

STOCK REVERBERATION DUE TO INTERNATIONAL TRADE RELATED ECONOMIC FACTORS

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Abstract

The economic activities of a nation are measured through various macroeconomic factors such as GDP, EXIM rate, unemployment level, Wholesale Price Index (WPI), and Consumer Price Index (CPI). Numerous studies have focused on identifying the association between inflation and stock prices, with some also highlighting the relationship between gold prices and stock price volatility. This study uses exchange rate and balance of trade as indicators to predict stock price volatility in China. The stock price volatility is measured using the Shanghai Stock Exchange Composite Index (SSE Composite Index). An analytical method is employed to evaluate the involved variables, with Johansen integration used to determine the relationships between them. The Vector Error Correction Model (VECM) is utilized to model these relationships. The Granger causality test and Johansen co-integration test measure the causal relationships of economic variables on the stock market indices. The findings indicate that the exchange rate positively influences stock prices, whereas the balance of trade shows a negative relationship. The exchange rate Granger-causes stock prices, but the reverse is not true. A similar Granger-causing relationship exists between the balance of trade and stock prices. The study also reveals that while the exchange rate of RMB to USD may not have a strong impact on stock prices, the exchange rates of other currencies may significantly influence China's stock prices.

Keywords: Balance of Trade, Exchange Rate, Granger Causality, Nifty, Volatility

JEL Classification: G10

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1 Introduction

The stock market is often considered a prime indicator of economic activity and is regarded as the best investment avenue due to its high returns compared to other sources. It plays a crucial role in economic prosperity, fostering capital formation and sustainable growth (Adjasi & Biekpe, 2006). The relationship between macroeconomic variables and stock prices has garnered significant interest among economists, financial policymakers, and academicians (Kwon & Shin, 1999). Fama and French (2015) laid the groundwork for understanding the relationship between stock price volatility and macroeconomic factors. Macroeconomic factors can be classified into four categories: general economic conditions, money-based variables, price-based variables, and international activities. General economic conditions include variables such as the level of employment and the wholesale price index or industrial production index. The money-based group consists of interest rates and monetary policy, including variables like interest rate, default spread, and term spread. Price-based variables include the inflation rate and key asset prices such as gold and oil prices (Jeyalakshmi, 2018). Variables related to international activities include exchange rates and foreign direct investment. It is argued that if corporate equity values are largely dependent on the economy's health, uncertainty in macroeconomic conditions would lead to instability in stock returns, assuming stable discount rates (Jabeen et al., 2022).

1.1 Theoretical Background of the Research

1.1.1 Exchange Rate

The exchange rate is the rate at which the currency of one nation is exchanged for the currency of another nation. Exchange rates can be free-floating, pegged, or hybrid. A free-floating currency has an exchange rate that varies based on the relative value of another nation's currency, determined by market demand and supply. A pegged or adjustable peg system involves a fixed exchange rate that may allow for occasional revaluation (Mussa, 1984). The value of a currency increases when demand exceeds supply. Interest rates also influence exchange rates; generally, lower interest rates lead to a lower exchange rate value for a currency. Exchange rates can be determined using the gold standard mechanism or the classical paper currency system. An increase in a country's imports can lead to a higher exchange rate for its currency. For example, when the dollar strengthens, Chinese consumers can buy more goods because they become cheaper. The price of foreign exchange is inversely

proportional to its demand, leading to a downward-sloping demand curve. Similarly, foreign exchange rates can also be determined by supply factors.

1.1.2 Exchange Rate Determination in China

China adopted a pegged exchange rate from 1994 until 2005, with the RMB pegged against the US dollar (Zhang, Chau, & Zang, 2013). During this period, the RMB was devalued, as China did not maintain a fair current account balance, often referred to as the "China Puzzle." However, in 1978, after decentralizing export activities, the overvalued exchange rate negatively impacted export incentives (Congressional Research Service, 2013). Consequently, an internal settlement rate of 2.80 RMB per dollar was set against the official exchange rate. In 1985, the official rate was merged with the internal settlement rate.

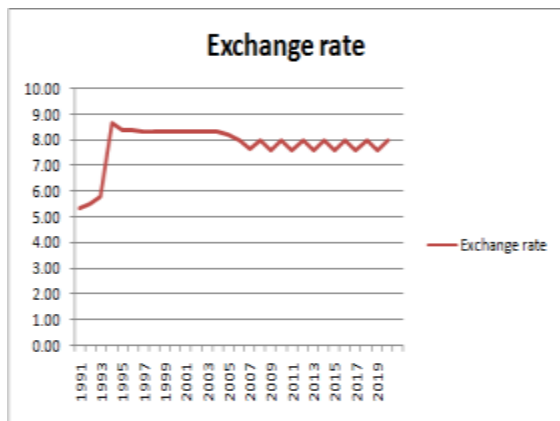


Figure 1- Exchange rate of China - 1991-2020

Figure 1 clearly shows that the exchange rate of RMB to USD drastically increased from 5 RMB to 0.5 RMB in the early 1990s. The exchange rate then remained steady until 2006, with only mild fluctuations observed thereafter. Over these seven years, the exchange rate maintained consistent low and high values.

