Empirical Analysis of China Stock Market Based on Grey System

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Abstract: Financial market is the main function of financing, and the number of stock financing is the basic embodiment of the function of financial market. Therefore, it is of important practical significance to study the factors affecting stock financing. Through the analysis of these factors, the role of the stock market can be further fully played. COVID-19-19 is a huge disaster for China's financial markets and also affects equity financing in financial markets. Based on the grey system, the related factors affecting the amount of stock financing are analyzed, we find out the key factors affecting the amount of stock financing, and put forward feasible suggestions.

Keywords: COVID-19 Grey system; Correlation analysis; Stock market; Enterprise financing

1. Foreword

The stock market embodies every aspect of social life, which has become a barometer of social and economic activities particularly, and has an important reference significance and wind vane for enterprises, investors and government decision-making. Since the outbreak of COVID-19, China, as the first country to fight the epidemic, and its national economy has dealt a huge blow. And have reduced the GDP and caused a recession crisis.

Stock investment is an important indicator to measure the stock market. It not only reflects the development situation of the stock market, but also reflects the financing situation and the stability of the enterprise. By using the gray system modeling software to select several significant quantitative data of the stock market this year, we select Deng's correlation degree to obtain the ranking of influencing factors, and put forward the feasible measures to rectify the stock market[1]. Furthermore, we will ensure the stability of China's stock market in the context of epidemic globalization, and ensure that enterprises can raise enough funds to promote the steady economic development.

2. Index selection

One of the important functions of the stock market is capital financing, and capital is crucial to the development of the enterprise. The index of stock financing amount can reflect these two economic phenomena on the side, so the stock financing amount is selected as a reference index[2]. The stock market has high risk and also corresponds to high returns. There are also many factors affecting the amount of stock financing. This paper selects several factors that are easier to quantify for analysis[3]. It aims to find out the key factors affecting the amount of stock financing, and then stabilize the stock market and promote the stable development of micro, small, medium and medium-sized enterprises.Specifically, we will include the following factors: number of domestic listed companies; number of listed stocks.; total issued capital; tradable shares; total market value of the shares; stock transaction amount; total number of transactions; The Shanghai Composite Index and the Shenzhen Composite Index.

Through the above brief analysis and preliminary judgment, consulting the National Statistical Yearbook and the People's Bank of China in 2016-2020 annual report, the original data set can be obtained. The stock financing amount is taken as the annual financing amount of four quarters plus the total amount, the Shanghai Composite Index takes the annual closing price of the Shanghai Composite Index, and the Shanghai Composite Index takes the annual closing price of the Shanghai Composite Index.

3. Model building

Gray system research theory is "some information is known, some information is unknown", "less data", "poor information", with uncertainty system as the research object, mainly through the "part" known information generation, development, extract valuable information, realize the correct understanding of system operation rules and exact description, and according to scientific prediction[4]. General abstract systems, such as social system, economic system, agricultural system, ecosystem, education system, and so on, all contain many factors, and the result of multiple factors acting together determines the development trend of the system.

Therefore, as a typical abstract system, the stock market is both feasible and very realistic to select a gray system for the correlation degree analysis.

3.1 Identify feature sequences

Principle: Suppose that there are multiple factors of the system, and select one of the factors as the comparison benchmark, which can represent the base sequence, and become the base sequence sequence, also known as the parent sequence[5].

(1)The base sequence

(2)The parent sequence

$$x_j \, (j = 0, 1, 2, ...) \tag{1}$$

$$x_0 = \left\{ x_0(k) \,\middle|\, k = 1, 2, ... n \right\} = \left\{ x_0(1), x_0(2), ... x_0(n) \right\} \tag{2}$$

After the previous analysis, the stock financing amount is selected as the parent sequence[6]. The number of domestic listed companies, the number of listed shares, the total stock issued share capital, the circulating share capital, the total market value of the shares, the total number of shares traded, the Shanghai Composite Index and the Shenzhen Composite Index are selected as the sub-series.

3.2 Calculate the initial sequence value images

For the original data set, due to the unit inconsistency, the initial value image (or standardization) of each sequence is required to achieve unlimited data hardening[7].

(1) Get dimensionless values.

$$X_i^{'} = \frac{X_i}{x_i(1)} = (x_i{'}(1), x_i{'}(2), ..., x_i{'}(n)), i = 0, 1, 2, ... m \tag{3}$$

3.3 Differential sequences were calculated

Difference sequence values were calculated, and the minimum absolute difference was calculated $\Delta_{\min} = 0$, maximum absolute difference $\Delta_{\max} = 0.9557$

3.4 Correlation coefficient

Calculate the correlation coefficient, and take the resolution coefficient $\rho = 0.5$

(1) The correlation coefficient formula

$$\xi_i(k) = \frac{\min\limits_{i} \min\limits_{k} |x_0(k) - x_i(k)| + \rho \max\limits_{i} \max\limits_{k} |x_0(k) - x_i(k)|}{|x_0(k) - x_i(k)| + \rho \max\limits_{i} \max\limits_{k} |x_0(k) - x_i(k)|} \tag{4}$$

The calculation results are shown in Table 1.

