



Ups and Downs of the Stock Market and the Evolution of the Return Distribution

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Abstract

This paper is based on the perspective of financial physics, using the cumulative distribution of yield to explore the law and characteristics of the whole system of Chinese capital market in bull market and bear market, and find that in the bull market, return distribution is from aggregation to dispersion, while in bear market, return distribution being from dispersion to aggregation.

Subject Areas

Financial Reporting, Marketing

Keywords

Financial Physics, Yield Distribution, Behavioral Finance

1. Introduction

The classical financial theory has shown a great limitation in the interpretation of many anomalies in the real market. Based on the results of nonlinear dynamics, complex systems and statistical physics, the “financial physics” (econophysics), has gradually become an important field in Finance (Wang Peng, Wei Yu, 2014) [1]. Many scholars believe that the development of financial physics may cause revolutionary theoretical and practical value (Bouchaud, 2008 [2], Lux, Westerhoff, 2009 [3]). It considered the financial market as a complex system. Among the various data, such as stock price, index is the physical experimental data [4]. The statistical laws in the system are studied by nonlinear scientific, complexity science and statistical physics. On this basis, the relevant theory is put forward [5]. In recent years, physicists have played a more and more important role in the Wall Street [6]. E. Derman fully explains why the Wall Street

needs physicists in its autobiography “My Life as a Quant: Reflections on Physics and Finance” [7]. It can be seen that financial physics has not only become a relatively independent field, but also has had a great impact on the practical field.

Probability distribution is the most essential and most important statistical property of the variables in the financial system, especially the probability distribution of the return rate, which is at the core position in various asset pricing models [8]. It is generally believed that the rate of return of the whole capital market should be approximated Normal distribution in the process of relatively stable market. This is because: 1) According to the central limit theorem, if there is no obvious factor of the system error, and the sample size is large enough, then the distribution of return rate should obey normal distribution. After more than 20 years of development, the stock market has been enough to meet the needs of the normal distribution; 2) For the stable process of the market, the investor sentiment is stable, and the choice of risk appetite is also a positive distribution. They will carry out the risk of the stock position, which in a certain extent, also makes the risk of the return of a positive distribution. But in the rise or fall of the market, because of investor sentiment and so on, it will result in the deviation of the return distribution from normal distribution. The research on the existing financial physics has found that the rate of return is the fat tailed distribution. Furthermore, the researchers adopted the methods of the stability distribution of Levi, the distribution of the truncated Levi’s flight, the distribution of the power law tail, the distribution of the tensile exponent and so on, to describe the actual pattern of change in the price of financial assets. Good results are obtained in the sample [9].

Market as a whole system of the ups and downs, is the focus of investors’ attention. Both positive investors and negative investors consider the system to make investment decisions [10]. The whole system is in the process of rising or falling, and the distribution of the return rate will be different. The study of it will help to deepen the understanding of China’s capital market and bear market. This paper is based on the perspective of financial physics, using the cumulative distribution of yield to explore the law and characteristics of the whole system of Chinese capital market in bull market and bear market.

2. Data Exploration

2.1. Sample Selection

Taking into account the situation of China’s stock market, here to select a low to the point of the cumulative rate of return distribution. The selected time interval is a [2005.10.28, 2007.1.29], b [2005.10.28, 2007.6.20], c [2005.10.28, 2007.10.17], this is the three section of the rise range, select the cumulative yield data from each interval, analyze a big bull market, excluding data missing listing Corporation, a total of 1368 samples. d [2007.10.17, 2008.1.10], e [2007.10.17, 2008.4.21], f [2007.10.17, 2008.11.4], this is 3 period of decline range, select each interval cumulative yield data, analysis of a bear market, excluding missing data of listed

companies were obtained a sample of 1479. g [2008.11.4, 2009.4.20], h [2008.11.4, 2009.8.5], this is a segment of the market, the selection of the range of the cumulative rate of return, excluding data missing companies to obtain a total of 1561 samples.

As shown in **Figure 1**, between “1 - 2” for a interval, between “1 - 3” for b interval, between “1 - 4” for the c interval, between “4 - 5” for d interval, between “4 - 6” for e interval, between “4 - 7” for f interval, between “7 - 8” for g interval, between “7 - 9” for h interval.

2.2. Mapping Analysis

2.2.1. A, B, C, the Cumulative Yield Data Distribution, Respectively, As Shown in the Following Figure 2

A range of yield distribution show that for the initial stage of the rise, the yield distribution into an aggregation state, the momentum is consistent, the performance is the same, the rise of the gap is not big, only a large margin of the company increased.

