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What Explains Herd Behavior in the Chinese Stock Market?

Terence Tai-Leung Chong[1], Xiaojin Liu[2], and Chenqi Zhu[3,*]

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Abstract: This paper examines the causes of herd behavior in the Chinese stock market. Using the non-linear model of Chang, Cheng and Khorana (2000), we find robust evidence of herding in both the up and down markets. We contribute to the existing literature by exploring the underlying reasons for herding in China. It is shown that analyst recommendation, short-term investor horizon, and risk are the principal causes of herding. However, we cannot find evidence that relates herding to firm size, nor can we detect significant differences in herding between state-owned enterprises (SOE) and non-SOEs.

JEL Classification: G15

Keywords: A-share market; Herd behavior; Return dispersion; Systemic risk.

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1. Introduction

Herding behavior in stock markets has been the subject of considerable academic attention over past two decades. Some studies regard herding as a result of rational incentives (Shleifer and Summers 1990, Chari and Kehoe 2004, Calvo and Mendoza 2000), while others believe that it results from the cognitive bias of investors (Devenow and Welch, 1996; Lux, 1995). Herding can be spurious or intentional – the former refers to a clustering of investment decisions owing to a similar underlying information environment, whereas the latter is a situation where investors follow each other's trading decisions regardless of their own beliefs. Herding is more ubiquitous in emerging markets. Most extant studies find significant evidence in favor of herding in developing countries (Chang et al., 2000; Chiang et al., 2010). However, few studies have identified whether certain market micro-structures or stock characteristics might encourage herding among investors.

This paper aims to fill this gap by examining herding behavior in the Chinese stock market, with a particular focus on the role of government intervention, information environments, investor horizons, and the level of systematic risk caused by herding. The case of the Chinese stock market is of interest because of its influence as the largest emerging stock market in the world. As of 2012, the total market capitalization of the Chinese stock market was over 3,740 billion U.S. dollars. Moreover, the market is unique in that it is dominated in number by individual investors, who have little professional knowledge and limited access to credible information. As a result, these investors might be predisposed to follow the trading decisions of institutional investors. Since 2006, the number of domestic institutional investors in China and the value of assets under their management have soared. More recently, an increasing number of foreign institutional investors have also made investments in China through the qualified foreign institutional investors (QFII) scheme.

Previous academic evidence of herd behavior in China is mixed. While Demirer and Kutan (2006) detect no evidence of herd behavior, Tan et al. (2008) find herding to be prevalent in both the A-share and the B-share markets. To the best of our knowledge, little effort has been made to investigate (1) the underlying reasons for herding, and (2) stock characteristics that generate a higher probability of herding. In this paper, we will address these two questions and provide a comprehensive analysis of herding behavior in the Chinese stock market. Following the methodology of

Chang, Cheng and Khorana (2000), we find significant evidence in favor of herding in the Chinese A-share market between 2000 and 2011.[4] Consistent with the view that market participants tend to exhibit herd behavior during market slumps, the evidence of herding in our sample is more pronounced in the down market. Subsample analyses show that our results are robust.

In addition, we also uncover the characteristics of stocks that are more likely to be herded. Firstly, in contrast to the conventional view that government intervention is an important perpetuator of herding, no significant difference in herding between state-owned enterprises (SOE) and non-SOEs is detected. Secondly, it is found that the number of analysts who follow the stock affects herding. In the subsample where the number of analyst following is above the median, we find significant evidence of herding, while no herding is detected in other subsamples. Thirdly, firm size and dispersion in analyst forecasts – which are also proxies for information environment – are not important causes of herding. In subsamples partitioned by size and forecast dispersion, significant evidence of herding is detected. In addition, we also investigate the influence of speculative investors on herding. Speculation is proxied by daily turnover rate, which is measured by the trading volume scaled by shares outstanding. Interestingly, we find that stocks in the subsample with highest daily turnover exhibit significant evidence of herding, which is consistent with the view that speculation contributes to herd behavior. Finally, we find evidence that herding is more pronounced in risky stocks.

The rest of the paper is organized as follows. Section 2 reviews the herding literature. In Section 3, we provide methodological details and descriptions of the data. Section 4 and 5 present the empirical results, and Section 6 concludes the paper.

2. Related Literature

There exists an exhaustive literature on the topic of herding. One scholarly camp argues that herding arises from investors' psychological bias. For example, Devenow and Welch (1996) and Lux (1995) argue that herding occurs when investors

[4] If we extend our results from 2000 to the inception of Shanghai Stock Exchange or Shenzhen Stock Exchange, the results do not change much. The reason for selecting a sample period after 2000 is because the information of analyst following is more available after this year. [Unclear what "information of analyst following" is – suggest rephrasing]

suppress their prior beliefs and blindly follow the trading strategies of others. Another strand of the literature contends that herding can also occur among rational market participants. An information-related herding theory states that the actions of informed traders might reveal inside information, which induces outsiders to follow the investment strategies of informed traders (Shleifer and Summers 1990, Chari and Kehoe 2004, Calvo and Mendoza 2000). Moreover, the principal-agent problem in the asset management industry might also cause herding. As suggested by Scharfstein and Stein (1990) and Rajan (1994), fund managers of institutional investors care about their performance relative to their peers, and hence have incentive to infer information from the investment strategies of their peers and mimic those strategies. In this way, they will perform on par with their counterparts in other mutual funds. Consequently, the rational behavior of fund managers leads to the seemingly irrational market phenomenon of herding.

