

The Impact of the Fed's Monetary Policy in 2022 on China's Stock Market: Evidence from SSEC and SZSE

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Abstract. International financial markets have been abuzz with worry over the Fed's interest rate rise strategy. The Fed's interest rate raises policy's implementation will have wide-ranging effects, particularly for an emerging market nation like China. The influence of the Fed's interest rate hike policy on the Chinese market will be examined in this essay in several different ways, including stock market yields, volatility, economic growth, and market expectations. The results of this study imply that the Chinese stock market has been negatively affected over the long term by the Fed's interest rate hike. In particular, the returns of the Shanghai Securities Composite Index and Shenzhen Securities Composite Index were significantly negatively impacted by the Fed's rate hike, with the SZSE index being more adversely impacted. Additionally, this study discovered that the Fed's interest rate hike had no effect on the SZSE Index's market volatility throughout the study period but had a considerable impact on the market volatility of the SSEC Index. This implies that a Fed rate hike may result in greater SSEC Index market volatility while having a negligible effect on SSEC Index market volatility. In order to stabilize market mood and reduce risks, the government and authorities should closely monitor any potential effects of the Fed's interest rate hike on the Chinese stock market. To adjust to the evolving global financial climate, investors should carefully evaluate market risks and develop prudent investment strategies.

1 Introduction

A Federal Reserve interest rate rise occurs when the Board of Governors of the Federal Reserve System decides, during a meeting in Washington, D.C., to change monetary policy by raising the federal funds interest [1]. To ensure economic stability and encourage long-term economic growth, the Fed bases its interest rate choices primarily on the direction of the US economy. It is likely to undertake a more accommodating monetary policy, such as decreasing interest rates, if it is anticipated that the economy would decline in the future and there is downward pressure on prices. On the other hand, it may adopt policies like hiking interest rates to tighten the monetary base. The risk of inflation will increase as the labor market and economic growth both improve. Therefore, the Federal Reserve aims to reduce inflation and maintain stable prices by raising interest rates. Additionally, by hiking interest rates, the Fed can increase the US's global competitiveness by luring additional investment into the US market [2].

The Federal Reserve's approach of rising interest rates might also cause volatility in international stock markets. As a result of changes in the value of the US dollar, it has been demonstrated that nations like Thailand, the Philippines, and Malaysia had to abandon fixed exchange rates [3]. This forced a massive depletion of foreign exchange reserves and ultimately triggered the financial crisis in Southeast Asia.

Additionally, the real estate and stock market bubbles that burst in the US during the interest rate hike cycle of 2004 to 2006 resulted in a global financial crisis and a tsunami in the international financial market [4]. However, the Fed's policy of raising interest rates could result in a rise in global stock market volatility due to the globalization of the economy and the deepening of economic ties between nations.

A significant body of research has examined how the Fed's decisions affect emerging economies and global financial markets in monetary systems dominated by the US dollar [5]. They claim that the strength of the Fed's monetary policy reversal will largely determine the extent of US monetary policy spillovers and that some emerging economies with shaky economic fundamentals will be particularly vulnerable. Due to variables like shifting interest rate differentials, some emerging nations with weak economic fundamentals would see pressure from capital outflows and exchange rate depreciation [6]. According to one study that looked at the specific effects of interest rate increases in the US, rising interest rates because of inflationary pressures may have a detrimental effect on emerging market economies [7]. Although emerging market countries often have more open and developed marketplaces than developed ones do, these differences often make emerging market nations easy targets for international capital rivalry. China, which has steadily transitioned from high growth to medium growth to high and stable growth, has grown to be the largest emerging market

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nation in the world and is highly integrated into the global economy [8].

The Fed's interest rate raise policies may have effects on the Chinese stock market, according to an extensive examination of prior data. These effects include a rise in stock market volatility, modifications to capital flows, adjustments to economic growth, and modifications to market expectations. Investors and decision-makers should keep a close eye on the Fed's interest rate hike policy changes and take the necessary action to meet any potential risks and opportunities.

