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The Impact of the Latest Federal Reserve Interest Rate Hike on the Chinese Economy

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Abstract: This study utilizes weekly data from March 2022 to September 2023, employing the TVP-VAR model to empirically analyze the impact of the Federal Reserve's interest rate hikes on the Chinese economy. The results indicate that the Federal Reserve's rate hikes have exerted negative shocks on China's output, with the effects dissipating after 8 to 12 lags. China's monetary policy has shown a short-term inverse relationship with that of the United States, though the overall impact remains minimal. The rate hikes have suppressed China's fixed asset investments, with a gradually diminishing impact on GDP. Additionally, the rate hikes have negatively affected the RMB exchange rate and China's exports, with the rising USD/RMB exchange rate further restraining exports. The widening interest rate differential between the USD and RMB has impacted China's stock market, making international capital more inclined to invest in U.S. enterprises. To address these challenges, this paper recommends that China continue to implement a prudent monetary policy, advance RMB internationalization and exchange rate marketization reforms, enhance market liquidity, and improve the stock market and institutional frameworks to bolster economic stability and resilience. The findings provide theoretical foundations and feasible strategies for sustaining China's economic growth and mitigating external shocks.

Keywords: Federal Reserve Interest Rate Hikes, Chinese Economy, TVP-VAR.

1. Introduction

Since China joined the WTO in 2001, its economy has experienced sustained growth and remarkable achievements. However, the close interconnectedness and interdependence of the global economy mean that China's economic development is influenced by the international environment, particularly the monetary policies of the Federal Reserve. Following the outbreak of the COVID-19 pandemic in early 2020, the U.S. government implemented extremely accommodative fiscal and monetary policies to support the economy. In 2020, the U.S. federal fiscal deficit reached 15% of GDP, the Federal Reserve lowered the federal funds rate to 0-0.25%, and expanded its balance sheet to over $8 trillion. These measures spurred a rapid recovery in the U.S. economy, with a 5.6% growth rate in 2021. However, as the economy recovered, inflation and unemployment rates also changed significantly. By February 2022, the U.S. CPI had risen by 7.9% year-over-year, core CPI had increased by 6.4%, and the unemployment rate had dropped to 3.8%. In response to high inflation and a tight labor market, the Federal Reserve raised the federal funds rate in March 2022, marking the start of a new rate hike cycle.

Examining the impact of this round of Federal Reserve rate hikes on the Chinese economy, particularly on inflationary pressure, monetary policy, RMB exchange rate, stock market, foreign trade, corporate financing costs, and the real estate market, is crucial. This study aims to explore these effects in-depth and provide relevant policy recommendations. Understanding the impact of Federal Reserve rate hikes on the Chinese economy is of significant importance. It can assist policymakers and businesses in anticipating and responding to future rate hike shocks, flexibly adjusting monetary policy, understanding and mitigating financial market risks, reducing dependence on a single market, and enhancing economic stability. By analyzing the spillover effects through a vector autoregression (VAR) model, the study can summarize the mechanisms of influence, providing insights for policy formulation and risk management to promote economic stability and sustainable development.

2. Literature Review

In recent years, research on the impact of Federal Reserve interest rate hikes on the global economy, particularly the Chinese economy, has garnered significant attention in academic circles both domestically and internationally. Bento J. Lobo's study, employing the Asymmetric Self-Exciting Threshold Autoregressive Exponential Generalized Autoregressive Conditional Heteroskedasticity (ASAR-EGARCH) model, discovered that announcements of changes in interest rate targets convey new information to the stock market. Additionally, risk aversion sentiment increases before interest rate change announcements, especially when both target rates and discount rates are announced simultaneously [1]. Marieh Azizirad's research, using Time-Varying Structural Vector Autoregression and Latent Variable System methods, found that interest rate hikes have a negative impact on short-term inflation. In the long term, however, inflation and nominal interest rates move in the same direction, though not on a one-to-one basis. This finding contradicts the predictions of the New Fisher Hypothesis. Furthermore, her study highlights that from the 1950s to 2016, the short-term and long-term interactions of macroeconomic variables have changed, emphasizing the importance of near-money asset liquidity premiums in macroeconomic analysis [2]. Meanwhile, Eiji Ogawa's research, using a Country-Specific Vector Autoregression (VAR) model, revealed that not only pull factors but also push factors such as market participants' expectations of U.S. interest rates and global risk aversion affect capital flows in emerging market countries.

Additionally, the study found that capital flows among emerging market countries exhibit widespread contagion effects [3].