A variety of empirical methodologies have been employed to examine herd behavior. Christie and Huang (1995), for instance, study cross-sectional standard deviations in the U.S. equity market. The underlying intuition behind their method is that if market participants suppress their own predictions about asset prices during periods of large market movements and base their investment decisions only on market consensus, individual asset returns will not diverge substantially from the overall market return. However, a rational asset pricing model would predict the dispersion of individual stock returns to increase with market return. Thus, during large market swings, a reduction of cross-sectional standard deviations leads to the existence of herd behavior. The results of Christie and Huang (1995) do not suggest evidence of herding in the U.S. stock market.

Chang, Cheng and Khorana (2000) propose a variant of the methodology used by Christie and Huang (1995). They calculate the cross-sectional absolute deviation (CSAD) of stock returns, which is less subject to the influence of outliers than the cross-sectional standard deviation (CSSD) of stock returns. The implication from a rational asset pricing model indicates that there is a linear and positive relation between CSAD and market return. The evidence that CSAD increases (decreases) with market return with a decreasing (increasing) speed lends support to herd behavior.

Chang, Cheng and Khorana (2000) document significant evidence of herding in the stock markets of South Korea and Taiwan. Partial evidence of herding in the

Japanese stock market is also found, but no evidence of herding is found in the U.S. or Hong Kong markets. Hwang and Salmon (2004) employ a different testing methodology based on cross-sectional variability of factor sensitivities. Their study confirms that herd activities exist in South Korea. Lin and Swanson (2003) find no evidence that foreign investors herd in the Taiwanese market using the cross-sectional standard deviation based methodology. Zhou and Lai (2009) discover that herd behavior in Hong Kong tends to be more prevalent in small stocks, and that investors are more likely to herd when selling rather than buying stocks. Chiang and Zheng (2010) examine daily return data for 18 countries, and document herd behavior in the stock markets of developed countries (except the U.S.) and developing countries alike.[5]

3. Methodology and Data

We use a simple framework, following Chang et al. (2000), to explain why our empirical method can capture herd behaviors. In a rational market without any friction, a capital asset pricing model (CAPM) indicates that the expected return of individual stock can be expressed as follows:

$$E(R_{it}) = \beta_0 + \beta_i E(R_{mt} - \beta_0),$$

where R_i is the individual stock return on day t, $R_{mt}$is the market portfolio return on day t, β_0 is the return on the zero-beta portfolio and β_i is individual stock's systematic risk.

The absolute value of the deviation of individual stock expected return from market return is:

$$|E(R_{it}) - R_{mt}| = |\beta_i - 1| * |E(R_{mt} - \beta_0)|,$$

where $E(R_{mt}) = \beta_0 + 1 * E(R_{mt} - \beta_0)$. The average cross-sectional absolute value of the deviation of all individual stocks (AAVD) is simply

[5] Apart from stock markets, Gleason, Lee and Mathur (2003) study herd behavior in European futures markets, and Gleason, Mathur and Peterson (2004) conduct a detailed analysis on the intraday herd behavior of the ETF market.

$$AAVD_t = \frac{1}{N} * \sum_{i=1}^{N} |E(R_{it}) - R_{mt}| = \frac{1}{N} * \sum_{i=1}^{N} |\beta_i - 1| * |E(R_{mt} - \beta_0)|$$

From the above equation, we can see that the average absolute value of deviation is a positive and linear function of absolute value of market return.

$$\frac{\partial AAVD_t}{\partial |E(R_{mt})|} = \frac{1}{N} * \sum_{i=1}^{N} |\beta_i - 1| > 0, \qquad \frac{\partial^2 AAVD_t}{\partial E(R_{mt})^2} = 0$$

Any non-linear relation between AAVD and market return indicates investor irrationality or market friction. As a special case of irrational trading behavior, investors following a herding trading strategy suppress their beliefs and follow the market, which decreases an individual stock's deviation from market return. In case of a volatile market, the herding effect dominates the positive effect arising from a rational trading strategy, suggesting a negative association between AAVD and $E(R_{mt})$. Combing the two effects together, we expect that AAVD first increases and then decreases with market return. Hence, we use the negative correlation between the AAVD and $E(R_{mt})^2$ as evidence of herd behavior.

To empirically test herd behavior in the Chinese stock market, we again follow Chang, Cheng and Khorana (2000) and employ a non-linear regression specification to examine the relation between the level of equity return dispersion and overall market return. The return dispersion measure is the cross-sectional absolute deviation of returns (CSAD), which is formulated as:

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

where N is the number of firms in the aggregate market portfolio, $R_{i,t}$ is the observed stock return for firm i on day t and $R_{m,t}$ is the return of market portfolio at time t. The CSAD is a proxy for the AAVD under the assumption that realized return is a good proxy for expected return and it measures the degree to which individual stock return deviates from market consensus.

