

Research on the relationship between securities public opinion and the fluctuation of the market value of listed companies

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Abstract: the securities public opinion is the "public opinion" of investors in securities. It reflects that the sensitive information spreads and diffuses rapidly by a large number of individuals, forced turned into a group cognitive process. Sometimes, for listed companies, public opinion is only some irrelevant gossip, bringing up short-term fluctuations in market value at best. But sometimes, public opinion may make listed companies' reputation be damaged sustained, and even turned the result into the stormy sea related to life and death. In view of this, the authors has produced a weekly heat list of public opinion for the stock market, dealing with the public opinion cases of listed companies of A-share market in the weekly heat list of public opinion since October last year. We will start our research from the point of view of the listed company's market value and explore the impact of securities public opinion for the listed companies. Ultimately, we hope to provide valuable research results for the participants of securities market.

key words: Securities public opinion; listed companies; market value; heat of public opinion

1 Introduction

The hot and difficult issues of social public opinion appear in a variety of alternation currently. Meanwhile, the difficulty of adjusting and controlling social public opinion is constantly increasing. Social public opinion has not only become an important factor in influencing the national policy, social life and mood of the masses, but also become the important factor of impacting of corporate image and business development. We often see that a small business event can easily lead to the emotional resonance of the Internet users, and immediately turned into a hot spots, and may even create a strong public opinion storm. Securities market is particularly prominent. For the key of reason, the difference between listed companies and unlisted companies is that a listed company is a public company. The word "public" decides that any message and news can influence the social image of corporate unpredictably and causes the investors lose more or less. When listed companies face to public opinion, they should maintain the image and credibility of public opinion and control the fluctuation of the stock in the same time. We have studied the case of securities public opinion in Chinese stock market which spread widely and impact strongly from the second half of 2011 to the first half of 2012 and found that Chinese stock market is a market with spreading rapidly information and highly market-oriented. There existed a variety of phenomenon, such as false news, media manipulation and the securities black mouth. Therefore, if the listed companies not respond timely or not respond appropriately when face to the complex and colorful phenomena in the stock market, it may lead to their own tangible and intangible assets suffered enormous losses.

We seize the characteristics of the securities market in this article and see the two elements "the securities public opinion "and" the market value of listed companies" as the main body of the

study. We will try to find the relationship between the two elements and provide valuable research results to securities market participants.

2 Related work

In recent years, some of our government administrations and part of the national research institutions and companies carry out the research on monitoring network information. As the representatives of the domestic scientific research institutions and the commercial organization representatives, Institute of Computing, Peking University^[1], Fudan University, Beijing Institute of Technology^[2], Autonomy Corp UK, Founder and TRS^[3] make a great contribution to monitoring network information. The key technologies and applications for specific network content and network public opinion have been improved.

In June last year, sponsored by People(<http://www.people.com.cn/>), Securities Times(<http://www.stcn.com/>) and the Peopleyuqing(<http://www.peopleyuqing.com/>), the public opinion center of Chinese listed companies^[4] was established. The purpose of establishment is to hope that by providing a rigorous professional public opinion monitoring platform, the public opinion data analysis, public opinion professional reports and public opinion consulting to form public opinion research reports of listed companies and all kinds of products. It serves for listed companies and stock market

On the basis of the foregoing, we work and research further. We use the securities public opinion monitoring system developed by our team to formulate the corresponding securities public opinion strategies, obtain securities public opinion information in the real-time, make an effective data analysis for securities public opinion, form intuitive visual diagrams and generate professional reports with Shanghai and Shenzhen A-share market price of the stock.

3 Relationship between securities public opinion and market value of listed companies

We will introduce the relationship between the securities public opinion and market value of listed companies in this chapter. We use the securities public opinion monitoring system developed by our team to extract the information of A-share market securities public opinion from October 10, 2011 to April 2012, a total of 28 weeks, 140 days. We link the Information with the market index, stock price and stock volatility, make a rigorous statistical analysis and display the result with form of chart in the final.

