Empirical Research on the Herd Behavior in Chinese Stock Market

Xiao Han

School of Economics & Management, Nanjing University of Science & Technology, Nanjing 210094, China

710497022@qq.com

Abstract: Power load forecasting is very important for power dispatching. Accurate load forecasting is of great significance for saving energy, reducing generating cost and improving social and economic benefits. In order to accurately predict the power load, based on BP neural network theory, combined with the advantages of Clementine in dealing with big data and preventing overfitting, a neural network prediction model for large data is constructed.

1. Introduction

After more than 30 years of operation and development, China's stock market has become increasingly prominent in China's modern financial system, to the point that it has become a necessary model field for the analysis of China's modern financial development. To some extent, the development of China's stock market reflects the development of China's real economy, which can be regarded as a barometer of the real economy. The healthy development of the stock market plays a very important role in improving the efficiency of capital allocation, promoting economic restructuring, improving the structure of the financial system, increasing investment channels for residents, and ensuring the healthy development of the economy. Therefore, maintaining the stability of the stock market is of great significance for maintaining the stability of the real economy, which is especially important for such economic entities as China, which has a large economic volume but a short development history of the market economy and an immature market system [1]. However, some stock market behaviors will increase the uncertainty of stock market. Among these stock market behaviors, different influences of stock market behaviors with different motivations on stock market development are also distinguished.

The stock market environment is often complicated. However, under the temptation of high returns, non-professional investors or even professional investment institutions may ignore market risks, lose their sense of investment and ignore market common sense. With the increase of irrational investment behaviors, the intensity and frequency of "herd behavior" in the stock market such as following other investors' investment strategies and imitating other investors' investment behaviors gradually increase, and the price fluctuation of the stock market also becomes more and more significant, thus seriously affecting the stable development of the stock market. At the same time, we must also recognize that herd behavior, a phenomenon of stock market behavior, is common in both mature and emerging financial markets [2].

In order to promote the healthy development of stock market, how to avoid the risks brought by herd behavior has become the research direction of more and more scholars. China's stock market is in an important stage of development, early understanding of herd behavior, efforts to learn from the western capital market development experience, summary of the stock market operation rules, the formulation of effective risk aversion measures, the standardization of China's stock market is of great benefit. In order to formulate effective risk aversion measures, it is necessary to clarify the concept of herding behavior, fully understand the causes of herding behavior, and accurately judge the occurrence of herding behavior, so as to achieve the appropriate remedy and target.

2. The data model

This paper uses cross-sectional standard deviation of returns (CSSD) and cross-sectional absolute

deviation of returns (CSAD), using this method to the CSI-300 index and sampled stocks day's closing price of the CSI-300 index, on the basis of judgment, Whether herd behavior exists in China's stock market.

Return CSSD and CSAD analysis method principle is: under the condition of volatility in the stock market, if investors are made based on herding behavior of investment decision, the yield of specific individual stocks will converge to the overall yield of the securities market, so we can measure the deviation of rate of return on stocks and the market index to capture the herd behavior in stock market.

2.1 CSSD data model

$$CSSD_t = \sqrt{\frac{\sum_{i=1}^{N}(R_{i,t}-R_{m,t})^2}{N-1}} \tag{1}$$

The CSSD data model is shown in formula (1), where N represents the number of stocks in the stock market, Ri, t represents the stock return rate of stock I at time t, and Rm, t represents the average return rate of N stocks in the market at time t, that is, the market return rate.

In order to introduce more stock market information and test the existence of herd behavior in the market, the data regression model as shown below is constructed.

$$CSSD_t = \alpha + \beta_1 D_t^L + \beta_2 D_t^U + \varepsilon_t \tag{2}$$

In formula (2), dummy variables and are introduced to describe whether the stock market has extreme fluctuations at time t.

Table.1. Values of dummy variables in the CSSD data model

	D_t^L	D_t^U
The market rate of return at time t is in the extremely low tail of the rate of return distribution law	1	0
The market rate of return at time t is in the extremely high tail of the rate of return distribution law	0	1

Note: there is no uniform standard for measuring extreme market fluctuations. Generally, 1% and 5% are used to define extreme market changes.

In summary, the CSSD data model is established to define the regression results of herd behavior existence in the stock market as follows:

If the regression coefficients of eq. (2) are significantly negative, then the herd effect exists.