B range of yield distribution show that with the rise of the rise of a very big difference, some companies can continue to rise, while some companies are very difficult to continue to rise, and even the emergence of a callback, the yield distribution is a decentralized state.

C range of the cumulative yield distribution show that with the rise of the continued rise in the magnitude of a greater difference, the number of high-yield companies increased, some companies began to callback, the distribution of earnings further dispersed.

To sum up, we can get the market in the bull market in a non normal distribution and continuous changes in the initial stage of the rise in the initial stage, the distribution of income is gathered, along with the rise of the distribution of income distribution from the aggregation of the whole process of the whole process of the accumulation of the whole process of accumulation of dispersed state.

2.2.2. D, E, F the Cumulative Return of the Bear Market in the Central Region, Respectively, As Shown in the Following Figure 3

By the D range of yield distribution can be seen, the big bull market after the decline in the initial stage of the distribution of earnings performance is a decentralized state. As the decline continues, the yield distribution of the e interval is still a dispersion state, but the e range of the yield distribution shows that the decline is a systematic decline. The change of yield from d to e is more like a shift in the distribution of returns. Systematic decline further continue, the distribution of the cumulative return rate in the f region shows that the distribution of the state tends to be aggregated. To sum up, we can see that in the Chinese capital market, the big bear market has the following characteristics: The distribution of cumulative return rate in the initial stage of the decline is a dispersion state, then it is a systematic translation, the final distribution tends to the aggregation state. The cumulative rate of return of the whole process is manifested by the evolution from the dispersion to the aggregation.

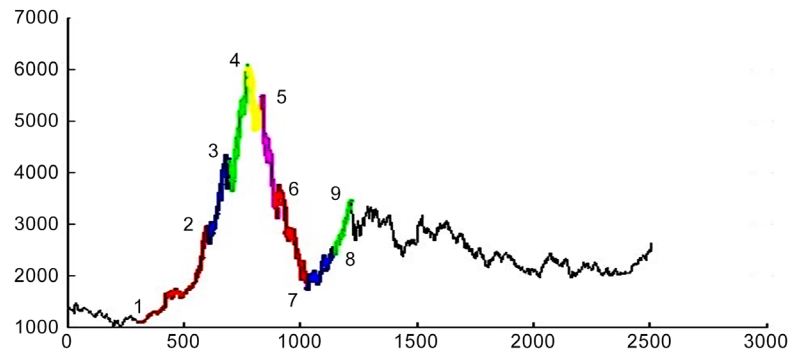


Figure 1. Time interval graph of sample data selection.