Table 1: Correlation coefficient

	2016	2017	2018	2019	2020
$\xi_1(k)$	1.0000	0.5902	0.4044	0.3846	0.4587
$\xi_2(k)$	1.0000	0.5930	0.4059	0.3867	0.4634
$\xi_3(k)$	1.0000	0.6204	0.4020	0.3760	0.4668
$\xi_4(k)$	1.0000	0.6265	0.3983	0.3731	0.4549
$\xi_5(k)$	1.0000	0.6089	0.5530	0.4074	0.3820
$\xi_6(k)$	1.0000	0.8721	0.6700	0.4768	0.3678
$\xi_7(k)$	1.0000	0.8145	0.5517	0.3592	0.3333
$\xi_8(k)$	1.0000	0.6516	0.5892	0.4838	0.5976
$\xi_9(k)$	1.0000	0.7558	0.7337	0.5430	0.5533

3.5 Deng's correlation degree

Sequence $X_i(t)$ means representing the correlation coefficients at each moment is called a subsequence $X_i(t)$ to the parent sequence $X_0(t)$ about degree of association

(1) Deng's correlation degree formula

$$r_i = \frac{1}{N}\sum_{k=1}^{N}\xi_i(k)$$

(5)

The calculation results are shown in Table 2.

Table 2: Deng's correlation degree formula

$\gamma(X_0,X_1)=0.5676$	$\gamma(X_0,X_2)=0.5698$	$\gamma(X_0,X_3)=0.5730$
$\gamma(X_0,X_4)=0.5705$	$\gamma(X_0,X_5)=0.5903$	$\gamma(X_0,X_6)=0.6773$
$\gamma(X_0,X_7)=0.6117$	$\gamma(X_0,X_8)=0.6117$	$\gamma(X_0,X_9)=0.7172$

4. Conclusions and suggestions

4.1 Conclusion

Through the software operation, the ranking is obtained as follows. The Shenzhen Composite Index ranked first, followed by the stock transaction amount, the total number of shares traded, the Shanghai Composite Index, the stock market value of the total value, the total stock issued share capital, the tradable share capital, the number of listed shares and the number of domestic listed companies. From this ranking, the following conclusions can be drawn

The composite index has a significant impact on the amount of stock financing. In the ranking, Shenzhen Composite Index ranked first and Shanghai Composite Index ranked fourth. Ranked higher among the nine factors. For the Shenzhen Composite Index, China's chinext is on the Shenzhen Stock Exchange.The science and Technology Innovation Board has a significant impact on the amount of stock financing, and the corresponding Shenzhen Composite Index is of great significance when studying the amount of stock financing. The Shanghai Stock Exchange is one of the two major stock exchanges in China. Although it does not have a science and technology innovation board, it still lacks a large number of enterprises to list and raise funds here, which has a significant impact on the amount of stock financing.

The stock transaction amount and the total number of shares traded have a significant impact on the amount of stock financing. The amount of shares traded and the total number of shares traded reflect the

activity of the stock market. The amount of stock traded reflects the amount of stock raised from the perspective of value, and the total number of shares traded reflects the amount of stock raised from the perspective of quantity. Both are key factors for the amount of stock funds raised.

The total market value of stocks, the total share capital issued by shares, the tradable share capital, the number of listed stocks and the number of domestic listed companies also have an impact on the amount of stock financing, but the impact is relatively small.

4.2 Suggestions

Using the grey system modeling software sorts the factors affecting the amount of stock financing and find the key factors. Based on the conclusions of the above model, the following suggestions are put forward to maintain the stable stock market price and promote the stable development of enterprises.

From the stock market perspective. First, strengthen supervision. Strengthen the listing system. At the same time, strengthen the punishment of malicious stock price gouging when raising shares, and raise the standard of fines. The second is to strengthen investor education. Lead investors to establish the concept of "risk and interests coexist", assess the situation when making investment decisions; at the same time, regulate the market behavior of institutional investors, play the leading role of institutional investors in the market, and regulate institutional investors and do not manipulate the market. Through the above behavior, we can improve the quality of the stock market financing enterprises, reduce the bad enterprises, but also disperse the risks of investors, so that the stock financing activity to achieve a win-win situation.

From the corporate point of view. The economy is the lifeblood of a country, and then capital is the lifeblood of an enterprise. But for enterprises, the capital is often not unlimited. Therefore, how to optimize the allocation of resources under the premise of raising funds is also extremely important. The stock market is one of the main places to raise funds, and enterprises can raise funds by issuing shares. However, before entering the stock market, enterprises should also strengthen their self-regulation and focus on building always excellent stocks; they should also follow the requirements of stock exchanges and regulatory agencies. Having done the above two points, through issuing shares to raise money is no longer difficult for enterprises.

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