Research on the Relationship Between Macroeconomic Indicators and Stock Market Value

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Abstract: The article first addresses the following questions: "Why does gross domestic product (GDP) rises, but the stock market value falls?"; "Among the macroeconomic factors, which factor has a greater impact on the promotion of investment value in the securities market?". With these questions in mind, we put forward a hypothesis emphasizing on the impact of macroeconomic factors on the value of the stock market based on existing research and used the regression method to verify this hypothesis. The following conclusions were drawn: (1) variables that have a positive nonlinear relationship with stock market value include balance of payments surplus, rising GDP level, M1, the whole society's fixed asset investment, and national per capita disposable income; (2) variables that have a negative nonlinear relationship with stock market value include deposit, loan interest rate, new RMB loan amount, consumer price index (CPI), and producer price index; (3) deposit reserve ratio has an S-shaped curve relationship with stock market value; (4) exchange rate has an inverted U-shaped curve relationship with stock market value.

Keywords: Macroeconomic indicators; Stock market value; Relationship

1. Introduction

In Liaoning Smart Economy Competition, we analyzed relationship between China's gross domestic product (GDP) and stock market value, and found that in 2000–2006 and 2007–2008, there was a rise in GDP but a fall in the stock market value. According to the theory of investment analysis, the GDP and stock market value should be in the same direction. Among the macroeconomic factors, which factor has a greater impact on the promotion of investment value in the securities market? With doubts and paradoxes, we attempt to verify these problems through empirical analysis to better guide investment practices.

The analysis of the fundamentals of securities investment is more common in textbooks. On May 19, 2022, a keyword search based on titles was carried out using the keyword "securities investment fundamentals" on China Knowledge Network. After excluding 5 articles that have less relevant content, six articles remained from a total of 11 articles. These six articles focus on the analysis of the fundamentals of securities investment [1,2]. Another keyword search based on full text was also carried out using the same keyword "securities investment fundamentals," with a total of 25,030 articles found. The top 500 articles with the highest correlation were selected as the research sample. CiteSpace was used for literature review. The studies could be divided into five types, in which volatility research is one of them. Volatility research began in 2003, and from 2013 to 2016, it focused on quantitative investment, teaching reform, experimental

teaching, and stocks. However, the 2021 volatility research focuses on applications. From careful reading of the content, the majority are theoretical research, with relatively few research on solving practical problems. Research has suggested that GDP and share price movements should be consistent over time; however, existing research does not explain why GDP rises while stock prices fall.

2. Construction of research models and formulation of research hypotheses

Based on existing studies, the independent variable is the investment value of the securities market (expressed by the annual closing price of the Shanghai Composite Index), while the dependent variable is the balance of payments, GDP, M1, fixed asset investment, deposit reserve ratio, national per capita disposable income, one-year deposit interest rate, short-term loan interest rate of 6 months to 1 year, new RMB loans, CPI, producer price index, and exchange rate. Based on existing research, we propose several hypotheses [3].

(1) *Hypothesis 1:* The balance of payments surplus will lead to an increase in stock market value. The balance of payments is a systematic record of all transactions between residents of a country and non-residents in a given period of time. It has a deficit and a surplus. The latter occurs when revenues exceed expenditures, while a deficit occurs when expenditures exceed revenues. When the balance of payments is in surplus, the prosperity of industries that provide export products is high, the profits of enterprises are good, the income of the public is greatly improved, and the price of the securities market can rise steadily. When there is a deficit in the balance of payments, a country's export of goods is inhibited, and the efficiency of enterprises that provide these products is inevitably affected. The securities issued by listed companies will be snubbed by investors in the market, and the listed companies associated with these enterprises would face difficulties in performing, resulting in the fall of stock market prices. If a country has a long-term deficit in its income and expenditure, its foreign exchange reserves will decrease, along with its capacity to use foreign exchange to purchase imported raw materials, equipment, and technology. As a result, there would be a decline in economic growth rate, the entire national economy would be affected by the balance of payments deficit, and the performance of the securities market would be unsatisfactory.

(2) *Hypothesis 2:* The rise in GDP will cause the stock market value to rise. GDP is the most basic indicator of the overall macroeconomic performance. The macroeconomic environment is the most basic factor of a company's management, survival, and development. The stock market value is bound to rise when the trend of macroeconomic operation improves and the overall profit level of enterprises rises.

