Herd Behavior in the Chinese Growth Enterprise Market*

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Abstract

This paper analyzes herd behavior in the growth enterprise market(GEM) of China. Herd behavior means that sheep or other animals move together at the same time when they are in a herd. This paper provides the brief reviews of theory of herd behavior and empirically tests the existence of herd behavior in the GEM by two regression models(non-linear model and transaction volume model) using the cross-section absolute deviation(CSAD) measure. The main results of this paper are as follows.

First, there is strong herd behavior in the Chinese GEM in all the three periods ; flat market, bull market and bear market.

Second, the herd behavior in the GEM is more obvious in the bull market and relatively weak in the bear market.

Third, we infer the strong herd behavior in the GEM is caused by imperfection of information disclosure system, excessive government intervention on the GEM, and speculative factors in GEM.

Based on above findings, we suggest that the GEM investors need to invest based on the more fundamental approach than market sentiment, and Chinese financial authority should minimize market intervention and supplement the operational systems of the GEM, such as information disclosure and short selling, in order to increase the efficiency of the GEM.

Key Words : *Herd Behavior, the Growth Enterprise Market(GEM), Chinese Stock Market, Cross-Section Absolute Deviation(CSAD)*

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[1] Introduction

Herd behavior means that sheep or other animals move together at the same time when they are in a herd. Often one or two leaders start, then momentum builds as more and more join until a large group are heading in the same direction. In financial markets, herd behavior means that the investors follow others rushing to buy or sell shares or other investments.

China's stock market is the world's second largest market, and represents 14 percent of the global market. Among Chinese stock markets, the growth enterprise market(GEM) in Shenzhen Stock Exchange was set up on October 30, 2009, which is known ChiNext or Chinese NASDAQ. The GEM has a total of 734 listed companies, as of October 31, 2018. The GEM has played an important role in the development of Chinese capital market and in financing many high-growth, high-tech start-up companies with Chinese characteristics. Despite of these positive contributions, there are a lot of inefficiencies in the GEM. Compared to the Chinese mother-board markets and foreign capital markets, investors in GEM seem to be more speculative, not rational.

Although the investments on companies listed in the GEM have many risks, which associated with the high growth of these companies, they have not been still fully identified. In view of the important role of the GEM, therefore, the test and analysis of the herd behavior in the GEM will provide the Chinese financial authorities, institutional investors and personal investors with a lot of implications.

The aim of this paper is to provide a brief review of herd behavior theory and to empirically test the existence of herd behavior in the GEM. This paper is organized as follows. Chapter II covers concepts of herd behavior and the previous literatures. In chapter III, the empirical analysis on the herd behavior in the GEM will be presented and the implications of empirical results are discussed. In chapter IV, conclusions and suggestions will be provided.

[2] Theoretical background and literature reviews

2.1 Concepts of herd behavior

Individuals are known to be influenced by others in their decision making. For example, when deciding which restaurant to make reservations at or which school to attend people frequently imitate the actions of their predecessors. Restaurants with a greater number of guests tend to appear more appealing to the observer. This phenomenon is referred to as herd behavior. Herd behavior can be applicable to the financial markets. Investors often

follow the direction of the market or the advice of financial experts. Understanding the behavior of investors in financial markets is very important.

The traditional framework for finance is largely built on the efficient market hypothesis(EMH) and its applications. Fama(1970) defined a market as efficient if prices always fully reflect all available information. The efficient market hypothesis(EMH) is based on assumptions that investor are rationality and arbitrage is possible. However, such assumptions have been challenged by behavior finance, which is mainly focused on investor psychology and limits to arbitrage. The field of behavioral finance is said to have developed in response to a host of anomalies that cannot be explained by traditional financial models. With the collapse of several stock markets, investor sentiment has been recognized as an important influence in the financial market. Recent research has focused primarily on the fact that individuals tend to follow the behavior of others. In fact, economists as well as practitioners believe that there is extensive herding among investors in financial markets.

2.2 The causes of herd behavior

Some authors suggest that investors are not rational and that the existence of such irrational investors may give rise to bubble-like market and herd behavior. Furthermore, non-rational herd behavior can result from psychological stimulation and suppression, such as pressure from social groups or social conventions. Keynes(1936) argues that investors are affected by sociological factors that may drive market participants to imitate the actions of others during periods of uncertainty. Baddeley et al.(2010) demonstrate that even experts may resort to herd behavior, given information scarcity, asymmetry and the employment of common heuristic rules.

