for the equation as follows: $Q_r(q|RL_t)=\alpha_{0,q}+\gamma_{1,q}|R_{m,t}^{down}|+\gamma_{2,q}R_{m,t}^2\times DM_t^{down}+\gamma_{3,q}|R_{m,t}^{up}|+\gamma_{4,q}R_{m,t}^2\times DM_t^{up}+\varepsilon_{q,t}$. Significant and negative estimates γ_3 and γ_4 imply herding (t-ratios in parentheses). ***P<1%, **P<5%, *P<10%

Table 6: Results of herd behavior for the spillover effects and financial crisis

Quantile regression	α	γ_1	γ_2	γ_3	γ_4	γ_5	R^2
Panel A: Composite							
τ=10	0.037	0.012	−0.002	−0.016	−0.008	−0.032	0.056
	(0.46)	(0.15)	(-0.20)	(−0.07)	(−0.89)	(−0.06)	
τ=50	1.99***	0.319	−0.015	0.249	−0.174***	−1.680*	0.028
	(14.02)	(1.58)	(−0.32)	(0.45)	(−4.84)	(−1.69)	
τ=90	1.479***	0.458	−0.061	0.084*	−0.490***	−0.147**	0.031
	(6.67)	(0.19)	(−0.23)	(1.93)	(−3.56)	(−2.09)	
Panel B: Shanghai							
τ=10	−0.030***	0.920***	−0.140*	−0.068	0.292	−0.132***	0.034
	(−7.16)	(2.40)	(−1.95)	(−0.07)	(0.56)	(−3.94)	
τ=50	0.080***	−0.351***	−0.422***	0.012	0.261*	−0.072***	0.085
	(11.21)	(−5.87)	(−3.89)	(0.94)	(1.86)	(−2.53)	
τ=90	0.344***	−0.469	0.811	0.037	−0.671	−0.003***	0.032
	(12.02)	(−1.29)	(1.35)	(0.29)	(−1.19)	(−2.97)	
Panel C: Shenzhen							
τ=10	−0.047***	0.674	−0.280*	0.289	0.056	−0.135***	0.015
	(−5.15)	(0.53)	(−1.95)	(0.15)	(1.37)	(−2.46)	
τ=50	0.206***	−0.043***	0.105	0.044	0.138	−0.505***	0.043
	(19.23)	(−3.58)	(0.54)	(0.96)	(1.00)	(−2.64)	
τ=90	0.575***	0.028	−0.011*	0.285	0.182	−0.473	0.045
	(8.59)	(0.40)	(−1.72)	(1.10)	(0.72)	(−0.12)	

This table indicates the estimates for the equation as follows: $Q_\tau(q|RL_t)=\alpha_{0,q}+\gamma_{1,q}|R_{China,t}|+\gamma_{2,q}R^2_{China,t}+\gamma_{3,q}R^2_{US,t-1}+\gamma_{4,q}R^2_{m,t}\times CRISIS_t+\gamma_{5,q}R^2_{US,t-1}\times CRISIS_{t-1}+\varepsilon_{q,t}$. Significant and negative estimates γ_2 γ_3 γ_4 and γ_5 denote herding (t-ratios in parentheses), herding spillover effects taking place from the US to China, herding occurring during the periods of financial crisis, and herding affected by the US stock market depending on the crisis period, respectively. ***P<1%, **P<5%, *P<10%

of the evidence of spillover effects from the US to China. The significant and negative value of γ_4 implies that herding occurs especially during the financial crisis. Once again, γ_5 captures the influence of the interaction between the US market and the financial crisis.

We find that the coefficient γ_3 is not significant, indicating that there is no influence of herding under the US market conditions. In spite of γ_4 being significant and negative in the composite market, no evidence of herding is shown for the Shanghai and Shenzhen markets. The findings are therefore similar to the results in Table 5. Furthermore, γ_5 is highly existent with low quantile and significantly, reporting that herding spillover effects took place from the US to China during the crisis period. It is important to emphasize that herd behavior may not indicate that investors are irrational. Under certain circumstances, such as investors' compensation, it is entirely rational to follow others' trading decisions to avoid returns which are lower than average markets. In addition, when market participants face uncertainty regarding the accuracy of their information set, herd behavior may arise, even when investors take a rational act (Bikhchandani and Sharma, 2001). In particular, the results indicate that herding is more likely to occur when the market is extremely stressful, even if investors' rational expectations of the market will become stable in the near future. As argued by Luo and Schinckus (2015), there is no contagion effect of markets in the US and China due to the reason that the government can easily intervene in volatile situations. These results may provide a gap for the investigation and explanation of the influences of the US stock market on China's stock market.

5. CONCLUSIONS

In this paper, to detect herd behavior and extend the method presented by Christie and Huang (1995) and Chang et al. (2000), we conduct and test the rational expectation based on the reaction to the fundamental information of the investors in China's market. Our empirical aims to measure the CSAD and RL in a particular market based on the concepts proposed by Bikhchandani and Sharma (2001) and Galariotis et al. (2015). The QR is applied to the composite and Shanghai and Shenzhen markets. The dummy variables of the spillover effect examining the influence of the US market are applied to test whether investors may tend to herd during the financial crisis.

We find that herding remains scarce during periods of market tumult. Herd behavior is also more pronounced under rising market conditions. We examine asymmetric herding related to investor's expectations and market conditions. The asymmetric effect of herding is present in all markets. Our results suggest that rational expectations have an important effect on herding. However, we find that there is no spillover effect due to the US market returns. In addition, herding is significantly present when investors face the financial crisis and external effects simultaneously. An important implication from the results involves the investors' reactions which are highly consistently based on their expectations of the market. The evidence reports that investors exhibit different levels of rational expectations; in particular, herding strongly exists in irrational expectations. This paper claims that investors' herd behavior may be apparently different due to the effectiveness of regulation, information efficiency and market integrations.

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