(3) *Hypothesis 3:* The increase in M1 will lead to a rise in stock market value. A significant money-making effect of the stock market would encourage investors to move other investment funds such as fixed deposits into the stock market, which benefit less, thereby increasing the overall M1. On the contrary, if the stock market does not make money, the money will be moved out of the stock market into other fixed assets, thus reducing the overall M1.

(4) *Hypothesis 4:* Under the condition of moderate investment scale and reasonable structure of investment, the whole society's fixed asset investment will cause the stock market value to rise. Fixed asset investment is the primary index used to measure the scale of investment. The formation of new productive capacity through investment in fixed assets is an indispensable means for expanding reproduction and promoting economic development. It is an important condition for promoting technological progress and the basis for establishing a rational production structure and distribution of productive forces. The scale and structure of fixed asset investment are not only related to the current state in service of the society, but also to future economic development prospects and structure. Securities investment is the future investment, so the analysis of fixed asset investment is of significance to making correct decisions in securities investment.

(5) *Hypothesis 5:* The increase in reserve ratio will lead to a decline in stock market value. Statutory deposit reserve ratio refers to the proportion of the total deposits of financial institutions to ensure the withdrawal of deposits and the settlement of funds. The higher the ratio, the less money the banks can borrow from deposits, thus reducing the money supply.

(6) *Hypothesis 6:* As national per capita disposable income increases, the stock market value rises. The increase in people's income will directly lead to the rise of stock market prices, and the increase in investment demand and consumption expenditure will affect the total social demand. The social aggregate demand in turn stimulates investment demand, so that enterprises expand the scale of production and increase corporate profits. This increase in profits will stimulate the enthusiasm of enterprises to expand their production scale and further improve the total profits, thereby promoting an increase in stock prices. Bond prices will also increase because of active market demand, improved business environment, increased profitability, and reduced debt service risk.

(7) *Hypothesis 7a:* When deposit rate falls, the stock market value rises; when deposit rate rises, the stock market value falls.

(8) *Hypothesis 7b:* The stock market value rises when the lending rate falls; when the lending rate rises, the stock market value falls.

(9) *Hypothesis 8:* As the new RMB loan amount increases, the stock market value will rise. New loans are used to reflect the situation of China's financial institutions to enterprises and residents in relation to the increase in amount of RMB loans issued based on statistical data released by the People's Bank of China to the public on a regular basis [4]. The increase in loans means that monetary policy has begun to ease, which is conducive to the circulation of money. The flow of money in the stock market will be large; hence, the new money will push the domestic stock market up [5].

(10) *Hypothesis 9:* A stable CPI will lead to an increase in stock market value. CPI is a lagging data, but it is often an important indicator of market economic activity and government monetary policy. Among stable CPI, full employment, and GDP growth, CPI stability is the most important socio-economic goal.

(11) *Hypothesis 10:* Producer price index and stock market capitalization have an inverted U-shaped relationship [6]. Producer price index is an index used to measure the average change in a manufacturer's ex-factory price. It is one of the several price indices collected and collated by the Statistical Office. If the producer price index is inches higher than expected, it indicates inflation risk. Producer prices may also indicate the risk of deflation. The fluctuation of the overall price level first appears in the production field, then spreads to the downstream industry through the industrial chain, and eventually affects consumer goods.

(12) *Hypothesis 11:* In the presence of trade surplus, the exchange rate declines, while the stock market value rises. Exchange rate is the price expressed in one currency for another. A rise in exchange rate denotes the conversion of 1 unit of foreign currency into an increase in the local currency. When the exchange rate drops, the currency appreciates, and it is advantageous to import, thus raising the stock prices of import enterprises.

3. Correlation analysis and causal analysis
3.1. Correlation analysis

Using SPSS, the results from Pearson correlation analysis of 13 variables, such as the Shanghai Stock Exchange (SSE) Index and GDP, show that the Shanghai Index and the international balance of payments, M1, national currency issue, fixed asset investment, and deposit reserve ratio are significantly positively correlated. The Shanghai Composite Index is negatively correlated with one-year deposit interest rate, short-term loan interest rate, and new RMB loans.

3.2. Linear relationship analysis

Stepwise multiple regression analysis of the model was performed using SPSS 21.0. The results show that GDP has a significant impact on the Shanghai Index, in which the coefficient of regression is 0.612. Other variables have no significant impact on the Shanghai Composite Index.