Other authors, such as Shleifer and Summers(1990), distinguish between arbitragers who are fully rational and noise traders who are irrational and act on noise and whose trading behavior suffers from systematic biases. They suggest that some shifts in investor demand for assets and changes in investor sentiment appear to be irrational and not justified by fundamentals. Arbitragers, instead of opposing this bandwagon, rationally decide to jump on it. The new higher demand will lead prices even higher and further away from fundamentals, attract more irrational investors, and the rational arbitragers will exit when prices are near the top in order to collect their profits. In other words, the behavior of rational arbitragers, in the short run, will nourish the irrational price bubble. It is interesting to note that irrational noise traders with inaccurate stochastic expectations may not only affect asset prices but also end up achieving superior returns(see DeLong et al., 1991).

In the other hand, some authors argue that under certain circumstances herd behavior is a rational choice. For instance, money managers may mimic the actions of other money managers in order to preserve reputation and/or compensation, and younger analysts know that if they make bold forecasts and deviate from the consensus they are more likely to be fired. During a bank run crisis depositors contribute to runs on banks because they see long lines

of other depositors outside banks and know that if they do not join the line early there may be no funds left for them, etc. (see Diamond and Dybvig, 1983).

Bikhchandani and Sharma(2000) distinguish between "spurious" herding where investors face a similar fundamental-driven information set and thus make similar decisions and "intentional" herding where investors have an intention to copy the behavior of others. The former may lead to an efficient outcome while the latter may not. Intentional herding may also lead to fragile markets, excess volatility and systemic risk.

2.3 Measuring herd behavior in financial markets

2.3.1 LSV(Lakonishok, Shleifer and Vishny) model

The empirical model for the research on the herd behavior of institutional investors stems from Lakonishok, Shleifer and Vishny (1992). They use the average trend of fund managers to buy or sell specific assets at the same time, that is, the number of both sides of the transaction as an indicator to measure herd behavior, to measure whether investors make investment decisions independently.

$$H(i,t) = |p(i,t) - p(t)| - AF(i,t)$$

Among them, p(i,t) is the percentage of fund managers who bought stock i at time t. That is p(i,t) = B(i,t) /[B(i,t) + S(i,t)], S(i,t) is the number of sellers, B(i,t) is the number of buyers. Considering the independent and random transactions of each fund manager, the theoretical distribution of p(i,t) obeys a binomial distribution whose mean value is p(t). That is p(t) is the expected value at time t. $AF(i,t) = E[\,|p(i,t) - p(t)|\,]$ is actually the expected value without the flock behavior hypothesis, which can be regarded as an adjustment factor here. Their empirical test results by this LSV method showed that the herding behavior of the U.S. mutual fund was not obvious, but the herd behavior of small-cap stocks was stronger than that of large-cap stocks.

One of the major drawbacks of the LSV method is that it does not take into account the amount of money invested by the fund manager. This method uses only the number of managers who buy and sell, regardless of the amount of money they traded. If the number of managers who buy and sell is the same, but the volume of transactions formed is quite different, then the LSV method may cause the obvious errors. Because the LSV model does not give weight to the used variables, results in the model can be very different from the actual phenomena. Wermers(1995) proposed the PCM method, based on the LSV model to consider the investor's investment weight(stock trading volume) and the direction of investment(difference in trading volume) improves the LSV approach by considering only the number of investors in the market. Sias(2004), on the basis of LSV, divides herding into true and false herding behavior. His test results show that only half of the herding behavior of U.S. securities investment funds is caused by true herd behavior. Bemhardt, Campello, and Kutsoati(2006) put forward new ideas based on Welch's research(2000). They develops a test for herding in forecasts by professional

financial analysts. They find that forecasts are biased, but that analysts do not herd. Rather, analysts are "anti-herd". Their research shows that analysts systematically issue biased 'contrarian' forecasts that overshoot the publicly-available consensus forecast in the direction of their private information. The magnitude of the forecast bias, its systematic variation with analyst following, and the pattern of bias in forecast revisions indicate that the bias is strategically chosen.

Tan et al.(2008) examine the behavior of stock market investors in China and find evidence of herding for both A-share markets which tend to be dominated by domestic individual investors and B-share markets in which foreign institutional investors are dominant. In another study of Chinese investors, Li et al.(2009) argue that for institutional investors with better information herding behavior is more intense compared to individual investors, indicating more selective trading by institutions vs individual investors who allocate their investments more evenly across stocks. They also find that while both types of investors herd toward the market, individual investors tend to rely more on public information and attention grabbing evens.

J,H. Kim and H. Choe(2012) analyzed the herd behavior of professionals and its impact in the Korean stock market with the LSV herding measure. They argued that they found an asymmetric impact of buy herding and sell herding; while there was no return reversal following sell herding, buy herding was followed by return reversal.