Using the USD-RMB exchange rate and two of the most representative Chinese stock market data, SSEC and SZSE, this research study the changes in Chinese stock market returns and volatility in the context of the Fed's interest rate hike and how they are affected by it. The marginal contribution of this paper is to provide support for empirical research that shows the long-term impact of the Fed rate hike on the Chinese stock market, to highlight differences between indices, to emphasize changes in yields, market returns, and volatilities. This marginal contribution also provides valuable guidance and food for thought for future research and decision-making.

First, the ADF method—which serves as the foundation for developing the model—is used to analyze the stability of these two data series. To forecast the value of the variables, namely the return on the exchange rate and the return on consumption, a VAR model is constructed in the second section. Testing the VAR model's stability is also necessary. The variables' values are evident from the impulse responses. The goal of the final section is to forecast both market returns and volatility using an ARMA-GARCH model.

2 Research Design

2.1 Data Resource

The opening and closing prices of the Shanghai Stock Exchange Index and Shenzhen Stock Exchange Index, as well as the exchange rate of the US dollar against the RMB, were chosen as the data source and data base for the empirical analysis to study the impact of the Fed's interest rate hike on the Chinese market. The data source for this study is Choice Financial Terminal. The study period spans 343 trading days from 1 January 2022 to 5 June 2023.

2.2 Weak Stationary Test: ADF

This part must first run a unit root test (smoothness test) on the model after it has been constructed. According to Evžen Kočenda and Alexandr Černý [9], this test is used to determine whether the random component has a unit root or whether it is stationary or not, with the original hypothesis being that the model is not stationary.

$$Return_1 = c_t + \beta Return_{t-1} + \sum_{i=1}^{p-1} \phi_i \Delta Return_{t-i} + e_t \quad (1)$$

Set the original hypothesis $H_0: \beta = 1$ and the alternative hypothesis $H1: \beta < 1$

Check whether β is equal to 1. If it does, there is a unit root, which suggests the series is not smooth. This also means the original hypothesis that the series is not smooth is rejected. If, however, the series is smooth, the unit root is absent. This section can reject the initial hypothesis after entering the data into Stata and running the ADF test since Table 1 shows that the p-value for log returns is 0, which is less than 0.1. The model is therefore sound and workable.

Table 1 Weak Stationarity Test: ADF test

	t	p
Raw		
Exchange rate	-1.439	0.8491
SSEC	-2.822	0.1891
SZSE	-2.735	0.2217
Return		
Exchange rate	-13.774	0.0000***
SSEC	-13.114	0.0000***
SZSE	-12.997	0.0000***

2.3 Vector Autoregression (VAR) Model

The dynamic link between the Fed's interest rate hike and the Chinese equities market is then investigated using a vector autoregressive (VAR) model. A multivariate time series analysis technique called a VAR model enables the examination of causal links between numerous variables. To evaluate the dynamic connection between jointly endogenous variables, a VAR model is frequently utilized. It is accomplished by performing autoregression on numerous period lags of all current period variables in the model. As a result, this approach is a "vector autoregressive," or VAR, method [10]. The study's explanatory variable is the exchange rate between the US dollar and the RMB. The best latency p for the VAR model is chosen using the lag selection approach.

$$Return_t = \phi_0 + \phi_1 Return_{t-1} + \dots + \phi_p Return_{t-p} + a_t \quad (2)$$

2.4 ARMA-GARCH Model

An ARMA-GARCH model is created to further explore volatility and returns in the Chinese market. The model simulates the series' volatility using a generalized autoregressive conditional heteroskedasticity model. where the explanatory variable is the USD-RMB exchange rate.

$$Return_t = \phi_0 + \sum_{i=1}^p \phi_i Return_{t-i} + \alpha_i - \sum_{i=1}^q \phi_i \alpha_{t-i} \quad (3)$$

A general expression for ARMA is given by the formula, where the AR(p) component is denoted by $\phi_0 + \sum_{i=1}^p \phi_i Return_{t-i}$ and the remaining component is MA(q). While MA(q) uses the error term for forecasting, AR(p) applies the historical USD-RMB

exchange rate from January 2022 to June 2023 to predict the future value.