The rational asset-pricing model implies a linear relation between the dispersion in individual asset returns and the market return; dispersion in individual asset returns arises with the absolute value of the market return under normal conditions. However, if market participants tend to follow the consensus of the market and trade in the same direction during periods of market stress, this herd behavior is likely to increase the correlation among asset returns, which leads to a non-linear relation between CSAD and market return. Therefore, a testing methodology based on a general quadratic relationship between CSAD and market return of the form is proposed as follows:

$$CSAD_t = \alpha + \gamma_1|R_{mt}| + \gamma_2(R_{mt})^2 + \varepsilon_t \qquad (2)$$

The non-linear term is captured by γ_2. In the presence of herding, the non-linear coefficient γ_2 will be significantly negative, indicating that during times of a high market volatility, equity return dispersion decreases with absolute return because investors tend to suppress their own opinions and follow the trading strategies of others. In addition, it is possible that the degree of herding may be asymmetric in the up and down markets. Therefore, the following models for up and down markets respectively are estimated:

$$CSAD_t^{UP} = \alpha + \gamma_1^{UP}\left|R_{mt}^{UP}\right| + \gamma_2(R_{mt}^{UP})^2 + \varepsilon_t \qquad (3)$$

$$CSAD_t^{DOWN} = \alpha + \gamma_1^{DOWN}\left|R_{mt}^{DOWN}\right| + \gamma_2(R_{mt}^{DOWN})^2 + \varepsilon_t \qquad (4)$$

where $CSAD_t^{UP}(CSAD_t^{DOWN})$ is the average deviation of individual stock return to the market return when the market return is positive (negative).

The stock price data of the entire population of A-share firms and market return data of the Shenzhen and Shanghai markets are obtained from the China Stock Market Accounting Research (CSMAR) database. Daily returns are examined, and the sample period ranges from January 2000 to December 2011.

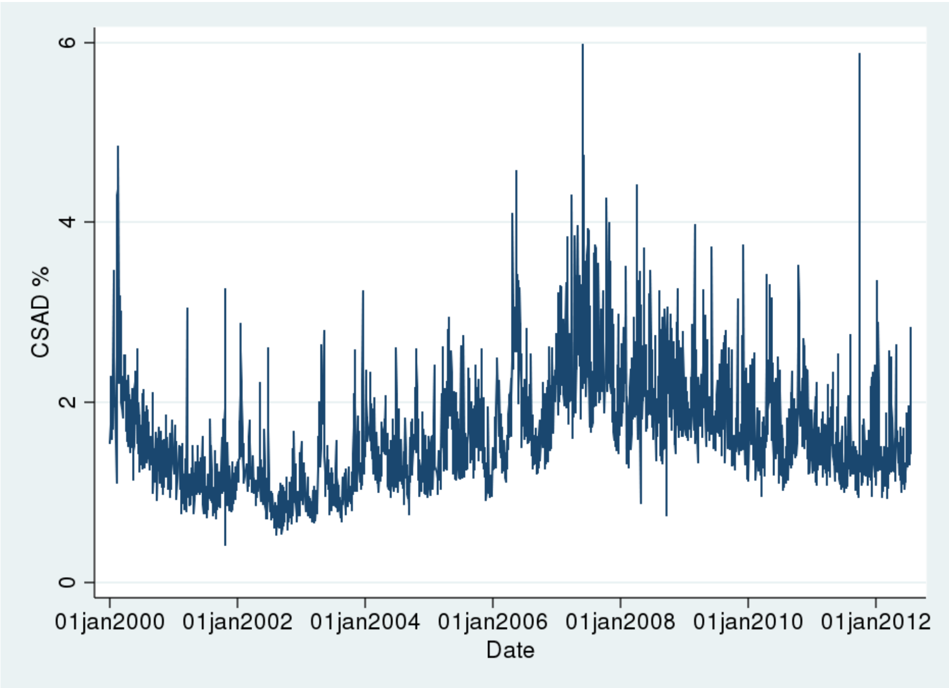
Table 1: Summary Statistics

Variable	Mean	Std.Dev.	Min	Max
Panel A: Whole Sample Statistics				
Variable	*Mean*	*Std.Dev.*	*Min*	*Max*
Market_Return	0.0	1.8	-9.1	9.9
CSAD	1.7	0.6	0.4	6.0
State	0.4	0.5	0.0	1.0
Beta	1.1	0.3	-4.7	10.7
Analyst	4.5	8.1	0.0	79.0
Dispersion	0.0	0.0	-1.2	0.0
Size	4168110.0	27900000.0	23130.0	2060000000.0
Turnover	24.7	34.5	0.0	2686.6
Panel B: Subsample Split by Government Intervention				
SOE	1.6984	0.5966	0.3859	6.1064
non-SOE	1.6938	0.6628	0.4219	8.5203
Panel C: Subsample Split by Information Environment				
Macro-Information Environment				
Low Beta	1.6779	0.7030	0.5750	9.3747
High Beta	1.7788	0.7337	0.2007	8.9691
Firm-specific Information Environment				
Few Analysts	1.7970	0.7661	0.6473	18.5991
More Analysts	1.7074	0.5933	0.6057	5.2141
More Dispersion	1.6563	0.6079	0.2041	8.6875
Less Dispersion	1.8314	0.7688	0.5488	10.0786
Small Size	1.7541	0.7345	0.4992	9.1110
Large Size	1.5577	0.7238	0.1201	21.6996
Panel D: Subsample Split by Speculation				
Low Turnover	1.1770	0.6915	0.3450	8.5775
High Turnover	2.9181	1.5319	0.3260	43.1503