2.3.2 CH(Christie and Huang) model

In addition to studying the herd behavior of institutional investors, some scholars have come to the market as a research object and have come to different conclusions. Christie and Huang(1995) proposed using the dispersion indicator CSSD(cross-sectional standard deviation of returns, standard deviation of cross section returns) to test the overall herd behavior of the market. When individual returns herd around the market consensus, dispersions are predicted to be relatively low. In contrast, rational asset pricing models predict an increase in dispersion because individual returns are repelled away from the market return when stocks differ in their sensitivity to market movements.

Christie and Huang(1995) argued that the results for both daily and monthly returns are inconsistent with the presence of herding during periods of large price movements. For example, during extreme down markets, when herding is expected to be most prevalent, the magnitude of the increase in the dispersion of actual returns is mirrored by the increase in the dispersion of predicted returns that are estimated from a rational asset pricing model.

The CH model uses the CSSD measure, which is calculated as:

$$CSSD = \sqrt{\frac{\sum_{i=1}^{n}(r_i - \bar{r})^2}{n-1}}$$

r_i is the yield of stock I,
$\bar{r}$ is the average yield of n stocks.

However, some scholars believe that even

if the volatility of the stock market is small, the same phenomenon of re-allocation of funds in the market can be observed. As a result, the conclusions of the CH model have been criticized by many scholars. Only when most stocks exhibit strong herding behavior, stock returns tend to converge, so it is now generally assumed that the CH model is only a relatively conservative estimate of herd behavior. Therefore, the CH model underestimates the extent of herding behavior.

2.4 CSAD(Cross-Sectional Absolute Deviation) model

Since CH model, using CSSD, is not sophisticated to capture herd behavior sensitively, the CSAD(Cross-sectional absolute deviation of returns) model was proposed by Chang, Cheng, and Khurana (2000) to test the herd behavior in the stock market. Its calculation formula is:

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

$CSAD_t$: the absolute degree of cross-section deviation in period t.

N : the number of shares in the market portfolio.

$R_{i,t}$: the return rate of stock i in period t.

$R_{m,t}$: the return rate of market index in period t.

They conducted a herd behavior on stock markets in countries such as the United States, Japan, South Korea, and Taiwan in the study. As a result of the inspection, it was found that there is no herding behavior in the mature US market, and there is a weak herd behavior in the more mature Japanese market, while the herd behavior is more significant in the two emerging markets of South Korea and Taiwan.

Caparrelli et al. (2004) also evaluated herding effects in the Italian Stock Exchange using the CSAD model. They found that herding was present in extreme market conditions, a result consistent with Christie and Huang(1995). Applying the same methodologies, Henker et al. (2006) examine market wide and industry sector herding with intraday data on Australian equities and find evidence that is inconsistent with intraday herding.

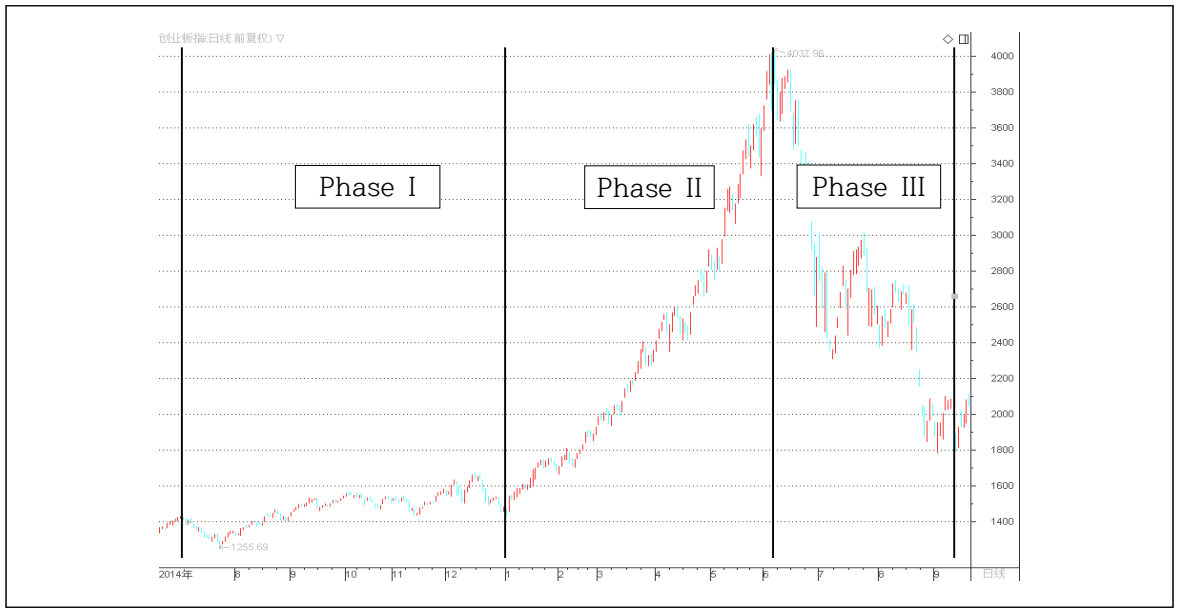
[3] Empirical analysis on the herd behavior in GEM