3.3. Nonlinear analysis

Shanghai Index represents the dependent variable Y, whereas the independent variable X is represented by balance of payments (BOP), GDP, M1, fixed asset investment, deposit reserve ratio, national disposable income, one-year deposit interest rate, short-term loan interest rate of 6 months to 1 year, new RMB loans, and CPI. Only significant nonlinear relationships and the best fitting degree are listed from the nonlinear analysis of the independent variables and the Shanghai Index [7].

The quadratic relationship between BOP and SSE Index is significant, and the fitting degree is the best: $Y = 715.135 + 1.395 * 105X - 1.186 * 1013X2$.

Between GDP and SSE Index, S function is significant, and the fitting degree is the best: $\ln(Y) = 7.955 - 56629.157/X$.

Between M1 and SSE Index, S function is significant, and the fitting degree is the best: $\ln(Y) = 7.853 - 21471.053/X$.

Between fixed asset investment and SSE Index, S function is significant, and the results are as follows: $\ln(Y) = 7.832 - 14233.782/X$

The cubic function of deposit reserve ratio and SSE Index is significant, and the fitting degree is the best: $Y = 14294.071 - 3530.427X + 286.123X2 - 6.928X3$.

Between national per capita disposable income and Shanghai Composite Index, the logistic function is significant: $\ln(1/Y) = X$.

Between the one-year deposit interest rate and SSE Index, the log function is significant, and the fitting degree is the best: $\ln(1/Y) = 1.217X$.

Between short-term loan interest rate of 6 months to 1 year and the Shanghai Index, the log function is significant, and the fitting degree is the best: $Y = 5755.054 - 2070.266\log(0.521X)$.

The quadratic function between new RMB loans and SSE Index is significant and has the best fitting: $Y = -7985.775 + 354.721X8 - 2.849X82$.

Between CPI and SSE Index, the exponential function is remarkable, and the fitting degree is the best, where $\ln(Y) = 498352.533 - 0.055X$.

Between producer price index and Shanghai Index, the logistic regression is significant, and the results are as follows: $\ln(1/Y) = 2.060*106 + 1.057X$.

Between exchange rate (100 USD against RMB) and the Shanghai Composite Index, the cubic function is significant, and the results are as follows: $Y = -13030.990 + 0.98X2 - 9.245 * 105X3$.
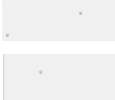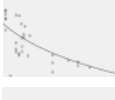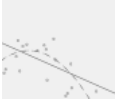
4. Conclusion

Through quantitative analysis (**Table 1**), the relationships between different macroeconomic indicators and the stock market value are described below.

(1) Variables that have a positive non-linear relationship with the stock market value include balance of payments surplus, rising GDP level, M1, the whole society's fixed asset investment, and national per capita disposable income.

(2) Variables that have a negative nonlinear relationship with the stock market value include deposit, loan interest rate, new RMB loan amount, CPI, and producer price index.

(3) The variable that has an S-shaped curve relationship with the stock market value is deposit reserve ratio.

(4) The variable that has an inverted U-shaped curve relationship with the stock market value is exchange rate.

Table 1. Verification of the relationships in the hypotheses

Hypothesis	Diagram	Verified
Hypothesis 1: The balance of payments surplus will lead to an increase in the stock market value.		Yes
Hypothesis 2: A rise in GDP will cause the stock market value to rise.		Yes
Hypothesis 3: The increase of M1 will lead to the rise of stock market value.		Yes
Hypothesis 4: Under the condition of moderate investment scale and reasonable structure of investment, the whole society's fixed asset investment will cause the market value of the stock market to rise.		Yes
Hypothesis 5: The increase in reserve ratio will lead to a decline in the stock market value.		Partially verified
Hypothesis 6: As the national per capita disposable income increases, the stock market value increases.		Yes
Hypothesis 7a: When the deposit rate falls, the stock market value rises; when the deposit rate rises, the stock market value falls.		Yes
Hypothesis 7b: The stock market value rises when the lending rate falls; when the lending rate rises, the stock market value falls.		Yes
Hypothesis 8: As the new RMB loan amount increases, the stock market value rises.		Partially verified
Hypothesis 9: A stable CPI will lead to a rise in stock market value.		Yes
Hypothesis 10: Producer price index and stock market capitalization present an inverted U-shaped relationship.		No
Hypothesis 11: In the presence of trade surplus, the exchange rate declines, and the stock market value rises.		Partially verified

Disclosure statement

The authors declare no conflict of interest.

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