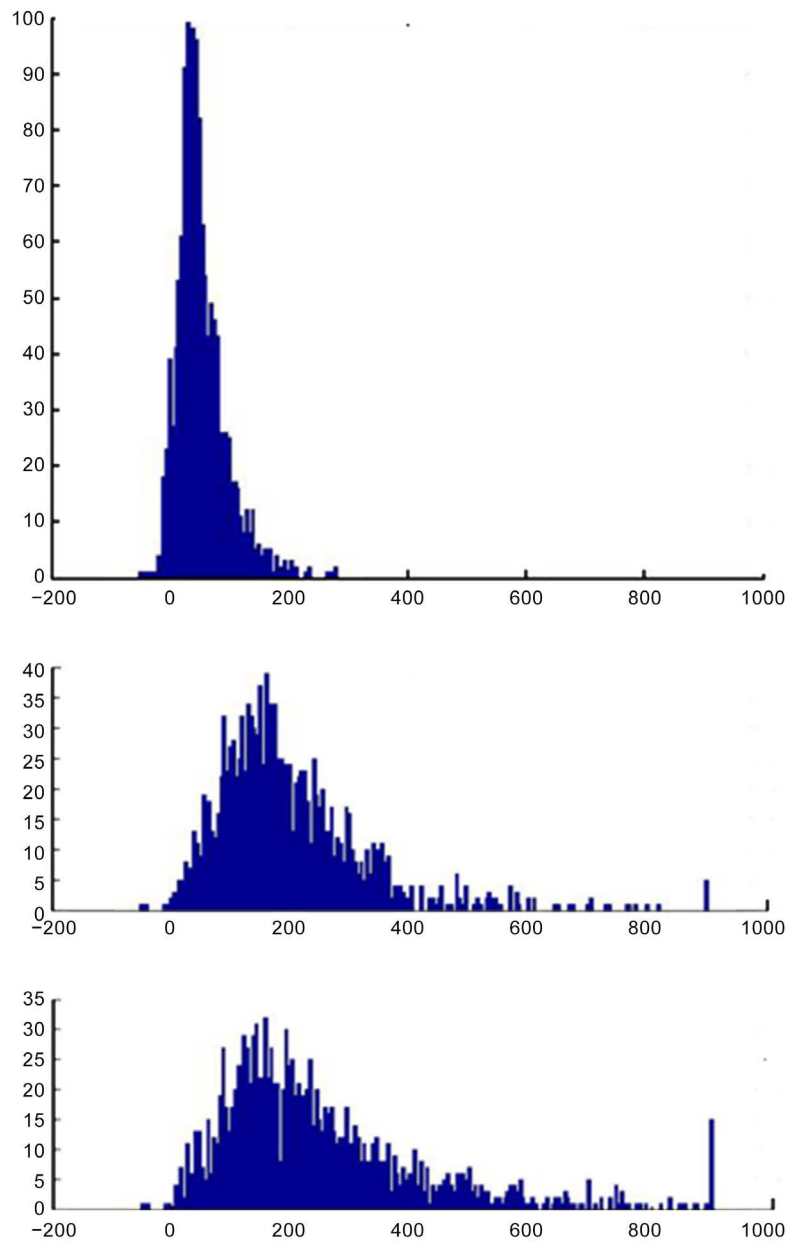


Figure 2. A, B, C interval of the market in the bull market (the horizontal axis to yield, the vertical axis is the number of companies).

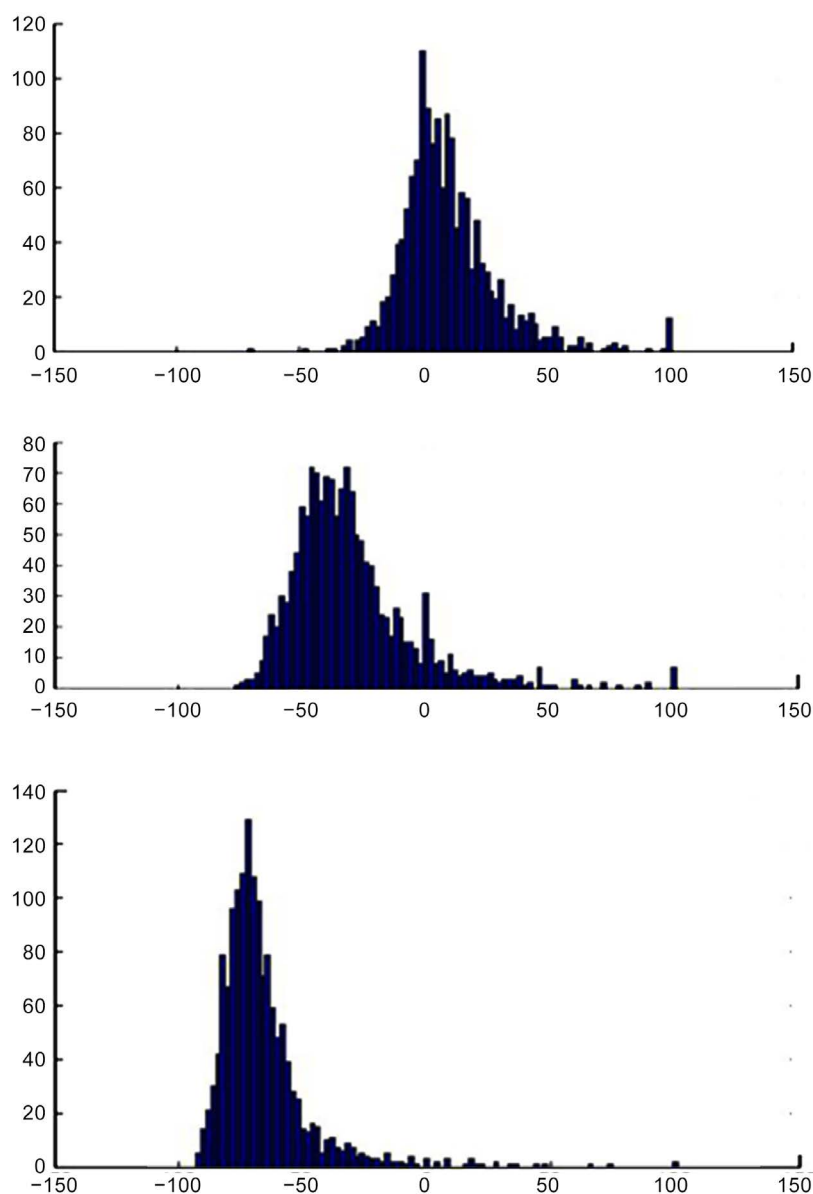


Figure 3. E, F, and D in the market of a bear market (the horizontal axis to yield, the vertical axis is the number of companies).