3.1 Data

The data are composed of 100 representative firms listed on GEM, which are daily yield data with a code of 300001 to 300100 on GEM.[1] The period starts from July 4, 2014 and ends on September 15, 2015. Taking into account the herd behavior in the GEM adjustment, up and down the stage may be different, we will test the herd behavior of the GEM during the

1) 300*** code number means GEM companies.

〈 Figure 1〉 GEM index



Source : Shenzhen Stock Exchange(http://www.szse.cn/main/en/chinext)

period of market adjustments, ups and downs.

The sample period was divided three periods:

(1) July 4, 2014 to January 5, 2015 The GEM index is in a sideways adjustment for the adjustment period. As shown in Graph 1, Phase I(flat market).

(2) From January 6, 2015 to June 3, 2015 After a series of bull market, the rise period. As shown in Graph 1, Phase II(bull market).

(3) June 15, 2015 to September 15, 2015 experienced a stock market crash, the market plummeted, a decline period. As shown in Graph 1, Phase III(bear market).

For the market rate of return, the SHSE-SZSE 300[2] are the most representative index selected from the SHSE Component and the SZSE Component, which is reflecting the overview and operation of the stock price changes in the Chinese securities market. Therefore, we regard daily rate of return of SHSE-SZSE 300 as the market rate of return.

3.2 Model

We uses CSAD(cross-sectional absolute deviation) model in order to estimate whether there is a herd behavior in the GEM. The CSAD model measures the essence of the herd behavior by observing whether the investor has a more consistent trading behavior when the stock price changes, thus further changing the

2) SHANGHAI SHENZHEN 300 INDEX ,jointly compiled by Shanghai Stock Exchange and Shenzhen Stock Exchange, has been officially released on April 8, 2005. The base day for the SHSE-SZSE 300 is December 31, 2004, based at 1000 points. It is composed of 300 A-shares selected from the two stock markets as the sample stocks, representing about 60% of total market cap of the entire two stock markets.

stock price along the original trend. The model was first proposed by Sanders and Irwin in 1997 with the following core formula:

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

Where $CSAD_t$ is the absolute degree of cross-section deviation in period t, N is the number of shares in the market portfolio, $R_{i,t}$ is the return rate of stock i in period t, and $R_{m,t}$ is the return rate of market index in period t. The original regression equation of the CSAD model is a linear regression equation. As follows:

$$CSAD_t = \beta_0 + \beta_1 |R_{m,t}| + \mu \quad (1)$$

According to the CSAD model, if there is a herd behavior in the stock market, the regression coefficient β_1 should be negative. Because if there is a herd behavior in the stock market, with the increase or decrease of market returns, the effect of herding will prompt investors to chase the development trend of the market, which will reduce the deviation between individual stock returns and market returns. If the stock market is rational and there is no herding effect, the fluctuation of the stock return rate should eventually become stable. Therefore, there is a linear relationship between the degree of deviation of the stock return and the market rate of return, and the coefficient of the independent variable is positive.

Therefore, theoretically speaking, under the premise of a rational capital asset pricing model, there is a positive correlation between the degree of deviation of stock returns and the market rate of return in the CSAD model, and it shows a linear relationship. It can be seen that the derivation of the rational capital asset pricing model and the herding effect are opposite. This shows that once it is shown that there is a herd-effect in the market, the rational market hypothesis can be rejected and there are irrational factors in the market.