In domestic research, Shi Yufan et al. (2023) utilized the Vector Autoregression (VAR) model to explore the transmission pathways of spillover effects from Federal Reserve interest rate hikes from the U.S. to China [4]. The results indicated that the spillover effects mainly exert pressure on China's price levels through monetary and exchange rate channels, leading to an increase in China's foreign exchange reserves and a decline in the three-year government bond yield. Similarly, Ma Li et al. (2019) employed a Time-Varying Parameter Vector Autoregression (TVP-VAR) model, finding that U.S. interest rate hikes led to a decrease in domestic investment, reduced consumption, and increased imports and exports in China, with Chinese firms bearing more pressure than foreign firms [5]. Further research by Liao Guomin et al. (2019), based on the computer communication electronics industry, established a TVP-SV-VAR model to analyze the impact of Federal Reserve interest rate hikes on China's computer communication electronics industry, finding a positive shock due to the competitive nature of the industry between China and the U.S. [6]. Tang Jun (2019) argued that the external environment for China's economic development would deteriorate, but China could mitigate this crisis by developing and upgrading its domestic consumer market [7]. Chen Ru et al. (2019) analyzed the dynamic relationships among the RMB exchange rate, monetary policy, and stock market, finding effective ways to curb negative financial transmission and seek a stable development path [8]. Furthermore, Lü Weiyi (2022) analyzed the negative impacts of Federal Reserve interest rate hikes on China's economy and finance, such as increased financial risk, greater difficulty in monetary policy control, and rising RMB depreciation pressure [9].

The impact of Federal Reserve rate hikes on the global economy, particularly the Chinese economy, is multifaceted, involving macroeconomic indicators, financial markets, and corporate pressures. These hikes transmit to China through channels such as monetary policy, exchange rates, and capital flows, resulting in changes in investment, consumption, and trade, thereby exerting significant pressure on Chinese enterprises. These studies provide valuable theoretical and empirical support for China in responding to Federal Reserve rate hikes, assisting policymakers and businesses in taking effective measures to maintain economic stability and sustainable development.

3. Empirical Research

The study references the variable selection and model construction methods of Yang Yaoxian (2020), choosing U.S. interest rates, Chinese output, interest rates, exchange rates, foreign trade volume, and stock market prices as variables [10]. Model one is structured based on the exogeneity of the variables in the order of FER, SHIBOR, USDCNY, and GDP to analyze the impact of Federal Reserve rate hikes on Chinese output. Model two examines the impact of Federal Reserve rate hikes on China's foreign trade and capital market prices, constructed according to the exogeneity of the variables in the order of FER, SHIBOR, USDCNY, NE, and SI. Although the models primarily use weekly data, some variables are only available on a monthly or quarterly basis; hence, these data have been expanded to a weekly frequency to extend the panel length.

The data utilized in this study are primarily sourced from the Federal Reserve's official website, the National Bureau of Statistics of China, the RESSET database, the China Economic Information Network Statistical Database, and the General Administration of Customs of China. The study analyzes the impact of the Federal Reserve's new rate hike cycle on key economic variables in China, including output, interest rates, exchange rates, foreign trade, and stock market prices. The data sample spans from March 2022 to September 2023, using monthly data for analysis. In the empirical models, logarithmic transformations are applied to China's GDP, the USD/CNY exchange rate, China's net export volume, and the Shanghai Composite Index, preserving the negative signs in the logarithmic transformation of net export data.

Table 1. Variable Symbols

Variable	Variable Meaning	Explanation
FER	Federal Funds Rate	FER represents the U.S. interest rate variable. Source: Federal Reserve's official website.
GDP	Chinese Output	GDP is the best indicator of national output. Source: National Bureau of Statistics of China.
SHIBOR	Shanghai Interbank Offered Rate (Interest Rate)	The 1-year SHIBOR is used to represent China's interest rate variable, corresponding to the U.S. Federal Funds Rate. Source: RESSET.
USDCNY	USD/CNY Exchange Rate	The USD/CNY exchange rate is selected as the representative variable for exchange rates. Source: China Economic Information Network.
NE	Net Export Volume	Net export volume is used as the proxy variable for China's foreign trade. Source: General Administration of Customs of China.
SI	Shanghai Composite Index	SI is taken as the representative variable for capital market stock prices. Source: RESSET.