2.2.3. Interval G, H Cumulative Yield Distribution in Small Bull Market Shown in the Following Figure 4

Figure 4, the cumulative gain G interval rate distribution at the beginning of a wave of small bull market. The cumulative rate of return distribution is the aggregation state, that is, the emergence of the general rise, only a small percentage of the company increased by a large margin. Cumulative yield distribution of H interval, with the continuing rise of the system, the rise of the same also appeared a lot of different, high yield companies increased. Some companies began to call back, the cumulative rate of return distribution, In this wave of market, the distribution of income distribution is also the evolution of the aggregation state to the dispersed state.

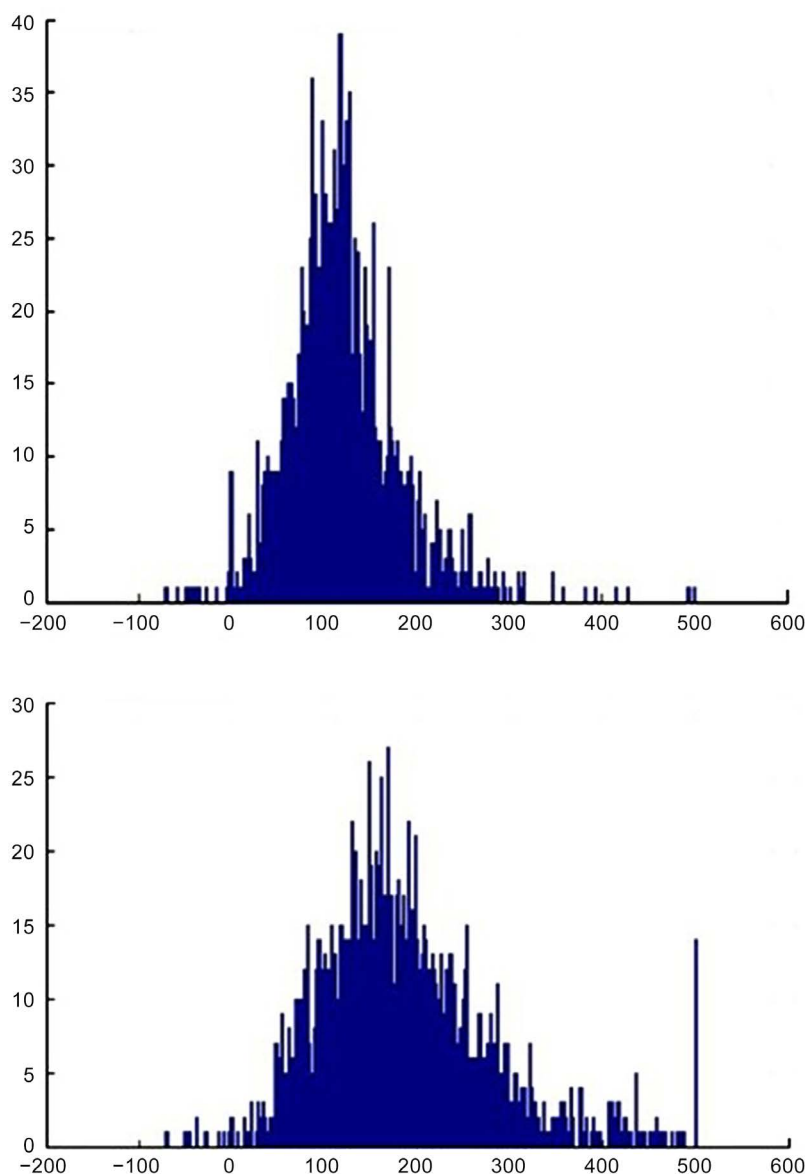


Figure 4. G, H range of the total revenue of the market in the market of the mavericks (the horizontal axis to yield, the vertical axis is the number of companies).

3. Rule Interpretation

The above data shows that in the bull market, the cumulative rate of return distribution in the beginning stage is aggregated, along with the rise of the distribution gradually dispersed state; In the bear market, the cumulative rate of return distribution in the beginning stages of the distribution of the state, As the decline continues, the distribution is gradually aggregated. The evolution of this distribution is mainly due to China's capital market without short selling mechanism.