Looking at the stock market in China, due to the low degree of market development, the premise of the rational CAPM model cannot be fully satisfied. Therefore, in the regression equation, even if the regression coefficient is significantly positive, it may not mean that there is no herding behavior. Based on this, extending the CSAD model further proposes the use of polynomial regression equations to test for the existence of herding effects. which is:

$$CSAD_t = \alpha + \beta_1 |R_{m,t}| + \beta_2 R_{m,t}^2 + \mu \quad (2)$$

If there is a herd behavior in the stock market, it will prompt investor's investment decision tends to be a market trend, which means that the yield of investment stocks will gradually converge to the market rate of return. Therefore, in the regression equation, the degree of deviation from the stock returns will decrease with the increase of the market rate of return (β_1 is a negative value), or show a decrease in the degree of deviation (β_2 is a negative value). That is to say, they show a negative correlation or a decreasing nonlinear relationship. It shows

that there are herd behavior in the market. (Chang et al., 2000; Henker et al., 2006). (Economou et al., 2011; Economou et al., 2016):

The use of polynomial equations for regression can make full use of existing data to make a clearer and more effective empirical study of the herd behavior in the GEM. Since the quadratic term of the independent variable is added to the regression equation, it is possible to determine whether there is a herd behavior in the market. It is also possible to judge the strength of herding by the size of the regression coefficient.

Theoretical behavioral prediction assumes that herding appears through the correlation with trading because of individual's interaction. When some investors ignore their information to blindly follow other investors' decisions, they tend to emphasize trading on a particular stock, leading trading volume to be abnormally high. Thus, We suppose that trading volume may fuel herding movement. Therefore, trading volume is a very important signal in stock trading. The large trading volume is also a necessary condition for the herd behavior between investors.

Generally, we think investors will choose to follow suit if there is a sudden increase in trading volume, so when the trading volume suddenly increases, the probability of herd behavior will increase on the next trading day. That is to say, the cross-sectional dispersion value should be negatively correlated with the trading volume of the first-phase lag[3]. We introduce variables that represent changes in trading volume and we can get new regression models:

$$\begin{aligned}\ln(CSAD_t) = {} & \alpha_0 + \alpha_1 \ln(CSAD_{t-1}) \\ & + \alpha_2 \ln(V_t) \\ & + \alpha_3 \ln(V_{t-1}) + \mu_t\end{aligned} \tag{3}$$

Where V_t is the total transaction volume, the presence of herd behavior requires a positive α_2 and a negative α_3. We observe that the volume and volatility are both positive, so logarithms are taken for all variables in order to eliminate heteroskedastic interference. The variable CSAD should be statistically stationary to eliminate the interference of autocorrelation.

3.3 Empirical Results

Before we test the regression models, we

〈Table 1〉 unit root test results

Variables	ADF Values		
	Phase I (flat market)	Phase II (bull market)	Phase III (bear market)
$CSAD_t$	-9.340010***	-8.051131***	-6.529814***
$\lvert R_{m,t} \rvert$	-9.467349***	-8.170582***	-6.043127***
$R_{m,t}^2$	-9.431529***	-8.786797***	-5.622219***
$\ln(V_t)$	-3.228339***	-4.620101***	-3.883951***

Notes: ***Results are significant at 0.01 level, respectively

3) see Lo, A.W. and Wang, J.(2000) and Statman, M., Thorley, S. and Vorkink, K.(2006).

do stationary test in order to secure the used variables' statistical stationarity. we do unit tests for respectively each period.

From the results of the stationarity test in 〈Table 1〉, we can see that the $CSAD_t$, $|R_{m,t}|$, $R_{m,t}^2$ and $\ln(V_t)$ data are stable at the significance level of 1% and all variables can be used directly in the test models.

3.3.1 Herd behavior in the flat market : Phase I

We estimate non-linear CSAD regression model in order to test the equation (2), and we can obtain the test results as shown in 〈Table 2〉.

The regression equation can be obtained from 〈Table 2〉

$$CSAD_t = 0.0195 + 0.2714|R_{m,t}| - 16.4538R_{m,t}^2$$

The result in 〈Table 2〉 that the adjusted R-square of the regression equation is 0.796247, indicates that the overall fitness of the regression equation is good. And the empirical result, that the coefficient β_1 is significantly positive, indicates that the cross-sectional absolute deviation (CSAD) fluctuates positively with the fluctuation of the market price of the Growth Enterprise Market. And the coefficient β_2 is significantly negative, which indicates that there is no linear relationship between them, that is, there is a herd behavior on the GEM.

Next, we estimate the transaction volume for regression model using the equation (3). The results are shown in 〈Table 3〉.

The regression equation can be obtained from 〈Table 3〉.

$$\begin{aligned}\ln(CSAD_t) = & -7.6733 + 0.1031\ln(CSAD_{t-1}) \\ & + 0.5605\ln(V_t) \\ & - 0.3512\ln(V_{t-1})\end{aligned}$$

The test results show that the coefficient of $\ln(V_{t-1})$ is significantly negative. So, we can conclude that there is a herd behavior in the GEM.