The second element is GARCH. According to research [11], GARCH and ARCH are fundamentally related and both contribute to the variance of volatility. GARCH extends the ARCH model by include the autoregressive component.

$$\sigma_t^2 = \alpha_0 + \alpha_1 \varepsilon_{t-1}^2 + \dots + \alpha_q \varepsilon_{t-q}^2 + \gamma_1 \sigma_{t-1}^2 + \dots + \gamma_p \sigma_{t-p}^2 + \beta_t ER_t \quad (4)$$

The formula states that $\alpha_1 \varepsilon_{t-1}^2 + \dots + \alpha_q \varepsilon_{t-q}^2$ is the ARCH term, $\gamma_1 \sigma_{t-1}^2 + \dots + \gamma_p \sigma_{t-p}^2$ is the GARCH term, and ER_t stands for the external explanatory variable. According to Bollersley [12], GARCH reduces the number of parameters that must be calculated while

increasing the precision of conditional variance forecasts for the future. Iteration reduces ARCH(p) to GARCH (1,1).

3 Empirical Results and Analysis

3.1 Order of VAR Model

The LR statistic and other informational criteria should be assessed for each lag in order to determine the best lag sequence for the VAR model. For each lag, information criteria should be assessed. After the data, the intended lag order is indicated by an asterisk (*).

Table 2 Likelihood ratio test and information criterion

Lag	LL	LR	p	FPE	AIC	HQIC	SBIC
0	2005.35			1.8e-08	-12.1415	-12.1323	-12.1185
1	2469.06	927.42	0.0000	1.1e-09*	-14.9276*	-14.9001*	-14.8586*
2	2470.9	3.6797	0.451	1.1e-09	-14.9145	-14.8686	-14.7994
3	2471.73	1.664	0.797	1.2e-09	-14.8953	-14.831	-14.7342
4	2474.75	6.0395	0.196	1.2e-09	-14.8894	-14.8067	-14.6822
5	2476.87	4.2392	0.375	1.2e-09	-14.878	-14.777	-14.6247
6	2477.2	.6616	0.956	1.2e-09	-14.8558	-14.7364	-14.5564
7	2483.14	11.887	0.018	1.2e-09	-14.8675	-14.7298	-14.5222
8	2485.03	3.7659	0.439	1.2e-09	-14.8547	-14.6986	-14.4633
9	2486.88	3.7009	0.448	1.2e-09	-14.8417	-14.6672	-14.4042
10	2487.82	1.8947	0.755	1.3e-09	-14.8232	-14.6303	-14.3397
11	2492.95	10.247*	0.036	1.2e-09	-14.83	-14.6188	-14.3004
12	2493.49	1.0886	0.896	1.3e-09	-14.809	-14.5794	-14.2334

This symbol is present for both lags 1 and 11, according to Table 2. The best order after the VAR model should be 11, as the LR's are most significant at lag 11 and FPE, AIC, HQIC, and SBIC are all minimums.

It is critical to verify that the VAR model is smooth after the number of lags has once again been specified. The impulse response function will not converge to zero in a non-stationary VAR model. This shows that the Chinese stock market will be affected over the long run by the Fed's interest rate hike.

The model's applicability was then evaluated by looking for unit roots and drawing the Unit Root Cycle. Figure 1 shows that the lag of 11 periods is accurate and that there is no need for revaluation because all unit roots are contained within the circles. VAR (11) is a stable model as a result.

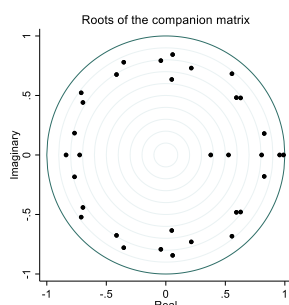


Figure 1 Unit root test

Photo credit: Original

3.2 Impulse Response: Dynamic Impact of Exchange Rate on Stock Market Index

The impulse response graph (Figure 2) seen in the return of the SSE index is significantly negatively impacted when the US dollar appreciates against the RMB by one unit, particularly between t=0 and t=5. This effect is most pronounced between t=0 and t=5. It is clear that the Fed's interest rate increase causes the US dollar to appreciate significantly, which causes the RMB to weaken and the SSE index to drop, which stops the stock market's decline. Although there are minor changes between periods 6 and 8, the effect is generally positive. The number dips to about -0.15% at t=5 and then progressively rebounds near 0.