1.1.3 Balance of Trade

The economy of a nation is influenced by many factors, with export and import being foremost among them. The difference between a nation's exports and imports is referred to as the balance of trade. This balance is described in various terms based on the net value of exports and imports. When exports exceed imports, it is called a trade surplus, positive trade balance, or favorable balance. Conversely, when imports exceed exports, it is referred to as a trade deficit, negative trade balance, or unfavorable balance. Calculating the balance of trade

is complex, involving extensive data and statistics (Blavasciunaite, Garsviene, & Matuzeviciute, 2020). Developing countries like India and China often face challenges in accurately computing trade balances. The balance of trade is influenced by factors such as production costs in both exporting and importing nations, exchange rate fluctuations, trade restrictions (including multilateral and bilateral agreements), international standards on environmental safety and health protection, resource accessibility, and the availability of foreign exchange to pay for imports. Domestic prices of goods also play a significant role (Zhang, Wang, Xiong, & Zou, 2021). Moreover, the balance of trade is affected by broader macroeconomic factors, including factor endowments, productivity, exchange rates, foreign exchange reserves, inflation, and demand. Factor endowments refer to the resources necessary for production (Engerman & Sokoloff, 2002). From a wealth channel perspective, there is a theory that rising stock prices lead to higher expected household income, which in turn boosts consumption. This increased consumption provides firms with easier access to financing, thereby affecting the trade balance. However, Simo-Kenge noted that stakeholders tend to invest more during stock market booms to maximize their returns.



Figure 2- Balance of Trade in China-1991-2020

1.1.4 Shanghai Stock Exchange Composite Index

Barakat, Elgazzar, and Hanafy (2016) showed that interest rates, exchange rates, and money supply have an integrating relationship with stock market returns. Jamaludin and Shahnaz Ismail (2017) studied the effect of macroeconomic variables in Indonesia, Singapore, and Malaysia, focusing on factors such as inflation, exchange rate, industrial production index, and forex reserves. Using panel least square regression techniques, they found that stock market returns are influenced by exchange rates and inflation rates. Their results highlighted

that inflation has a significant, inverse impact on stock returns (Wongbangpo & Sharma, 2013).

In their study, macroeconomic variables such as gross national product (GNP), consumer price index (CPI), money supply (MS), interest rate, and exchange rate were used as independent variables. The dependent variables included the Jakarta Composite Stock Price Index (JCSPI), the Philippines Stock Exchange Composite Index (PSE), the Kuala Lumpur Stock Exchange Composite Index (KLSE), the Stock Exchange of Singapore Index (SES), and the Stock Exchange of Thailand Index (SET). The results indicated both short-term and long-term relationships between stock prices and macroeconomic factors in these countries.

The SSE Composite Index, commonly referred to as the SSE Index, reflects all stocks traded on the Shanghai Stock Exchange. The SSE Composite Index includes two types of shares: A and B shares, with trading starting on July 15, 1991, and the base period set to 1990 (Altoo, 2023). The base value for this index is set at 100. Despite comprising only large companies in China, the SSE Composite Index is one of the most watched indices globally. Speculators and investors use this index to gauge China's economy. It is computed using the Paasche-weighted composite price index and includes major companies trading in China.

2 Review of Literature

Kim and Chunchi (1987) explored stock returns by integrating a multifactor return-producing process into the conventional CAPM. They used a k-factor CAPM model to determine the influence of major macroeconomic elements on stock prices. The study found that the interest rate and money supply significantly impact the market, while the market return measure does not appear to be the most important factor. Naik and Puja (2012) studied the fundamental relationship between stock prices and macroeconomic variables in India. They used the ADF test, co-integration, and the Granger causality test to analyze the relationship between macroeconomic variables such as the actual economic rate (REER), Forex reserve, balance of trade, industrial production index (IPI), wholesale price index (WPI), Foreign Direct Investment, and NIFTY, using data from April 2006 to March 2010. Their results showed no co-integration between NIFTY and all other macroeconomic variables except WPI, according to the Johansen co-integration test. Additionally, no causal relationship was found between

WPI and NIFTY. Harcourt and Edwin (2017) surveyed the impact of macroeconomic variables on the Nigerian stock market. Results from ordinary least squares revealed that macroeconomic variables such as the interest rate, gross domestic product, money supply, inflation, and exchange rate had no impact on stock price volatility. Similarly, stock prices did not influence the stock prices gap. Previous research has primarily focused on inflation and other macroeconomic variables, with limited studies addressing the balance of trade and exchange rate. Most research has concentrated on developed nations like the USA and UK. However, China, as a rapidly growing economy, has exchange rate and balance of trade as critical factors in determining its economic level. Kim and Chunchi (1993) used exchange rate determination in their study in China, employing the CAPM model, which focuses on assets' risk-free rate and return. In contrast, the current study uses the VAR model, incorporating the risk factor and lag values, thereby enhancing the research's reliability. This study bridges the gap between current and previous research.