3.1. ADF Test and Johansen Cointegration Test

This paper utilizes unit root tests and Johansen cointegration analysis. The characteristics of the data can influence the effectiveness of unit root tests. The study extends monthly data to weekly data, using long panel data logarithmic transformation. Differential analysis was conducted using SPSSAU software. Based on the analysis results, second-order differencing was selected for all data to enhance model stability.

The ADF (Augmented Dickey-Fuller) test method was employed for unit root testing on the processed data. All data passed the unit root test at a 95% confidence level. The optimal lag order was determined to be 1 using the BIC (Bayesian Information Criterion) rule. Johansen cointegration tests were then conducted using a first-order lag. For the hypothesis of 'at most 5 cointegrations,' the trace statistic value was 4.625, and the 5% critical value was 3.841, indicating rejection of the hypothesis at the 5% significance level.

3.2. TVP-VAR Analysis

In the dynamic state-space model framework, y_t is a k ×1vector of observed variables, c_t is a k×1 vector of state variables, $B_{i,t}$, i=1…s are k×k matrices of time-varying coefficients, and ut is a k×1 vector of innovations, assumed to follow a normal distribution Ω_t.

$$y_t = c_t + B_{1,t} y_{t-1} + \cdots + B_{s,t} y_{t-s} + u_t$$

$$t=s+1, \ldots n \tag{1}$$

Transform the covariance matrix Ω_t to $A_t\Omega_t A_t' = \Sigma_t\Sigma_t'$.

Assuming A_t is a lower triangular matrix.

$$A_t = \begin{pmatrix} 1 & 0 & \cdots & 0 \\ a_{21,t} & 1 & \vdots & \vdots \\ \vdots & \vdots & \vdots & \vdots \\ a_{k1,t} & \cdots & a_{kk-1,t} & 1 \end{pmatrix} \tag{2}$$

$\Sigma_t$is a diagonal matrix.

$$\Sigma_t = \begin{pmatrix} \sigma_{1t} & 0 & \cdots & 0 \\ 0 & \sigma_{2t} & 0 & \vdots \\ \vdots & 0 & \vdots & 0 \\ 0 & \cdots & 0 & \sigma_{kt} \end{pmatrix} \tag{3}$$

Transform equation (1) into

$$yt = ct + B1, tyt - 1 + \cdots + Bs, tyt - e + A_t'\Sigma_t\varepsilon_t, t = s + 1, \cdots n \tag{4}$$

$$V(\varepsilon_t) = I_n, \text{Let } X_t' = I_n \otimes [1, y_{t-1}', \cdots y_{t-s}'] \tag{5}$$

Transform equation (2) into

$$y_t = X_t' B_t + A_t' \Sigma_t \varepsilon_t \qquad t = s + 1, \cdots n \tag{6}$$

B_t is a time-varying coefficient, and both parameters A_t and Σ_t are time-varying parameters. The TVP-VAR model mainly refers to the methods of Primiceri (2005) and Nakajima Jouchi (2011), making the following assumptions:

Let α_t represent the vector in A_t where elements are neither 0 nor 1, $\alpha_t = (\alpha_{21}, \alpha_{31}, \alpha_{41}, \cdots \alpha_{k,k-1})'$. For the estimation of A_t, define $h_t = (h_{1t}, \cdots h_{kt})'$, where $h_{jt} = \log\sigma_{jt}^2, j = 1, \cdots k, \ t = s + 1, \cdots n$, and it is assumed that the parameters follow a random walk.

$$\beta_{t+1} = \beta_t + \mu_{\beta t} \tag{7}$$

$$\alpha_{t+1} = \alpha_t + \mu_{\alpha t} \tag{8}$$

$$h_{t+1} = h_t + \mu_{ht} \tag{9}$$

$$\begin{pmatrix} \varepsilon_t \\ \mu_{\beta t} \\ \mu_{\alpha t} \\ \mu_{ht} \end{pmatrix} \sim N\left(0, \begin{pmatrix} I & 0 & 0 & 0 \\ 0 & \Sigma_\beta & 0 & 0 \\ 0 & 0 & \Sigma_\alpha & 0 \\ 0 & 0 & 0 & \Sigma_h \end{pmatrix}\right), t = s + 1, \cdots n \tag{10}$$

$$\beta_{t+1} \sim N(\mu_{\beta_0}, \Sigma_{\beta_0}), \alpha_{t+1} \sim N(\mu_{\alpha_0}, \Sigma_{\alpha_0}), h_{t+1} \sim N(\mu_{h_0}, \Sigma_{h_0})$$

To simplify the model estimation, assumng $\Sigma\beta$, $\Sigma\alpha$ and Σh are Diagonal matrixes. Set the initial values of the model, let $\mu_{\beta_0} = \mu_{\alpha_0} = \mu_{h_0} = 0$, $\Sigma_{\beta_0} = \Sigma_{\alpha_0} = \Sigma_{h_0} = 10 \times I$, and assume the prior distribution of the model as: $(\Sigma_\beta)_i^2 = \text{Gammma}(20,0.01)$, $(\Sigma_\alpha)_i^2 = \text{Gammma}(2,0.01)$, $(\Sigma_h)_i^2 = \text{Gammma}(20,0.01)$.