The SZSE's equity returns responded similarly to an increase in the value of the US dollar. The SSE index was less impacted than the SZSE, which was greater. After 5 periods, it gradually recovers to converge to -0.1% with a continuous gap to 0, falling to -0.25% at time t=5. This demonstrates how profound and important the Fed's rate move was for the SZSE. The chart data, however,

indicates that it is anticipated that the adverse effect will steadily diminish and converge to zero over time.

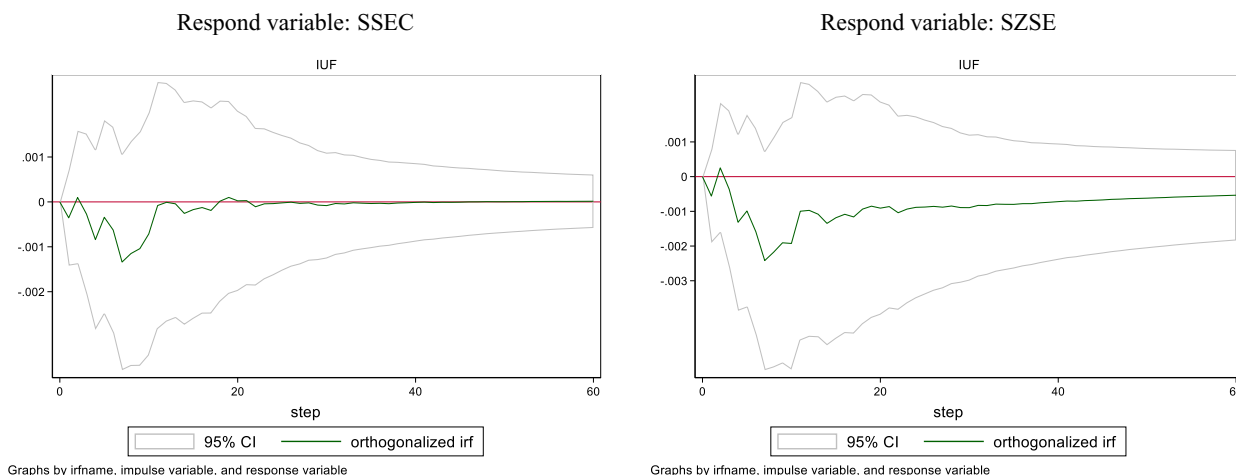


Figure 2 Impulse and response (Impulse variable: Exchange rate)

Photo credit: Original

3.3 ARMA Order Identification

First, the log return series of the SSEC index must be ranked using the PACF and ACF. The lag order of AR(p) and MA(q) can be derived with the aid of PACF and ACF. The first component of the PACF of the SSEC in Figure 3 beyond the crucial value in the plot is 26. The

same is true for the first part of the ACF. As a result, the values of p and q are 26, and AR(p) and MA(p) are also of order 26.

The SZSE's log returns are arranged next. According to the results of the ordering of the two images in the second row of Figure 3, it appears that both sections beyond the critical value are equal to 26, which means that both p and q are equal to 26. As a result, AR(p) is of order 26 and MA(p) is also of order 26.