〈Table 2〉 Non-linear model results in Phase I

Variables	Coefficient	Std. Error	t-Statistic	Prob.
C	0.019493	0.000336	58.05233	0.0000
| R_m |	0.271445	0.020294	13.37578	0.0000
R_m^2	-16.45379	0.801151	-20.53769	0.0000
R-squared	0.799587	Mean dependent var		0.023160
Adjusted R-squared	0.796247	S.D. dependent var		0.007018
S.E. of regression	0.003168	Akaike info criterion		-8.64738
Sum squared resid	0.001204	Schwarz criterion		-8.57879
Log likelihood	534.8142	Hannan-Quinn criter.		-8.61952
F-statistic	239.3820	Durbin-Watson stat		1.443084
Prob(F-statistic)	0.000000			

〈Table 3〉 Transaction volume model results in Phase I

Variables	Coefficient	Std. Error	t-Statistic	Prob.
C	-7.673271	2.416099	-3.175893	0.0019
LNCSAD(-1)	0.103084	0.090750	1.135909	0.2583
LNV	0.560475	0.140711	3.983170	0.0001
LNV(-1)	-0.351230	0.139592	-2.516123	0.0132
R-squared	0.145240	Mean dependent var		-3.80626
Adjusted R-squared	0.123509	S.D. dependent var		0.28466
S.E. of regression	0.266504	Akaike info criterion		0.22538
Sum squared resid	8.380877	Schwarz criterion		0.31731
Log likelihood	-9.748325	Hannan-Quinn criter.		0.26272
F-statistic	6.683486	Durbin-Watson stat		1.93547
Prob(F-statistic)	0.000331			

The empirical results of the two test models show that there is strong herd behavior in Chinese GEM in Phase I, when it is the flat market.

3.3.2 Herd behavior in the bull market : Phase II

We estimate non-linear CSAD regression model in order to test the equation (2), and we can obtain the test results as shown in 〈Table 4〉.

The regression equation can be obtained from 〈Table 4〉.

$$CSAD_t = 0.0256 + 0.1399|R_{m,t}| - 11.7591R_{m,t}^2$$

From the results of 〈Table 4〉, we can see that the coefficient β_1 is positive, which indicates that the cross-sectional absolute deviation (CSAD) fluctuates positively with the fluc-

〈Table 4〉 Non-linear model results in Phase II

Variables	Coefficient	Std. Error	t-Statistic	Prob.
C	0.025586	0.000625	40.94066	0.0000
$\mid R_m \mid$	0.139858	0.023366	5.985498	0.0000
R_m^2	-11.75919	0.693936	-16.94563	0.0000
R-squared	0.833343	Mean dependent var		0.03408
Adjusted R-squared	0.829871	S.D. dependent var		0.01175
S.E. of regression	0.004847	Akaike info criterion		-7.79109
Sum squared resid	0.002255	Schwarz criterion		-7.71245
Log likelihood	388.6593	Hannan-Quinn criter.		-7.75928
F-statistic	240.0164	Durbin-Watson stat		1.59578
Prob(F-statistic)	0.000000			

〈Table 5〉 Transaction volume model results in Phase II

Variables	Coefficient	Std. Error	t-Statistic	Prob.
LNCSAD(-1)	-0.120706	0.105237	-1.146994	0.2543
LNV	1.023015	0.206796	4.946967	0.0000
LNV(-1)	-0.464651	0.193774	-2.397902	0.0185
C	-15.55985	2.719885	-5.720775	0.0000
R-squared	0.296435	Mean dependent var		-3.42800
Adjusted R-squared	0.273981	S.D. dependent var		0.33009
S.E. of regression	0.281261	Akaike info criterion		0.34089
Sum squared resid	7.436130	Schwarz criterion		0.44640
Log likelihood	-12.70375	Hannan-Quinn criter.		0.38356
F-statistic	13.20176	Durbin-Watson stat		1.99478
Prob(F-statistic)	0.000000			

tuation of the market price of the Growth Enterprise Market. The coefficient β_2 is negative, which indicates that there is a herd behavior on the GEM in bull market.

Next, we estimate the transaction volume for regression model using the equation (3). The results are shown in 〈Table 5〉.

The regression equation can be obtained from 〈Table 5〉.

$$\ln(CSAD_t) = -15.5599 - 0.1207\ln(CSAD_{t-1}) + 1.0230\ln(V_t) - 0.4647\ln(V_{t-1})$$

These results show that the coefficients $\ln(V_t)$ and $\ln(V_{t-1})$ are statistically significant. And the coefficients $\ln(V_t)$ is positive and $\ln(V_{t-1})$ is negative, which means that there is a herd behavior listed on the GEM in Phase II(bull market).