2.1 Objectives of the Study

- a) To analyze the cointegrating relationship between the SSE Composite Index, balance of trade, and exchange rate.
- b) To identify the causal relationship between the balance of trade, exchange rate, and the SSE Composite Index.

3 Research Methodology

The study utilizes data such as the monthly average of the SSE Composite Index from January 2001 to January 2023, the balance of trade of China, and the exchange rate of China. The historical data, collected monthly from China's government data website and investing.com, is first processed and verified using the Augmented Dickey-Fuller (ADF) test, L-Jung Box test, and Jarque-Bera test. The ADF test is used to check for the presence of unit roots in the data, ensuring its stationarity. The statistical inferences are considered valid only if the time series data meets certain conditions. The ADF test is applied to each of the variables in the subsequent analysis.

$$y = a + Y_{t-1} + C$$

The goodness of fit can be assessed using the normality test, which examines whether a dataset follows a normal distribution. The Jarque-Bera test is employed to evaluate the

goodness of fit of the data. Johansen cointegration analysis is utilized to examine the cointegrating relationship between the stock market index and the two macroeconomic variables under study. Initially, integration analysis is conducted between the SSE Composite Index and China's exchange rate and balance of trade. The Johansen test is not only employed to detect cointegration among variables but also aids in constructing an appropriate Vector Error Correction Model (VECM) for further analysis. It identifies the presence and strength of cointegrating relationships between the macroeconomic variables and the SSE Composite Index. Granger causality analysis is a tool used to infer causality relationships, examining the concept of cause and effect, albeit not equating them. It operates on the assumption that data-generating processes in any time series are interdependent variables, employing a bottom-up approach.

4 Data Analysis and Interpretation

4.1 Random Walk of the Time Series

The random walk quality of

H_0 : The time series under study is stationary.

Table 1: Unit Root test

Test Values	SSE Composite Index	Balance of trade in China	Exchange rate RMB to USD
Unit Root Test with no Trend and no intercept			
Critical Value	2.673	2.2	4.723
At level (0)	0.0294	$2.2e^{-16}$	0.00338
At 1 st diff	0.0855	$<2.2e^{-16}$	0.0487
At 2 nd diff	0.0501	-	0.00234
Unit Root Test with Trend and no intercept			
Critical Value	3.258	83.00	4.853
At level (0)	0.0229	$<2.2e^{-16}$	0.008862
At 1 st diff	0.0432	$2.43e^{-16}$	0.00217

At 2nd diff 0.0610 - -

Unit Root Test with Trend and intercept

Critical Value	1.88	28.86	10.59
At level(0)	0.1347	2.85e ⁻¹⁶	4.506e ⁻⁰⁵
At 1 st diff	0.0146	<2e ⁻¹⁶	0.00215
At 2 nd diff	-	6.59e ⁻¹⁶	-

The Z-values for the SSE Composite Index without trend and intercept are 0.0294 (<0.05), with trend and no intercept are 0.0229 (<0.05), and with trend and intercept is 0.1347. Therefore, the SSE Composite Index without trend and intercept, and with trend and no intercept, do not exhibit a unit root. However, the SSE Composite Index with trend and intercept at level 0 does indicate a unit root. Upon differencing the data once, no unit root is found. Consequently, further analysis can proceed using the logarithmic values of the data. For the balance of trade in China and the exchange rate of RMB to USD, both without trend and intercept, the Z-values are all less than 0.05, indicating no unit root presence.

4.2 Test for Serial Correlation

H_a: The data are randomly distributed (r ≠ 1)

Table : 2 - Serial Correlation

Variable Name	X-Squared	Df	p-value
SSE Composite Index	339.1504	2	<2.2e ⁻¹⁶
Balance of trade in China	301.0801	2	<2.2e ⁻¹⁶
Exchange rate RMB to USD	362.3514	2	<2.2e ⁻¹⁶

The data are tested for randomness using the L-Jung Box test and it is found to be completely random as the p-value for all the three variables under study(<2.2e⁻¹⁶) is less than 0.05. Hence the alternate hypothesis is accepted which means the data obtained showed a randomness.