This table reports the descriptive statistics of market return and proxies for herding. The sample is all A share stocks in China from 2000 to 2011. $Market\_Return$ is the value-weighted market return. $CSAD$ is defined in Section 3. $State$ is a dummy variable indicating whether the listed firm's ultimate owner is the government. $Beta$ is the coefficient on from the 30-day rolling window estimation of the market model. $Analyst$ is the number of analyst following. $Dispersion$ is the standard deviation of analyst earnings forecast. $Size$ is market capitalization. *Turnover* is the ratio of trading volume to total tradable shares outstanding.

The summary statistics are reported in Table 1. The time series average value weighted market return over the whole sample period is 0.0%, with a standard deviation of 1.8%, ranging from -9.1% to 9.9%. As for CSAD, the mean is 1.7% and its standard deviation is 0.6%, which is similar to the statistics in Tan et al. (2008). Figure 1 depicts the time series pattern of CSAD. Note that large investor dispersion mostly occurs in 2007 and 2008.

Figure 1: CSAD over the sample period



This figure depicts the CSAD over the sample period. CSAD is defined in Section 2.

4. Empirical results

4.1 Nonlinearity in return dispersions and market return

Table 2 presents the estimation results of the following model:

$$CSAD_t = \alpha + \gamma_1 |R_{mt}| + \gamma_2 (R_{mt})^2 + \varepsilon_t \qquad (5)$$

Table 1: Regression Result

Panel A: Whole Sample

	(1)	(2)	(3)
VARIABLES	*Full Sample*	*Up Market*	*Down Market*
$\lvert R_{mt} \rvert$	0.2933***	0.2323***	0.3361***
	(0.024)	(0.025)	(0.033)
R^2_{mt}	-0.0253***	-0.0285***	-0.0200***
	(0.004)	(0.003)	(0.005)
Constant	1.3692***	1.3907***	1.3665***
	(0.027)	(0.030)	(0.035)
Observations	2,901	1,568	1,333

Panel B: Crisis Period

VARIABLES	*Oct 2007-Oct2008*	*Jan2000-Sep2007*	*Oct2008-Dec2011*
$\lvert R_{mt} \rvert$	0.1513***	0.2780***	0.1961***
	(0.056)	(0.042)	(0.032)
R^2_{mt}	-0.0201***	-0.0163**	-0.0167***
	(0.007)	(0.008)	(0.006)
Constant	2.0913***	1.3919***	1.6504***
	(0.091)	(0.045)	(0.038)
Observations	261	1,149	1,036

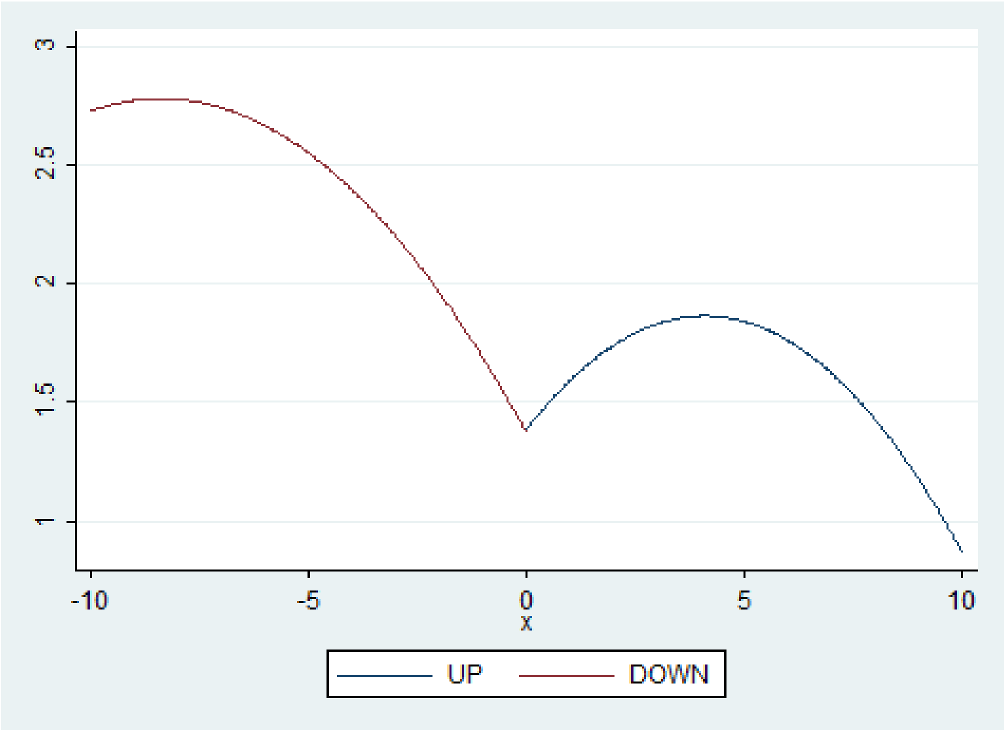
Panel A presents the regression results (all A shares) for $CSAD_t = \alpha + \gamma_1 |R_{mt}| + \gamma_2 {R_{mt}}^2 + \varepsilon_t$ for up market and down market respectively. Panel B examines the effect of extreme market conditions on herding. From 2007 October to 2008 October, the Chinese stock market dropped dramatically. The Newey-West (Newey and West, 1987) heteroskedasticity consistent standard errors are reported in parenthesis. *, **, and *** indicate significance at the 10%, 5%, and 1% levels.