For the interval "1 - 2" and interval "7 - 8" stage of the market, that is, the initial stage of the rise of the system, the distribution of returns is aggregated. This is because when the market has a good system of good news. At the same time

also have the conditions for the rise of the system, market expectations tend to be consistent, the bull market began to start, will be a general rise in the state, There is a big difference in the overall stock of the system, comparison of the distribution of the yield of a and g. The higher the aggregation state, the greater the energy, the higher the possible space.

For the range of the “4 - 5” stage of the market, that is, the initial stage of the system down. Because the market has no short selling mechanism, there is a limit of short selling, and only the stock of investors may sell shares led to the decline in stocks. And for not holding shares of investors cannot through the short sale to promote the decline in stocks. For the start of a bear market, the investors, the impact of the financial effect of the casino, will underestimate the risk of the stock, but also with the optimistic investors to buy stocks. Such investors are expected to be inconsistent, they will lead to a decline in the initial stage of the distribution of the yield is relatively dispersed state.

For the interval “3 - 4” and interval “8 - 9” stage of the market, that is the final stage of the system’s rise. The existing literature suggests that there is a big bubble, that is, the securities price is significantly higher than its intrinsic value [11]. There are several reasons for the formation of foam: 1) China’s capital market has no short selling mechanism. Investors cannot carry through short selling. The price is higher than the value of its value and can’t be recovered, the price cannot return to its reasonable level for a long time. 2) The previous stage of the stock price rise to investors brought about by the interests of, because of the impact of the financial effect of the casino, the risk aversion of investors to the stock market is reduced, which leads to the further rise of the stock price. 3) Over optimism, confidence and wishful thinking can lead to an underestimate of the financial markets, making money to attract new investors to enter, will make the bubble appear. Rational investors know that the price of a stock is higher than its intrinsic value, But because the market does not exist the mechanism of short selling, cannot profit by short selling. They are likely to have a positive feedback trading (to follow the trend of the transaction), looking for the kind of stock market sought after. Further fueled the rise, this power led to the distribution of the yield gradually dispersed state. When stock returns are very large, they are very large, shows that rational investors have done a lot of this trend of trade, Can be seen that the price of the stock is already higher than its intrinsic value, the system is likely to reverse the market price.

For the range of the “6 - 7” stage of the market, that is the final stage of the system down. Many documents that appear oversold phenomenon system, in which the price is much lower than its value [12]. About the oversold phenomenon, scholars all think there are two reasons: 1) As a result of the fall in the early days, the representative of the law of the rule of law led to investors believe that the decline in the back will continue. This on the market panic spreading, diffusion resulted in a stock investors dumped their hands, lead to oversold phenomenon. 2) Investors suffered a loss because of the previous fall. Thus, the risk aversion of the stock market is increasing, and the discount rate will be used

when the stock is valued, which will result in the decline of stock price. On the one hand, because of the fear of the market continued to spread, the emergence of the herd effect, and so cause the stock has dropped. On the other hand in the market rational investors will buy oversold stocks, that is, the price is less than the value of the stock, the stock price support. Two aspects of the role of the distribution of income distribution tend to aggregate state. When the mood of pessimistic panic is released and the buying of rational investors lurks, the systemic market may usher in a reversal. Systematic market may usher in a reversal of the rise.

According to the above analysis, it can be seen that the rational investors in the system of the market in the distribution of the rate of return plays an important role. If China's capital market is introduced into the mechanism of short selling, the rational investors in the bear market can make a profit by selling short. Short selling in the initial stage of the decline in the relatively small decline in stocks, and promote their further decline; Negative feedback trading in the final stages of decline (that is, to follow the trend of trading) short selling stock market disdain, This will make the distribution of the yield in the bear market as well as the evolution of the aggregation state to the dispersed state.

4. Conclusions and Limitations

From the perspective of financial physics, this paper makes use of the method of frequency distribution of the accumulative rate of return of different companies and finds that the rule of stock rises from aggregated state to dispersed state in bull market and the rule of stock falls from dispersed to aggregated state in bear market. This paper also explains the rule from two aspects of traditional finance and behavioral finance, providing a reference for investors to analyze and predict the trend of market. Because of the complexity of the whole system of the capital market, and the external factors that affect the distribution of return rate, the theoretical analysis of this law still needs more research.

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