If the regression coefficients of eq. (2) are not significantly negative, then the herd effect does not exist.

2.2 CSAD data model

Compared with CSSD data model, CSAD data model is more accurate.

$$CSAD_t = \frac{1}{N}\sum_{i=1}^{N}\left|R_{i,t}-R_{m,t}\right| \tag{3}$$

The CSAD data model is shown in formula (3), where N represents the number of stocks in the stock market, Ri, t represents the stock return rate of stock I at time t, and Rm, t represents the average return rate of N stocks in the market at time t, that is, the market return rate.

In order to measure the existence or absence of herd behavior in the stock market, a nonlinear regression model can be established by using the CSAD data model, as shown in equation (4):

$$c\,CSAD_t = \alpha + \gamma_1\left|R_{m,t}\right| + \gamma_2 R_{m,t}^2 + \varepsilon_t \tag{4}$$

In equation (4), CSADt with Rm, the changes of t is symmetrical, so I can accord the type (4) into type (5) with type (6), the symmetry of herding behavior on the basis of investigation on the market, to distinguish the upward and downward market, separately to the two empirical analysis of herd behavior of market circumstances.

$$CSAD_t^{UP} = \alpha + \gamma_1^{UP} \left| R_{m,t}^{UP} \right| + \gamma_2^{UP} (R_{m,t}^{UP})^2 + \varepsilon_t \qquad (5)$$

$$CSAD_t^{DOWN} = \alpha + \gamma_1^{DOWN} \left| R_{m,t}^{DOWN} \right| + \gamma_2^{DOWN} (R_{m,t}^{DOWN})^2 + \varepsilon_t \qquad (6)$$

In equations (5) and (6), the words UP and DOWN in the upper right of the variable correspond to the amount of the variable in the upmarket and downmarket.

In summary, the establishment of CSAD data model defines the regression results of herd behavior existence in the stock market as follows:

If r1 > 0 and r2=0 in the regression result, the herd effect does not exist.

If r1 < 0 and r2=0 or r2 < 0 in the regression result, herding effect exists.

3. Data and empirical research

3.1 The data source

This paper selects the CSI-300 index and the daily closing price of the sample stocks that constitute the CSI-300 index as samples. In order to exclude the influence of the sample stock on the overall result, all stocks involved in the process of index sample adjustment were excluded from the selected samples.

The CSI-300 index takes size and liquidity as the two basic criteria for sample selection, and gives liquidity a greater weight, in line with the index's positioning as a trading index. Generally speaking, the stocks listed after a quarter are likely to be included in the index sample stocks; Exclude suspended stocks, ST stocks, stocks with abnormal operating conditions or heavy financial losses, and stocks with high volatility and clearly manipulated market performance. Other stock indexes in the market, no matter the composite index or the component stock index, only represent the respective market trends of Chinese markets, and do not have the ability to reflect the overall trend of Chinses markets. The CSI-300 index is a barometer of the overall trend of the two markets. In the process of investigating the herd behavior of China's stock market, choosing CSI-300 index is more comprehensive and objective.

All the sample data involved in the empirical analysis of this paper, including stock index changes, component stock changes, daily stock returns and other information, are from the Ruisi database.

The time interval selected for the sample data in this paper is January 1, 2015 solstice, September 30, 2016, a total of 428 trading days. As shown in figure 4.1, within the selected time interval, the CSI-300 index has both a complete period of upward and downward market movements.
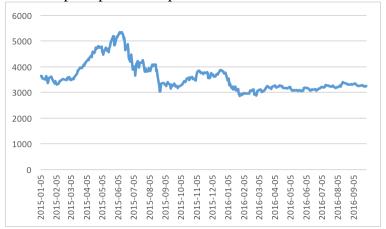

Figure 1. Changes in the CSI-300 index (2015.01.01-2016.09.30)

3.2 The empirical research

(1) CSSD data model test

The sample data were substituted into formula (2), and the threshold of extreme market change was defined by the standards of 1% and 5%. The regression analysis results are shown in Table 2.