The model is also estimated separately for subsamples in the up and down markets. To make a direct comparison between the coefficients of the linear term in the up and down markets, the absolute value, instead of the raw value, of equally weighted market return is used in the model estimation. The intercept term represents the average level of equity dispersion when the market return is zero, and is 1.37% for the whole sample. Compared to the down market, where the intercept is also 1.37%, the estimated value of the intercept term in the up market is 1.39%. The difference is not significant.

The coefficients of the absolute market return (γ_1) are significantly positive in the whole sample regression, as well as in the up and down market regressions. This is consistent with the CAPM prediction , which states that return dispersions increase linearly with absolute market return, discussed briefly in Section 3. The rate of increase is 0.23 and 0.34 in the up market and down market, respectively. Consistent with the findings of McQueen et al. (1996), the stock market in China reacts faster to bad news than good news. As a result, the average of CSAD is larger in good times due to asymmetric reactions to good and bad news.

More importantly, the non-linear term coefficients (γ_2) are negative and significant in all three regressions, providing indirect evidence for herd behavior in the Chinese stock market. As discussed in Section 3, a negative correlation between CSAD and quartic market return term suggests that individual investors suppress their own beliefs and follow the market, which in turn leads to cross-sectional dispersion reacting to absolute market return at a decreasing rate. Our evidence is consistent with that of Chiang and Zheng (2010), who also document evidence of herding in both the up market and down market. However, we do not know whether herding is more prevalent when the market is booming or slumping, because the non-linear term coefficients are of similar magnitude and significance in both up and down markets.

Figure 2: Herding in the Up or Down Market



This figure depicts the relation between CSAD and market return in the up market and down market respectively. The parameters are based on regression results reported in Table 2. The horizontal axis is the market return and vertical axis represents CSAD.

To gain a better picture of the relation between CSAD and market return, we depict the estimation results in Figure 2. Figure 2 shows a hump-shaped relation between CSAD and market return. The turning point for the up market is 4.65%, while it is 5.09% for the down market. The speed of the increase (decrease) before (after) reaching the turning point is also faster in the up market than in the down market. In other words, investors show a lower threshold for suppressing their own opinions in the up market. Note that in the presence of herding, the relative degree of herding is larger in the up market. However, such difference is not significant.

4.2 Robustness Check

As shown in Figure 1, the stock return dispersion is more volatile and relatively large during 2007, when the stock market experienced a dramatic boom followed by a rapid slump. To investigate whether herd behavior is still prevalent under such extreme market conditions, we examine the herd behavior during October

2007 and October 2008.[6] In October 2007, the A-share market reached its peak with the Shanghai Composite Index at 6124 points, and an average price-earnings ratio of 50. After that, the stock market started to fall swiftly, plummeting towards its lowest around October 2008, where the Shanghai Composite Index was at 1664 points. This period is therefore widely accepted as an A-share stock market crisis. It is intriguing whether investors will change their behavior in times of crises.

The model specification is the same as before. The results are reported in Panel B of Table 2. In Column 1, we report the estimation results in the crisis period, October 2007 to October 2008. The coefficient of the squared market return (γ_2) is negative and significant, which indicates the presence of herd behavior in the crisis period. Furthermore, we also investigate herd behavior in our sample period, as separate from the crisis period. The results are reported in Column 2 and Column 3. Our results show that herd behavior is still present before October 2007 and after 2008. It should be noted that the coefficient of the squared market return (γ_2) is larger in the crisis period than the normal period. This parallels Chiang and Zheng's (2010) assertion that financial crises, to some extent, contribute to the intensification of herd behavior.

5. Determinants of Herding

Apart from testing the presence of herd behavior in the market, it is also important to explore the causes behind herd behavior. We will consider market microstructure and firm characteristics as possible triggers or enablers of herd behavior. The four factors we examine here are government intervention, information environment, speculation, and risk.