3.1 Relationship between the securities public opinion and market index

The relationship between the market and the stocks can be said to be whole and part, or the macro and micro. Therefore, we start with a macro point to analyze the relationship between the market and the securities public opinion.

In theory, the ups and downs of each stock will affect the market index. So it can be said that the Chinese stock market index reflects the strength of the trend of China's stock market as a whole. What is the relationship between the market index and the securities public opinion? We regard 30 days as a period and extract daily market index and some related topic such as "daily

market", "market index" and "market trends" discussed on the network. The following figure shows the relationship between the securities public opinion and market index from March 19 to April 19(except holidays), for example.

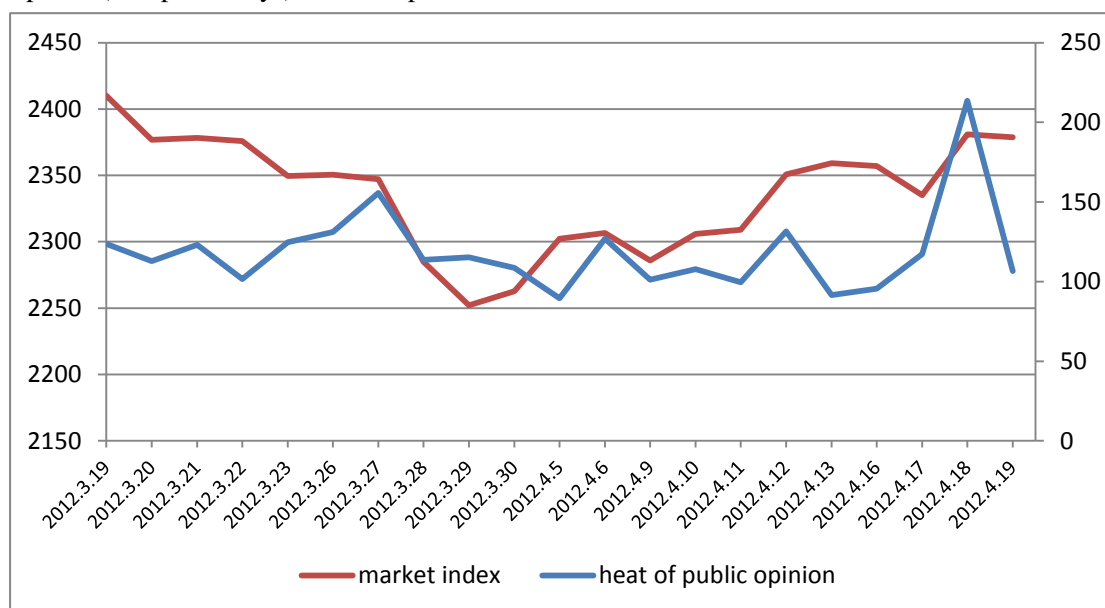


Figure 1 the relationship between the heat of public opinion and market index

From the figure, we can see that the market index and the heat of public opinion are not significantly correlated. In the period of March 27 to April 12 the trend of them are similar, but in the period of March 19 to March 26 and April 13 to April 19, both the trend are very different. Why is there such a fact? Actually, the market information of public opinion contains "positive" and "neutral", "negative" three types of information. If the day includes a lot of "neutral" and "negative" news, its heat of public opinion will be high, but reflects on the curve is the market index decline, indeed. So if only associate the heat of public opinion with market index, the effect not obvious is normal.