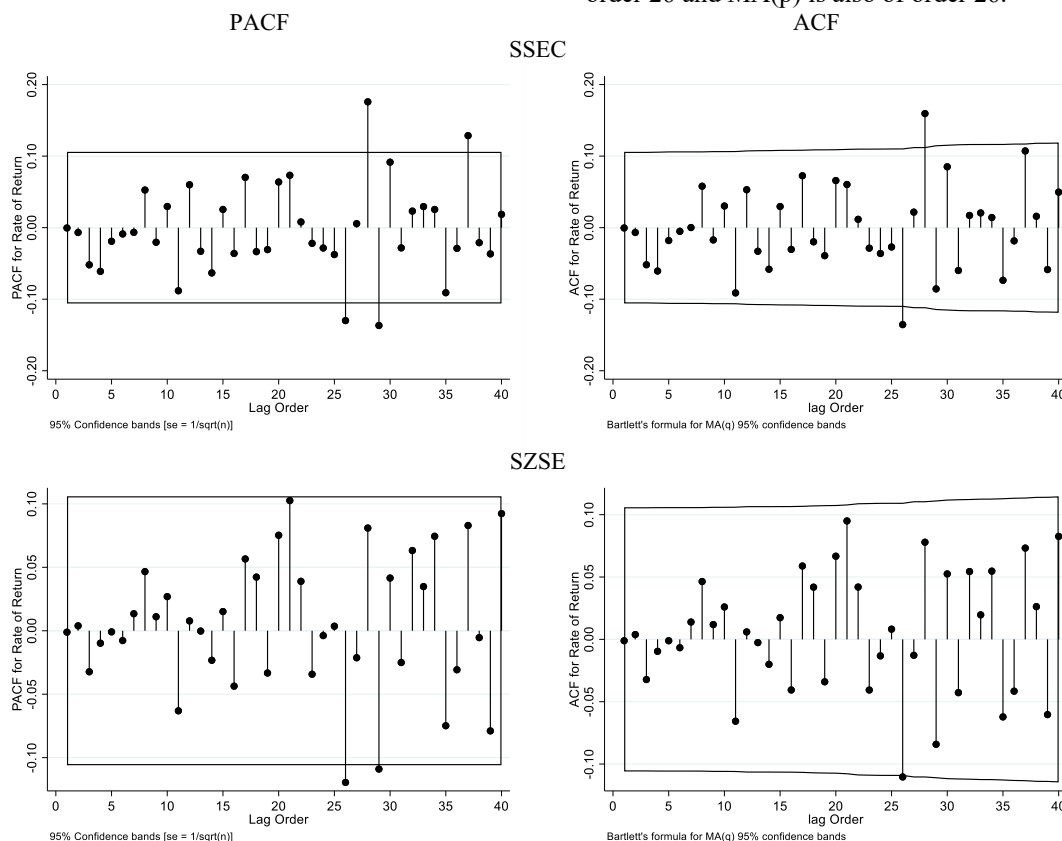


Figure 3 ARMA (p, q) identification

Photo credit: Original

3.4 ARMA-GARCH Estimation Results

The variance equations and the model's estimation results are both listed in Table 3. The variance equation's ARCH and ARCH and GARCH are both less than 0.05, indicating that both are significant, and this suggests that the SSEC and SZSE markets have considerable conditional heteroskedasticity. Additionally, conditional heteroskedasticity suggests that returns' volatility is aggregated, allowing for a GARCH model.

According to the calculated results, the exchange rate coefficients in columns (1), (2), and (3) are all

positive, which shows that changes in the exchange rate have a large impact on the volatility of SSEC in the current time. On the other hand, columns (4), (5), and (6) demonstrate that the SZSE is not generally impacted in the same way. The coefficient values in column (6) are not credible because despite their considerable performance, neither of the values in columns (4) or (5) in the same row demonstrate significance, and column (6) lacks a p-value.

Overall, this suggests that while the market volatility of SZSE in the current period is unaffected by exchange rate changes, it has a considerable impact on the market volatility of SSEC.