5.1 Government Intervention

Firstly, we identify government intervention as a probable cause of herding, especially as the Chinese stock market is highly regulated. A number of regulations, such as IPO or SEO verification, enable the regulatory authority to keep the capital market under tight control. Moreover, more than half of the listed firms are

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[6] When we extend the crisis period to September 2007 – November 2008, the results still hold.

state-owned enterprises (SOE). These enterprises must report to the state-owned Assets Supervision and Administration Commission (SASAC) and follow strict government guidelines in their operation. Hence, government policies and regulatory measures can easily distort investor sentiment in China.

To analyze the impact of governmental intervention on herd behavior, we examine whether herding is more pronounced in SOEs. We define whether or not a listed firm is a SOE based on the ultimate controlling shareholder. If the ultimate controlling shareholder is the central government, the local government, or public institutions, the firm is considered a SOE. We obtain the shareholder information from CSMAR, merging our daily stock return data with annual ownership information. CSAD based on SOEs and non-SOEs is calculated using the same formula defined above. We then use the same model specification to detect herd behavior in SOEs and non-SOEs, respectively. The results are reported in Table 3.

Table 2: Regression Result (Subsample Split by State Ownership)

Panel A: SOE

	(1)	(2)	(3)
VARIABLES	*SOE Full Sample*	*SOE Up Market*	*SOE Down Market*
$\lvert R_{mt}\rvert$	0.2475***	0.1738***	0.2991***
	(0.025)	(0.035)	(0.035)
R^2_{mt}	-0.0191***	-0.0229***	-0.0140**
	(0.004)	(0.007)	(0.006)
Constant	1.4463***	1.4656***	1.4574***
	(0.030)	(0.035)	(0.040)
Observations	2,185	1,187	998

Panel B: Non SOE

VARIABLES	*NonSOE Full Sample*	*NonSOE Up Market*	*NonSOE Down Market*
|Rmt|	0.2470***	0.1818***	0.2947***
	(0.026)	(0.037)	(0.037)
R2mt	-0.0187***	-0.0241***	-0.0131**
	(0.004)	(0.007)	(0.007)
Constant	1.5513***	1.5574***	1.5748***
	(0.032)	(0.036)	(0.042)
Observations	2,185	1,187	998

This table presents the regression results (all A shares) for $CSAD_t = \alpha + \gamma_1|R_{mt}| + \gamma_2 {R_{mt}}^2 + \varepsilon_t$ for the up market and down market respectively. In Panel A, the dependent variable CSAD is calculated based on SOEs, while in Panel B it is calculated based on non-SOEs. The Newey-West heteroskedasticity consistent standard errors are reported in parenthesis. *, **, and *** indicate significance at the 10%, 5%, and 1% levels.

Table 3 indicates that the coefficients of the non-linear term in market return are always significantly negative. The magnitudes are also similar: -0.0191 and -0.0187 for SOEs and non-SOEs, respectively. Both are significant at the 1% level. Even if we vary the non-linear effect in the up and down markets, we still cannot find any significant difference between SOEs and non-SOEs in the non-linear term, regardless of market conditions. Hence, we cannot conclude that government intervention gives rise to herd behavior.

5.2 Information Environment

In this subsection, we investigate how the information environment affects herd behavior. The paucity of reliable and timely information, upon which decisions by the investor are made, is one of the primary reasons for herd behavior. Without a credible information source, investors generally follow market trends as a basis for their investment decisions. As suggested by the Kyle Model (Kyle, 1985), a large number of buy orders is indicative of good market sentiment, whereas a larger number of sell orders is a signal of bad news. If there is complete information, investors are able to make their own judgments about investment portfolios. However, when the information environment is opaque, the best strategy is for investors to infer true information from their counterparts or simply follow others, leading to rampant herd behavior in the market.

Moreover, the principal-agent problem between fund managers and shareholders in the asset management industry also intensifies herding. As suggested in Scharfstein and Stein (1990), fund managers might mimic investment strategies from their peers. Hence, we conjecture that the scarcity of reliable information foments herd behavior even for institutional investors.

To study the effect of information environment, we use the following proxies: the number of analyst following the stock, analyst forecast dispersion, and firm size. Analysts help disseminate firm-specific information in a more timely and efficient manner. Therefore, the presence of analysts should enhance market efficiency and reduce herd behavior. However, some “star analysts” have a larger number of followers and are thus capable of generating herd behavior among investors. When investors indiscriminately follow the recommendations of analysts, herd behavior becomes observable regardless of the quality of the information.