Then we choose a tendentious view classification algorithm, SVM algorithm^[5]. We take a classification of long and short for public opinion information we have extracted by SVM algorithm and divide them into three types: positive, neutral and negative. The positive public opinion compare with market index as follow:

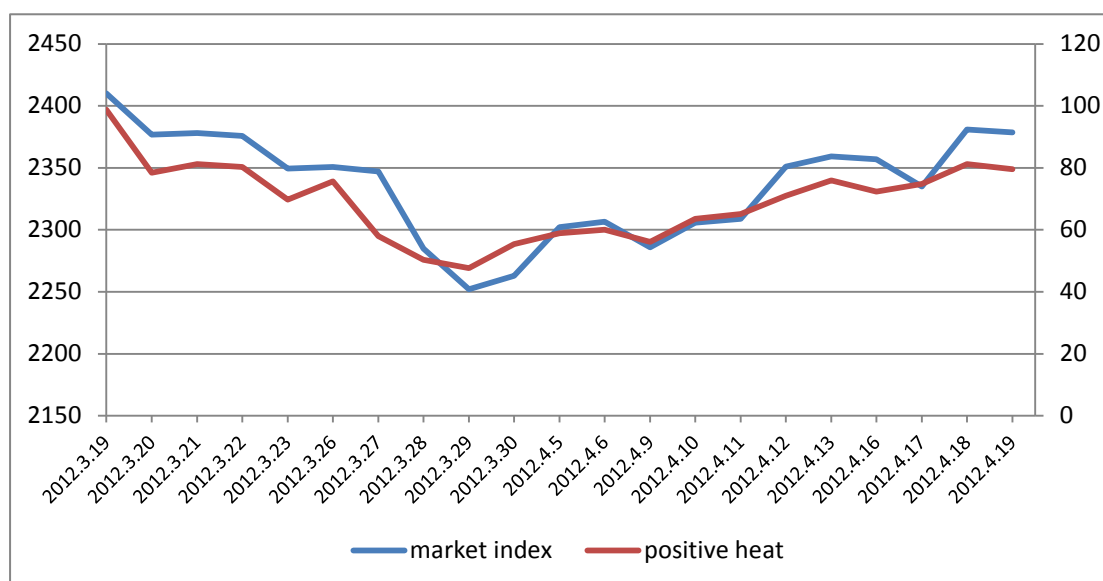


Figure 2 the relationship between the heat of positive public opinion and market index

We can see that the positive heat has a similar trend with market index. So we can say that there is a certain relationship between the market index and the securities public opinion and we believe the relationship can be very helpful for the market trend forecast.

3.2 Relationship between securities public opinion and stocks

We start from a macro perspective to obtain the relationship between securities public opinion and market in the previous one. We will proceed from microscopic point of view and try to find the relationship between securities public opinion and the stocks in this section.

First, we want to prove that whether there is relationship between securities public opinion and individual stocks. There will be three points of ways (Probability, Contrast, Abnormal Return)

3.2.1 Probability

We extracted securities public opinion of A-Share market from October 10, 2011 to April 20, 2012, totally 28 weeks or 140 workdays and make a list of "the heat of weekly public opinion" by weeks. Meanwhile, we use of professional stock trading software to obtain the top 10 stocks on the list of "weekly amplitude ups and downs". Two lists are compared, find that there is one stock presenting on the two lists at best. The probability is only 10%. Next, we expand the range of contrast, compare the top 5% stocks on the list of "the heat of weekly public opinion" with the top 10 stocks on the list of "weekly amplitude ups and downs" and find the consistent probability up to 74%. If we expand the count of stocks to top 7%, the result of comparison is up to 98%. So, we can get the following conclusions: the top 7% stocks on the list of "the heat of weekly public opinion" contain the top 10 stocks on the list of "weekly amplitude ups and downs". The meaning of the conclusion is that there is a certain relationship between the securities public opinion and stock change.

3.2.2 Contrast

This method is to compare the relevant attributes of the securities public opinion with individual stocks. We selected two attributes: daily stock closing prices and daily stock price

fluctuations. To make this method more typical, we only select top 10 stocks on the list of "the heat of weekly public opinion". The following figures show two kinds of relationship between heat of public opinion and the closing price of the stock.