4.3 Testing for Normality

Table: 3 - Normality

Variable Name	X-Squared	Df	p-value
SSE Composite Index	1.0781	2	<2.2e ⁻¹⁶
Balance of trade in China	19.327	2	<2.2e ⁻¹⁶
Exchange rate RMB to USD	369.26	2	<2.2e ⁻¹⁶

The distribution of the data is tested using Jarque Bera test to know about its normality and the p-value of all the variables are found to be less than 0.05. Hence, the variables namely the SSE composite index, Balance of trade, and exchange rate found to be normally distributed.

The data is found to be fit for further analysis as it has no serial correlation, no unit root, and normality

4.4 Johansen Co-integration Test

H0: There is no co-integration exists

Table : 4 - Co-integration

Decision(H0)	Trace Statistics	Critical Value@5%	Probability	Eigen Value Statistics
There is none	244.78	146.76	0.067	81.88
At most one	169.91	174.90	0.034	68.86
At most two	103.26	187.31	0.054	44.11

Johansen co-integration test is practiced to recognize the extended association between the variables. For $r=0$, the critical value @ 5% (146.76) is less than the trace statistics (244.78). So, the null hypothesis is not accepted at $r=0$ level. But at $r=2$, there is no co-integrating relationship as the trace statistics is less than the Eigen value. This shows that there exists at least one co-integrating connection among the variables.

The vector error correction model with linear trend and lag length 2 is as follows

$$\text{Ln SSE} = 0.0141 + 8.256 \text{Ln X rate} - 0.087 \text{Ln BOT.}$$

Based on the VECM model utilizing the maximal eigenvalue matrix, the exchange rate shows a direct positive relationship with the SSE Composite Index, whereas the balance of trade demonstrates a negative relationship with the SSE Composite Index. Specifically, an 8.256 unit increase in the exchange rate corresponds to a unit increase in the SSE price, while a 0.087 unit decrease in the balance of trade corresponds to a unit increase in the SSE Composite Index price.

4.5 Causal Relationship between SSE Composite Index and the Dependent Variable

The short-term relationships among variables were analyzed using the Granger causality test. The results indicate that the Balance of Trade Granger causes movements in the SSE Composite Index, with a statistically significant p-value of 0.0007209 (less than 0.05). However, the SSE Composite Index does not Granger cause the Balance of Trade, as its p-value is greater than 0.05. Additionally, neither the Exchange Rate nor the SSE Composite Index Granger cause each other, as their respective p-values of 0.432 and 0.263 are both greater than 0.05. Therefore, these findings suggest a strong short-term relationship where movements in the SSE Composite Index are influenced by changes in the Balance of Trade.

Table : 5 Granger Causality relationship

Null Hypothesis	F-Statistic	Probability
The exchange rate of RMB to USD is not granger causing the SSE Composite Index	2.47	0.43
SSE Composite Index is not a granger causing the Exchange rate of RMB	1.35	0.26
Balance of trade does not granger cause SSE Composite index	8.61	0.00072***
The SSE Composite Index does not granger cause Balance of trade	0.37	0.69

4.6 Findings

The exchange rate of RMB to USD directly influences the SSE Composite Index, but the probability of an increase in the stock rate for a unit increase in the exchange rate is only 57.8%. In contrast, the probability of the SSE Composite Index affecting the exchange rate is much higher at 74.7%. This indicates that the domestic economy has a greater impact on external trade. On the other hand, the balance of trade has nearly a 99% probability of affecting SSE composite prices. This underscores that an increase in domestic production leads to a favorable balance of trade, thereby influencing the economy. Therefore, economists and policymakers are advised to prioritize local trade to strengthen the economy.

5 Conclusion

Despite technical analysis, investors should consider the impact of macroeconomic factors before investing in stocks, as these factors can significantly influence share prices. Rapidly developing countries like China are particularly affected by international trade dynamics. Key macroeconomic factors related to international trade include the balance of trade and exchange rates, which are crucial determinants. This study finds that exchange rates typically have a positive effect on stock prices, whereas the balance of trade tends to have a negative impact. While the exchange rate between the RMB and USD may not exert a strong influence on stock prices, other currency exchange rates can significantly affect stock prices in their respective countries. Therefore, it is advisable for the Chinese economy to prioritize strengthening local trade to enhance economic resilience. It's worth noting that this research focuses on the volatility of stock rates on the Shanghai Stock Exchange, which may not always reflect the broader Chinese economy. Furthermore, the study examines only two macroeconomic indicators that primarily pertain to international trade, potentially limiting their ability to fully explain fluctuations in stock rate volatility.

5.1 Future implications of the research

The study can also be further conducted with more variables to understand the real time influences as real time influences have many macroeconomic variables intertwined with stock prices.

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