Table 3: Regression Result (Subsample Split by Information Environment)

Panel A: Number of Analysts Following

VARIABLES	*Quantile1*	*Quantile2*	*Quantile3*	*Quantile4*
$\|R_{mt}\|$	0.1752***	0.1177***	0.1999***	0.2426***
	(0.034)	(0.038)	(0.029)	(0.029)
R^2_{mt}	-0.0012	-0.0008	-0.0096*	-0.0174***
	(0.007)	(0.007)	(0.006)	(0.006)
Constant	1.5822***	1.7841***	1.5117***	1.4624***
	(0.037)	(0.042)	(0.032)	(0.031)
Observations	2,185	2,185	2,185	2,185

Panel B: Analyst Dispersion

VARIABLES	*Quantile1*	*Quantile2*	*Quantile3*	*Quantile4*
$\|R_{mt}\|$	0.2106***	0.1965***	0.2186***	0.2402***
	(0.029)	(0.028)	(0.028)	(0.036)
R^2_{mt}	-0.0106*	-0.0101*	-0.0136**	-0.0141**
	(0.006)	(0.006)	(0.006)	(0.007)
Constant	1.4187***	1.4598***	1.4496***	1.5755***
	(0.030)	(0.030)	(0.032)	(0.038)
Observations	2,185	2,185	2,185	2,185

Panel C: Firm Size

VARIABLES	*Quantile1*	*Quantile2*	*Quantile3*	*Quantile4*
$\|R_{mt}\|$	0.2187***	0.2247***	0.2203***	0.2737***
	(0.029)	(0.029)	(0.027)	(0.026)
R^2_{mt}	-0.0119**	-0.0104*	-0.0103*	-0.0186***
	(0.006)	(0.006)	(0.006)	(0.005)
Constant	1.5112***	1.4219***	1.3781***	1.2716***
	(0.029)	(0.029)	(0.027)	(0.027)
Observations	2,901	2,901	2,901	2,901

This table presents the regression results (all A shares) for $CSAD_t = \alpha + \gamma_1|R_{mt}| + \gamma_2 {R_{mt}}^2 + \varepsilon_t$ for four portfolios formed by three different proxies of information environment. Panel A reports the results for the subsample split by the number of analysts following the individual stock. In Panel B and Panel C, the whole sample is partitioned by analyst forecast dispersion and firm market capitalization. Analyst forecast data begins 2003, as few stocks have been followed by analysts before 2003. The Newey-West heteroskedasticity consistent standard errors are reported in parenthesis. *, **, and *** indicate significance at the 10%, 5%, and 1% levels.

Panel A of Table 4 presents the non-linear effect of market return on stock return dispersion across firms with different numbers of analyst following. The analyst data starts in 2003; before 2003, most firms did not have analyst following. We rank the number of analyst following for each industry every year and form four portfolios accordingly. We calculate CSAD for each portfolio and estimate Model 1. Column 1 represents the results for firms whose number of analysts is the least, compared to their peers within the same one-digit China Securities Regulatory Commission (CSRC) industry. Columns 2 to 4 represent the other three quartiles respectively.

Observe from Panel A that for portfolios with few analysts following, no significant evidence of herding is found. The coefficients of the non-linear term in the first two columns are insignificant. For portfolios with a larger number of analysts following (Column 3 and Column 4), the coefficient on the quadratic term is significantly negative, indicating the presence of herd behavior. Therefore, the very existence of analysts results in herd behavior in China, as investors tend to suppress their own opinions in favor of stocks that are heavily followed by analysts.

Similarly, for each firm, we calculate the dispersion among analysts in their earnings forecast each year. In related literature, analyst forecast dispersion is a widely used proxy for the information environment. We investigate the likelihood of stocks becoming the target of herding based on the degree to which they display a large analyst forecast. The results are reported in Panel B of Table 4. Surprisingly, it is observed that herding is prevalent across four quantiles, suggesting that the degree of analyst disagreement towards the earnings is not an important cause of herding. We also examine the possible effects of firm size on herding behavior. One may predict that herding behavior occurs less in large firms, as information on them tends to be more transparent compared to smaller firms. However, as reported in Panel B, no difference of herding behavior can be found for portfolios of different firm sizes. In other words, the degrees of herding behavior are similar for large and small firms.

5.3 Speculation

There is little doubt that speculation is a prominent catalyst for herding behavior. However, it is impossible to determine whether a particular investor is rational or speculative, or whether speculation arises from psychological bias or calculated strategy. In this paper, we focus on one particular aspect of speculation, namely the short-term investor horizon. As pointed out by Froot et al. (1992), myopic investors might herd on limited information; thus, the short-term investor horizon might lead to herd behavior.

We measure speculative behavior using daily turnover, which is total trading volume scaled by total tradable shares outstanding. A higher turnover implies a relatively shorter investor horizon. For each trading day, we rank all stocks according to their turnover values and form four portfolios corresponding to turnover quartiles. We then estimate Model 1 for each portfolio. The results are reported in Table 5. Consistent with our expectation, herd behavior is found in portfolios with the highest turnovers, as the coefficient on the quadratic term is significantly negative. Apart from the highest turnover portfolio, no herd behavior is detected in other portfolios.

Table 4: Regression Result (Subsample Split by Speculation)

	(1)	(2)	(3)	(4)
VARIABLES	*Quantile1*	*Quantile2*	*Quantile3*	*Quantile4*
$\lvert R_{mt} \rvert$	0.2513***	0.1903***	0.1881***	0.2212***
	(0.026)	(0.025)	(0.030)	(0.052)
R^2_{mt}	-0.0023	-0.0054	-0.0088	-0.0207*
	(0.005)	(0.005)	(0.006)	(0.011)
Constant	0.8708***	1.0793***	1.4649***	2.6824***
	(0.023)	(0.023)	(0.030)	(0.050)
Observations	2,901	2,901	2,901	2,901

This table presents the regression results (all A shares) for $CSAD_t = \alpha + \gamma_1 |R_{mt}| + \gamma_2 {R_{mt}}^2 + \varepsilon_t$ for four portfolios formed based on investor speculation. Speculation is proxied by turnover ratio, which is measured by each stock's trading volume scaled by total tradable shares outstanding. The Newey-West heteroskedasticity consistent standard errors are reported in parenthesis. *, **, and *** indicate significance at the 10%, 5%, and 1% levels.