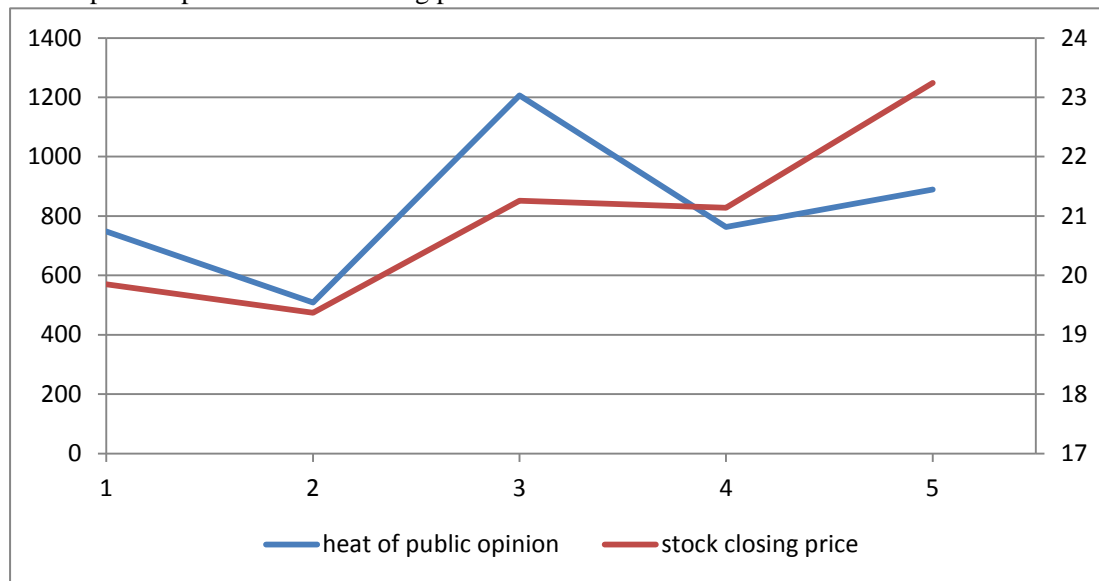


Figure 3 the relationship between the heat of public opinion and stock closing price

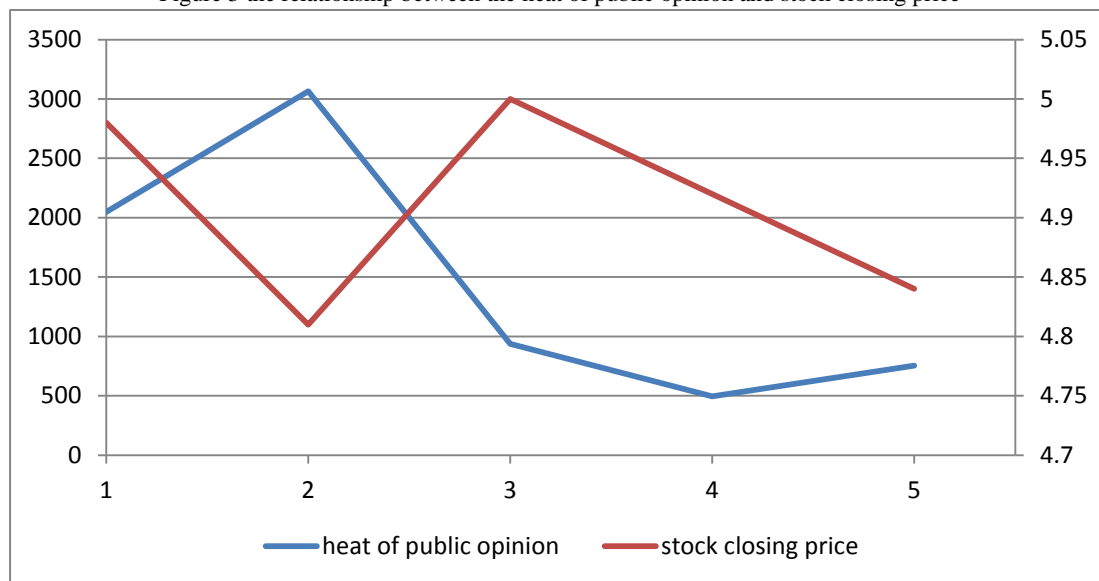


Figure 4 the relationship between the heat of public opinion and stock closing price

We see that the two kinds of relationship between the heat of public opinion and stock closing price can be described as quite different. We find that there are 127 stocks keep the similar linear trend between heat of public opinion and stock closing price but another 153 not keep in the process of experiment after we choose 280 stocks. The ratio is close to 1:1. So it is hard to say that there is a certain relationship between the heat of public opinion and stock closing price.