3.3. Empirical Results Analysis

In the empirical section of the paper, OxMetrics 6 software was used to conduct the TVP-VAR model analysis. The lag order for all models was set to 1. The MCMC algorithm was employed to perform 10,000 sampling iterations on the model sample data. The simulated estimation results of the model parameters are shown in the figure below. The analysis revealed that the model converged to the posterior distribution.

Table 2. Estimation Results of Model One

Parameters	Mean	Standard Deviation	95% Lower Bound	95% Upper Bound	Geweke Factor	Inefficiency Factor
sb1	0.0219	0.0023	0.0178	0.0269	0.021	5.72
sb2	0.0199	0.0021	0.0165	0.0246	0.019	34
sa1	0.0712	0.024	0.0396	0.13	0.103	20.94
sa2	0.0416	0.008	0.0294	0.0605	0.04	6.64
sh1	3.8914	0.8115	0.4395	4.8344	0.029	248.21
sh2	0.2261	0.088	0.0989	0.4364	0.729	37.39

Table 3. Estimation Results of Model Two

Parameters	Mean	Standard Deviation	95% Lower Bound	95% Upper Bound	Geweke Factor	Inefficiency Factor
sb1	0.0224	0.0025	0.0182	0.0279	0.206	10.17
sb2	0.0210	0.0026	0.0170	0.0272	0.057	82.39
sa1	0.0699	0.0231	0.0392	0.1296	0.209	37.85
sa2	2.8085	1.5294	0.1691	4.9122	0.052	302.07
sh1	2.8085	1.5294	0.1691	4.9122	0.052	302.07
sh2	0.2359	0.1046	0.0944	0.4975	0.000	57.86

The TVP-VAR model includes impulse response functions for the entire sample period, similar to those in traditional VAR models, as well as impulse response functions based on specific time points. Considering the length of the study period, this research primarily analyzes the impulse response results at equidistant intervals.

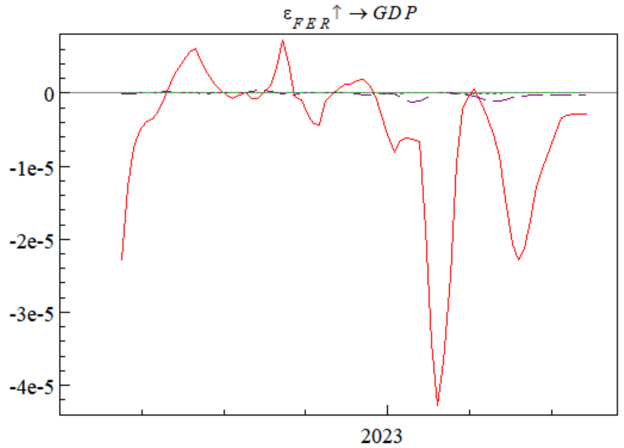

Figure 1. Full Sample Period Impulse Response Function of U.S. Federal Funds Rate on China's Total Output

Figure 1 depicts the impulse response function of the U.S. Federal Funds Rate on China's total output over the full sample period from March 2022 to the end of August 2023. The figure shows that China's total output experiences a negative shock effect from the Federal Reserve's interest rate hikes, with the most significant negative impact occurring in February and March 2023. However, the overall positive and negative impacts are not significant, indicating a weak influence. The shock effect is largely absorbed, with the response returning to around the zero axis at lags of 8 and 12 periods. The single shock effect of the monetary policy transmission is mostly absorbed within a short period.