5.4 Systematic Risk and Stock Synchronicity

Finally, we examine the influence of risk on herd behavior. Individual and institutional investors tend to seek advice from others in face of market uncertainty. Shiller and Pound (1989) document that institutional investors are more likely to listen to advice from other professionals when facing riskier investments. To the extent that institutional investors herd based on information from others, such herding would be more profound in stocks with higher risk. We measure risk in terms of systematic risk (beta from the market model $R_{it} - R_{ft} = \beta_0 + \beta_1(R_{mt} - R_{ft}) + \epsilon_{it}$), and stock synchronicity (R^2 from the market model). In a similar fashion, we form four portfolios based on systematic risk or stock synchronicity and estimate Model 1 for each portfolio. The results are reported in Table 6.

Table 5: Regression Result (Subsample Split by Risk and Synchronicity)

Panel A: Systematic Risk Proxied by Beta of Market Return

VARIABLES	*Quantile1*	*Quantile2*	*Quantile3*	*Quantile4*
$\lvert R_{mt} \rvert$	0.2453***	0.1911***	0.2114***	0.2884***
	(0.026)	(0.026)	(0.027)	(0.030)
R^2_{mt}	-0.0090*	-0.0091	-0.0108*	-0.0225***
	(0.005)	(0.006)	(0.006)	(0.006)
Constant	1.4036***	1.3373***	1.3383***	1.5009***
	(0.029)	(0.026)	(0.027)	(0.030)
Observations	2,901	2,901	2,901	2,901

Panel B: Synchronicity Estimated from Market Model

VARIABLES	*Quantile1*	*Quantile2*	*Quantile3*	*Quantile4*
$\lvert R_{mt} \rvert$	0.2480***	0.2552***	0.2358***	0.2013***
	(0.032)	(0.028)	(0.026)	(0.024)
R^2_{mt}	-0.0087	-0.0171***	-0.0155***	-0.0102**
	(0.006)	(0.006)	(0.006)	(0.005)
Constant	1.7578***	1.4357***	1.2799***	1.1133***
	(0.034)	(0.028)	(0.027)	(0.024)
Observations	2,901	2,901	2,901	2,901

This table presents the regression results (all A shares) for $CSAD_t = \alpha + \gamma_1 |R_{mt}| + \gamma_2 R_{mt}{}^2 + \varepsilon_t$ for four portfolios formed based on systematic risk and stock synchronicity. Systematic risk is measured by beta from the 30-day rolling regression $R_{it} = \beta_0 + \beta_0 R_{mt} + \epsilon_{it}$. In Panel B, the whole sample is split based on synchronicity, which is measured by R^2 from the market model. The Newey-West heteroskedasticity consistent standard errors are reported in parenthesis. *, **, and *** indicate significance at the 10%, 5%, and 1% levels.

Table 6 shows that herd behavior mainly exists in portfolios with higher systematic risk and stock synchronicity. In Panel A, when systematic risk is small, the coefficient on non-linear term is either insignificant or marginally significant. However, when systematic risk is high, the coefficient of the non-linear term is highly significant. Similarly, one can find in Panel B that portfolios of stocks with high synchronicity show signs of herding. Therefore, herding is not prevalent for Chinese stocks with high idiosyncratic risk, but is more prevalent for stocks with high systemic risk.

6. Conclusion

Despite the growing importance of the Chinese stock market, the existence and cause of herd behavior in this market has yet to be fully elucidated. In this study, we investigate herd behavior in the Chinese stock market following the methodology proposed by Chang, Cheng and Khorana (2000). A non-linear regression specification of CSAD and market return is employed to examine the herd behavior in the Chinese A-share market. In the absence of herd behavior, classic asset pricing theory (CAPM) predicts that CSAD is a linear function of absolute value of market return. Any non-linear relation between CSAD and market return is evidence of deviation from CAPM. Particularly, when investors suppress their own beliefs and follow market sentiment, we should find a negative correlation between cross-sectional absolute deviation of individual stock returns from market return and a non-linear term in market return.

Indeed, we find significant evidence of the presence of herd behavior over the whole sample period, as well as during the extreme market conditions of October 2007 to October 2008. Furthermore, we examined the effects of government intervention, information environment, speculation, and systematic risk on herding. It is found that analysts following would lead to herding, and that herd behavior is mostly concentrated in firms with high turnover ratios or high systematic risks. However, we cannot find evidence that relates herding to firm size, nor was there a noticeable difference in herding between state-owned enterprises (SOE) and non-SOEs.

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