We conducted a comparative experiment between the heat of public opinion and the daily stock price fluctuations after the previous experiment. The following figures show two kinds of relationship between heat of public opinion and the daily stock price fluctuations.

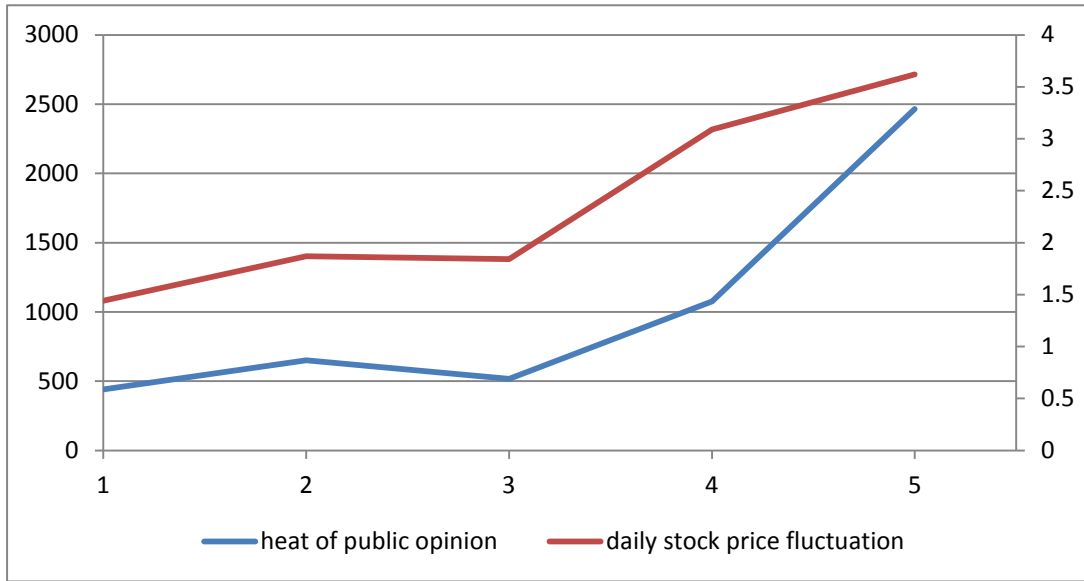


Figure 5 the relationship between the heat of public opinion and daily stock price fluctuations