The empirical results of the two test models show that there has been strong herd behavior in Chinese GEM in Phase II when it is the bull market.

3.3.3 Herd behavior in the bear market : Phase III

〈Table 6〉 Non-linear model results in Phase III

Variables	Coefficient	Std. Error	t-Statistic	Prob.
C	0.042099	0.001315	32.02565	0.0000
$\mid R_m \mid$	0.349508	0.023898	14.62477	0.0000
R_m^2	-7.390719	0.516178	-14.31817	0.0000
R-squared	0.822370	Mean dependent var		0.053331
Adjusted R-squared	0.816449	S.D. dependent var		0.016750
S.E. of regression	0.007176	Akaike info criterion		-6.98968
Sum squared resid	0.003090	Schwarz criterion		-6.88763
Log likelihood	223.1751	Hannan-Quinn criter.		-6.94954
F-statistic	138.8908	Durbin-Watson stat		1.378831
Prob(F-statistic)	0.000000			

〈Table 7〉 Transaction volume model results in Phase III

Variables	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.733602	3.855384	-0.190280	0.8498
LNCASD(-1)	0.047110	0.132361	0.355920	0.7232
LNV	0.311921	0.199485	1.563629	0.1233
LNV(-1)	-0.410893	0.192595	-2.133462	0.0371

R-squared	0.083991	Mean dependent var	-2.97757
Adjusted R-squared	0.036611	S.D. dependent var	0.322290
S.E. of regression	0.316336	Akaike info criterion	0.598315
Sum squared resid	5.803956	Schwarz criterion	0.735549
Log likelihood	-14.54775	Hannan-Quinn criter.	0.652196
F-statistic	1.772711	Durbin-Watson stat	2.033925
Prob(F-statistic)	0.162418		

We estimate non-linear CSAD regression model in order to test the equation (2), and we can obtain the test results as shown in 〈Table 6〉.

The regression equation can be obtained from 〈Table 6〉.

$$CSAD_t = 0.0421 + 0.3495\left|R_{m,t}\right| - 7.3907R_{m,t}^2$$

Empirical results show that the coefficient β_1 is significantly positive, and the coefficient β_2 is significantly negative. These results means there is a herd behavior on the GEM in Phase III.

Next, we estimate the transaction volume for regression model using the equation (3). The results are shown in 〈Table 7〉.

The regression equation can be obtained from 〈Table 7〉

$$\ln(CSAD_t) = -0.7336 - 0.0471\ln(CSAD_{t-1}) + 0.3119\ln(V_t) - 0.4109\ln(V_{t-1})$$

〈Table 7〉 shows that the coefficients of $\ln(V_t)$ is positive and not significant. But, the coefficients of $\ln(V_{t-1})$ are negative and statistically in 5% significant level, which is a little weaker than other Phases. Above all, the adjusted R-squared is very low and the F-statistic is not significant, which mean the linear regression model is not well fitted. Therefore, this empirical result of the transaction volume model in Phase III shows that there is a herd behavior in the GEM in Phase III(bear market), but it is a little weaker.

Overall, by the empirical results of the two test models in Phase III, we can conclude that there is some weaker herd behavior in the Chinese GEM in Phase III, when is the bear market.

3.4 Analysis and discussions of empirical results

Through the non-linear CSAD model and the trading volume model, we found that there was a significant herd behavior in the Chinese GEM. And we found that the herd behavior was more obvious in the bull market and relatively weak in the bear market. We think the reasons of these results as follows.

First, information disclosure system in China is not perfect. The disclosure system of the listed companies in Chinese GEM, in particular, has problems in terms of completeness, accuracy and timeliness. These problems has asymmetrically effected on the Chinese market. Due to the defected information disclosure system, investors are unable to obtain sufficient information for the listed companies. Therefore, they often make decisions based on stocks of analysts in the newspapers and magazines. These behaviors of individual investors will lead to herd behavior(see Chong et al.(2017)), and this behavior is more reflected in the good news. When the market appears positive, investors have entered the market one after another to create a chase situation. When the market is good, as the participation in market can promptly bring to profits, the desire for investors to enter the market is particularly strong.