Table 3 ARMA-GARCHX regression

	(1)	(2)	(3)	(4)	(5)	(6)
	SSEC			SZSE		
Exchange rate						
L0	134.702	119.9501	110.0221	233.6094	227.4501	42011.34
	0.008	0.106	0.091	0.332	0.631	.
L1		63.0419	80.5770		111.1442	43592.09
		0.427	0.298		0.876	0.000
L2			-61.1653			61084.96
			0.073			.
ARCH	.1424	.1302	.1399	.0580	.0585	.0506
	0.010	0.0249	0.015	0.011	0.010	0.004
GARCH	.5596	.5739	.4964	.9264	.9235	.9442
	0.000	0.000	0.001	0.000	0.000	0.000
Constant	-10.5615	-10.5818	-10.3988	-13.2939	-13.2184	-823.613
	0.000	0.000	0.000	0.000	0.000	0.000

4 Discussion

The findings of this research are both comparable to and different from those of the previous literature in a number of ways. First, the results support earlier research in that the Fed's interest rate increase has a detrimental effect on stock market returns. The SZSE was negatively impacted more than the SSEC, according to this study's findings of differences between the various indices. This result may be explained by changes in market dynamics, investment behavior, or structural variations between the two indices. Second, the study demonstrates that the rate hike has a big influence on the SSEC index's current market volatility while having little effect on the SZSE index's current market volatility. This discovery offers a fresh viewpoint for a more thorough comprehension of the market behavior of various indices.

This study's conclusions have significant research ramifications. First off, by carefully analyzing the long-

term effects of the Fed's interest rate hike on the Chinese stock market, it can give investors, scholars, and policymakers more thorough knowledge with which to develop appropriate investment strategies and policy actions. In addition, examining the variations among various indexes can aid in our understanding of the mechanisms through which market structure, sector composition, investor mood, investment behavior, and other factors affect the stock market. The report also offers suggestions for future research, such as how to look more closely at the long-term effects of various factors on the Chinese stock market and similar connections in other global markets.

Because of its findings, policy makers can comprehend and use the conclusions of this paper. First and foremost, decision-makers need to acknowledge that the Fed's rate hike has had a long-term effect on the Chinese stock market, particularly with regard to the SZSE returns and SSEC volatility. This suggests that while establishing monetary policy, consideration should be given to any potential effects on the stability

of the stock market. Second, regulators could take steps to control market volatility and lessen negative effects, such as improving market communication, controlling investor expectations, or putting in place measures to prevent excessive market volatility.

Finally, investors can use the research presented in this paper to inform their investment plans. First off, investors must use risk management and diversification techniques to reduce potential losses given the observed negative impact of interest rate hikes on stock market performance. Investors in the SZSE should exercise particular caution because the study indicated that the index is more sensitive. Second, because of the effect on SSEC's present market volatility, investors can use short-term trading or hedging tactics to profit from transient price changes.

5 Conclusion

In the context of the Fed's interest rate hike, the long-term effects of the Fed's interest rate hike on the Chinese stock market are examined in this study. By examining the returns of the SSEC and SZSE indices as well as market volatility, it is possible to determine how the Fed's rate hike will affect the Chinese stock market.

This study's goal is to analyze how the Federal Reserve's interest rate increase affected the Chinese stock market. The impact of interest rate hikes on SSEC and SZSE as well as variations in volatility and yields are the main topics of discussion. In this work, the VAR and ARMA-GARCH models are used to achieve this goal. The ARMA-GARCH model evaluates the change in stock volatility in contrast to the VAR model, which investigates impulsive responses while assessing returns. The study conducts an empirical inquiry before drawing findings. The Fed's rate hike will have a negative effect on the returns on the Chinese stock market as a whole and will cause stock market volatility, especially for smaller markets like the SZSE. Therefore, these studies can offer insightful knowledge to scholars, investors, and decision-makers. Investors can use the findings to inform their investment selection methods, while policymakers can comprehend and use the findings in light of the research. Of fact, the Fed's increases in interest rates have an impact on many other areas as well as the economy. This article only partially addresses the subject, which merits further investigation and further debate.

The novel aspect of this study is its examination of the long-term effects of the Fed's interest rate increase on the Chinese stock market. It also offers insights into the various effects on the returns of the SSEC and SZSE indexes as well as the current market volatility. However, there are still flaws, such as methodological restrictions, a lack of causation evidence, and issues with data selection. Future studies should enhance the study methods even more, increase the sample size, and take into account more variables to increase the validity and generalizability of the results.

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