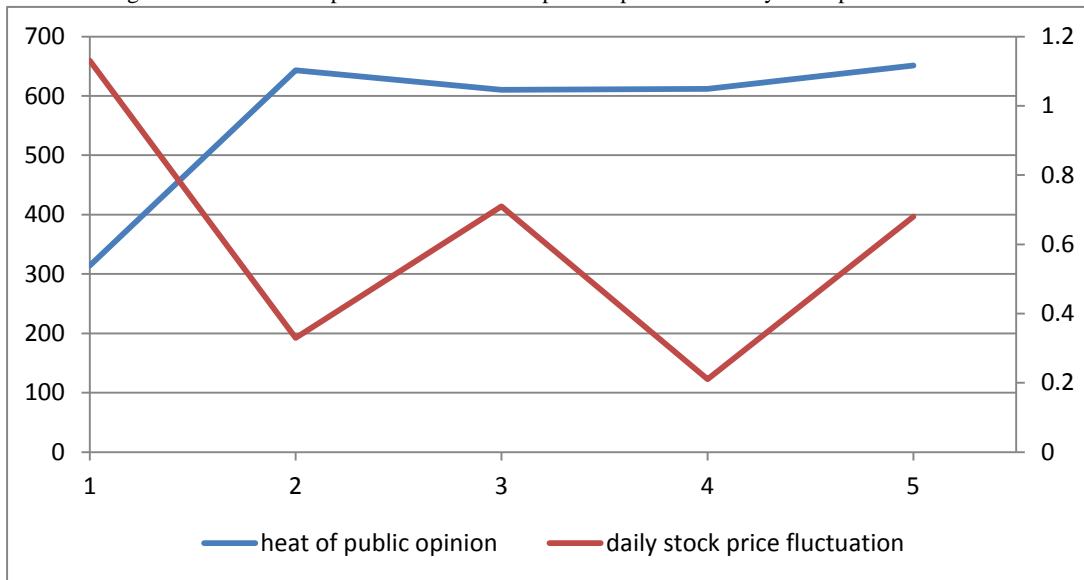


Figure 6 the relationship between the heat of public opinion and daily stock price fluctuations

We find that there are 206 stocks keep the similar linear trend between heat of public opinion and daily stock price fluctuations but another 74 not keep in the process of experiment after we choose 280 stocks. The ratio is close to 3:1. Through our observation and analysis, we find that the 74 stocks which seemingly not keep similar linear trend between heat of public opinion and daily stock price fluctuations have a particularity. Large capital stocks account for the majority of these stocks. As we all know, the large capital stocks have high circulation market value and not easy to control, relatively. It is hard to "shake" it even if the high heat of public opinion because country hold part of the capitalization of large capital stocks and there must be some national behavior to adjust and control the severe shock when heat of public opinion is high. This is the characteristics of the state holding. Here we do not consider the impact of large capital stocks for the relationship between the securities public opinion and stock price fluctuation. Thus conclude that there is a certain relationship between the securities public opinion and the daily stock price fluctuation

3.2.3 Abnormal Return

This method includes mainly four research steps.

First is to determine the estimated window and target window. We select the target window is every five trade day (T1, T2, T3, T4, T5) for a week from October 10, 2011 to April 20, 2012, totally 28 weeks. Estimated window is a period time before the target window. We regard the period time as four weeks (Longer for period time, more accurate for regression estimate parameters α & β).

Then, calculate the normal return. In the estimation window, we assume that the return of the stock is "normal". The normal return is the expected the return in the period of estimated window. This paper uses the market model to calculate the normal return. The market model assumes that there exist a stable linear relationship between market return and stock return. Market model remove the part related to market return fluctuation to reduce the statistical error and increase the explanatory power of the model. The basic formula of the market model:

$$R_{i,t} = \alpha_i + \beta_i * R_{m,t} + \varepsilon_{i,t}$$

In the formula, $R_{i,t}$ is the return of stock i in day t. $R_{m,t}$ is return of market in day t. α_i and β_i is regression of estimated parameter. $\varepsilon_{i,t}$ is an error term. We use the market return to do regression calculations for the return of each stock in the estimated window and the result of estimated parameter will be stored. Based on the market return, we use the result of estimated parameter to restore the stock return in normal level in the target window. To represent by $R_{i,t}'$:

$$R_{i,t}' = \alpha_i + \beta_i * R_{m,t}$$

After that we need to calculate the abnormal return. To calculate the stock's daily abnormal return in the target window, the formula is:

$$AR_{i,t} = R_{i,t} - R_{i,t}'$$

To calculate the cumulative abnormal return within the target window:

$$CAR_{i,t} = \sum_{t=1}^{t=5} R_{i,t} - R_{i,t}'$$

Last, we use T-test to test whether the cumulative abnormal return in the target window is significantly.



Figure 7 the cumulative abnormal return

The p-value of the cumulative abnormal return is 0.01, lower than 0.05, indicating significant differences between the two dataset in the above figure. Our statistics in 280 stock's cumulative abnormal return shows that the p-value of stock's cumulative abnormal return in 274 is less than 0.05. We can interpreted that the stocks on top list of weekly heat of public opinion have a significant fluctuation on market value. It is can be said that there is a certain relationship between securities public opinion and individual stocks.