Second, there have been the excessive interventions of government on the Chinese stock market. Chinese stock market is called the policy market because government policies have an unusually significant impact on Chinese stock market. Reviewing the history of the Chinese stock market, the government has always intervened in the bottom and top stages of market. Due to the influence of government policies on the stock market, the government's policy will affect investors' judgment on the market trend. Especially when the stock market is declining, small and medium-sized individual investors always expect that the government will introduce the relevant policies to protect the collapse of the market, which is often reflected in the market. These means "less slaughtering" in the market.

Third, there is little doubt that speculation is a prominent catalyst for herding behavior. Chong et al.(2017) that their empirical results in China show that herd behavior is found in portfolios with the highest turnovers, which means that the possibility of herd behavior is higher in the highly frequent trading investor than in low trading investors. 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. In China stock markets, most investors are retail investors. For example, China A-share trading is dominated by retail investors who hold more than 75 percent of the market, and this share rate is estimated more higher in GEM. Generally, retail investors tend to trade high-frequently with short investment horizon, making buy and sell decisions based on emotion and speculation rather than fundamentals. The overly high share of speculative retail investors in GEM is presumed to be a cause of the herd behaviors.

Finally, short-selling mechanism is imperfect in Chinese stock market. Short-selling have been allowed for only institutional investors and foreigners since Feb. 2015, so most individual investors were only able to earn money through long positions and could not benefit from short selling. So we can infer that investors tend to be more sensitive to good news and less sensitive to bad news, which means that the herd behavior was more obvious in the bull market and relatively weak in the bear market.

[4] Conclusion and suggestions

This paper analyzed herd behavior in the growth enterprise market(GEM) of China. Herd behavior means that sheep or other animals move together at the same time when they are in a herd. This paper empirically tested the existence of herd behavior in the China GEM(Growth Enterprise Market) by two regression models(non-linear CSAD model, transaction volume model) using the cross-section absolute deviation(CSAD) measure. The main results of this paper are as follows.

First, there is an strong herd behavior in China GEM in all the three periods ; flat market, bull market and bear market.

Second, the herd behavior in GEM is more obvious in the bull market and relatively weak in the bear market.

Third, we infer the herd behavior in GEM is caused by imperfection of information disclosure system and excessive government intervention on GEM, speculative retail investors, and imperfect short selling system in GEM.

Based on above findings, we would like to suggest the following proposals for investors and financial authorities in GEM.

Investors in GEM are required to adopt a value investment approach that pays more attention to the companies' fundamentals and economic environment in order to realize the high risk hidden behind the high growth and high returns of the GEM. At the same time, investors should not trust the information of informal channels and should try to eliminate the short-term fluctuations in the stock market. Value investment approach enable us to avoid greed and falling into traps.

The Chinese financial authority should recognize that minimizing government interventions on market is to lead the Chinese stock markets to efficient market, which investors will act more rationally. And the information disclosure system and short selling system in GEM should be supplemented. In other word, it is done more timely, accurately and completely, then, the market will be more efficient. And the financial authority should encourage the institutional investors to be "good leaders" and play a role in stabilizing the market.

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중국 창업기업시장(GEM)에서의 군집행동

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요 약

이 논문은 중국 창업기업시장(GEM)에서의 군집행동을 분석했다. 군집행동은 양이나 다른 동물들이 무리를 지어 동시에 움직이는 것을 의미한다. 이 논문은 군집행동의 이론에 대한 기존 연구를 검토하고, 횡단면절대편차(CSAD) 측정법을 이용한 두가지 회귀분석모델(비선형 모델과 거래량 모델)에 의해 중국 창업기업시장(GEM)에서의 군집행동의 존재를 실증적으로 분석하였다. 이 논문의 주요 실증분석결과는 다음과 같다.

첫째, 세 가지 주식시장 국면(횡보시장, 상승시장, 하락시장) 모두에 걸쳐 중국 GEM에서는 강한 군집행동이 나타났다.

둘째, GEM에서의 군집행동은 강세장에서 더 분명하게 나타났으며 하락시장에서는 상대적으로 약하게 나타났다.

셋째, 중국 GEM에서의 강한 군집행동은 정보공개 시스템의 불완전성, GEM에 대한 과도한 정부개입 및 투기적 요인 등이 원인인 것으로 판단된다.

이러한 실증분석결과를 토대로 저자는 GEM 투자자는 시장심리보다 기본적 분석방법을 기반으로 투자해야 하며, 중국 금융당국은 GEM의 시장효율성을 높이기 위해서 정부의 시장개입을 줄이면서, 정보공시 및 공매도와 같은 GEM의 운영시스템을 보완해야 한다고 제안한다.

주제어 : *군집행동, 창업기업시장(GEM), 중국주식시장, 횡단면절대편차(CSAD ; Cross-Section Absolute Deviation)*

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