Table.2. Regression analysis results of CSSD data model

	α	β_1	β_2	R^2	F	DW
extreme change is 1%	2.55***	2.40***	1.08***	0.5210	176.3491	1.0831
extreme change is 5%	2.31***	2.06***	1.09***	0.6542	210.0028	1.9788

It can be found from Table 2 that both regression coefficients β1 and β2 are significantly positive at the confidence level of 1%, regardless of the extreme market variation of the 5% definition criteria. This indicates that within the time interval of sample data, when the return rate of China's stock market is at the polar or extremely high point of 1% or 5%, the return rate of specific stocks is significantly dispersed. The empirical results show that there is no herd behavior in China's stock market between January 1, 2015 and September 30, 2016.

(2) CSAD data model test

As shown in Table 3, after empirical analysis of sample data, it is found that the average return rate of CSI-300 index is 0.0451%, fluctuating between -12.364% and 8.524%, with a fluctuation range of 20.888%, indicating high market risk and low stability. The mean absolute deviation of cross-sectional return CSAD was 1.9204%, and the fluctuation range was between 0.715% and 7.782%.

Table.3. Statistical results of sample data of CSI-300 index

variable	observations	Average (%)	standard deviation	Minimum (%)	Maximum (%)
Rm	428	0.0451	2.3296	-12.364	8.524
CSAD	428	1.9204	1.0530	0.715	7.782

Through empirical analysis of equation 4, the regression results are shown in Table 4. In the column of the overall market in Table 4, r2 is < 0, but it is not significant at the 10% confidence level, so it cannot be concluded that there is herd effect in China's stock market.

Table.4. Regression results of sample data of CSAD data model

	α	r_1	r_2	R^2	F	DW
The overall market	1.616***	0.721***	-0.030	0.5541	205.0118	2.0778
The upward market	1.620***	0.303***	0.006	0.7860	171.087	2.3570
The downside market	1.583***	0.513***	-0.055**	0.5829	102.1260	2.0001

Regression analysis was conducted on equation 5, and sample data of 1 January 2015 solstice July 1 2015 were selected to investigate the existence and symmetry of herd behavior in the case of market upturn. The regression results are shown in the column of table 4.3 upturn market. It can be seen that in the market, $r_2^{\mathrm{UP}} > 0$ is not significant at the 10% confidence level, so the emergence of herd behavior cannot be judged.

Regression analysis was performed on equation 6, and sample data from 1 solstice, July 2015, and 1 October 2016 were selected to investigate the existence and symmetry of herd behavior in the case of market upturn. The regression results are shown in table 4.3, column of down-market. It can be seen that, when the market goes down, $R_2^{\mathrm{DOWN}} < 0$ is significant under the 10% confidence level, and it can be judged that herd behavior appears in China's stock market during this period.

4. Conclusion

In this paper, the CSI-300 index and the sample stocks that constitute the CSI-300 index (excluding the sample stock) daily closing prices are selected as samples, and the CSAD model is used to conduct an empirical study on herd behavior in China's stock market. According to the empirical results, it is found that the herd behavior is not obvious when the stock market in China goes up. Herd behavior is more pronounced in a market downturn.

In empirical, overall and upward market conditions to the regression results because under the confidence level was not significant to judge the existence of herd behavior, I think the herding behavior on Chinese stock market is likely to be China's stock market "circuit breakers" and "10% price limit" covered, unless there is an obvious herding behavior, or cannot be found in the empirical

herding behavior.

Through the above empirical research results analysis. This paper will put forward some policy Suggestions for stock market investors and relevant government departments. Investors in the market, especially retail investors, should try to enrich their investment knowledge, correct their investment mentality, and improve their decision-making level. When investors have valuable investment information, they should calmly analyze the market situation, reasonably analyze their own risk tolerance, especially in the case of market downturn, try to avoid the emergence of irrational herd behavior, carefully follow the strategy, do not believe rumors, and do not spread rumors. For the relevant functional departments in China, we should strengthen the establishment and improvement of the capital market system as soon as possible, improve the construction of the market system, when the market shows irrational herd behavior, we should rescue the market appropriately, when the stock market shows signs of collapse, timely issue policies to correct the market direction. Under the current basic national conditions, relevant functional departments of the state should strengthen the construction of their own credibility, so as to play a greater and more stable role in conveying market stability information through social public media in case of herd behavior and other irrational market behaviors. At the same time, strengthening the education of investors and improving the professional level of investment are also important ways to promote the stable development of China's stock market, which should be paid attention to.

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