3.2.4 Spearman rank correlation coefficient method

We have used three kinds of methods to prove there is indeed some kind or some relationship between securities public opinion and individual stocks. Next, we will find out that a relationship exists between them. We use the Spearman rank correlation coefficient^[6] formula to determine the relationship between securities public opinion and stock price fluctuation. Spearman rank correlation coefficient formula is:

$$\rho = 1 - \frac{6 * \sum d^2}{n(n^2 - 1)}$$

ρ is Spearman rank correlation coefficient, d is ranking difference between the two collection, n is size of the collection. We selected stocks on the top 10 list of weekly heat of public opinion as representatives and selected heat of daily public opinion and daily stock price fluctuations as two sets. The figure as follow:

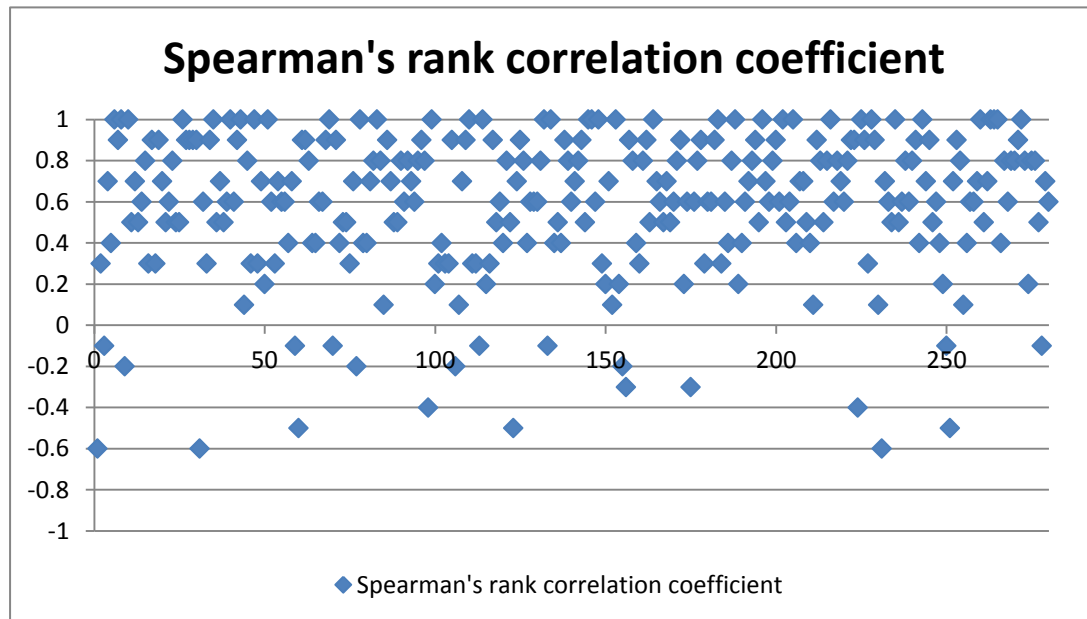


Figure 7 Spearman rank correlation coefficient

From Spearman rank correlation conclusions we can know the results more close to 1, the relationship between the two sets is more positive. From the figure we can see, most of the points still fall between 0.5 and 1. The average value of these 280 points is 0.59 by calculation. So, we can get the following conclusion: the daily price fluctuations of stocks and the heat of daily public opinion have a positive correlation, the correlation value is 0.59.

4 Conclusion

Through experiments we found that there is a certain relationship between securities public opinion and the market value fluctuation of listed companies. Analysis from a macro perspective, a positive linear correlation exists between the positive public opinion and market index fluctuation. From the microscopic point of view, with three kinds of experimental methods (Probability, Contrast and Abnormal Return), we prove that there is the inevitable association between stock price fluctuations and securities public opinion. We find the value of this inevitable association is 0.59 by Spearman rank correlation coefficient

5 References

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