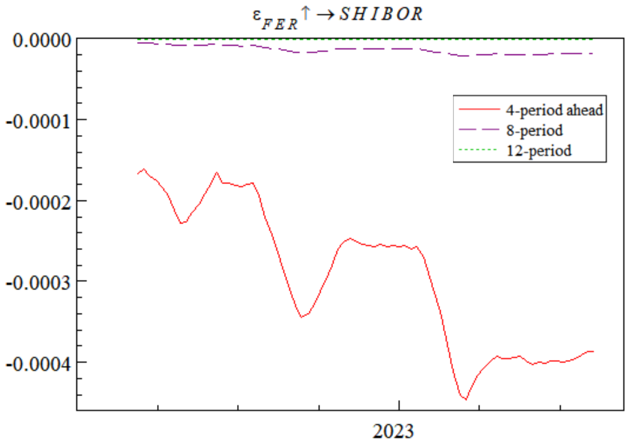

Figure 2. Full Sample Period Impulse Response Function of U.S. Federal Funds Rate on Chinese Interest Rates

Figure 2 illustrates the negative shock of the U.S. Federal Funds Rate on Chinese interest rates. In the short term, the negative impact shows a fluctuating increase, peaking in March 2023, after which the impact gradually diminishes. This indicates that Chinese monetary policy exhibits a short-term behavior contrary to U.S. monetary policy during the U.S. interest rate hike cycle. In terms of impact magnitude, a single unit increase in the U.S. interest rate results in a maximum negative impact on Chinese interest rates of less than 0.001 units. Overall, the impact is not significant and remains relatively limited.

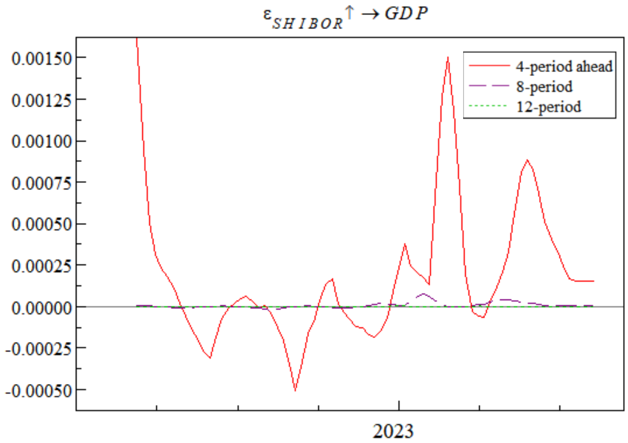

Figure 3. Full Sample Period Impulse Response Function of Chinese Interest Rates on GDP

Figure 3 shows that the increase in Chinese interest rates has both positive and negative impacts on GDP output. Before 2023, the overall effect is a negative shock, with the maximum negative impact being less than 0.0005, and the shock effect is not significant. The greatest impact occurred between August and September 2022. Interest rates peaked in the first and late second quarters of 2023, with the positive impact effect exceeding 0.001 at the end of the first quarter of 2023. Each unit shock of Chinese interest rates brings a small positive effect on output overall, with an 8-period lag. The overall significance of the impact of interest rates on output during the new rate hike cycle from March 2022 to the end of August 2023 is relatively small, indicating that investment demand in China is less sensitive to interest rate changes during this period. As shown in the impulse effect trends, the spillover effect brought by the interest rate channel gradually decreases over time.

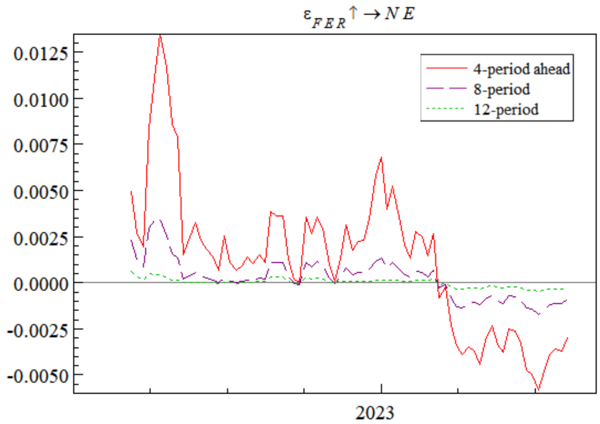

Figure 4. Impulse Response Function of Net Export Spillover Effect

Figure 4 shows the impulse response function of China's net exports, indicating China's trade net export reaction to U.S. interest rate hikes. The short-term positive impact of the Federal Reserve's interest rate hikes on China's net exports persisted until March 2023, peaking at 0.0125 in the early second quarter of 2022, with a significant effect. After March 2023, the impact turned negative but remained below 0.005, indicating it was not significant. The shock does not fluctuate around the zero axis with 8-period and 12-period lags. The overall spillover effect of net exports shows a decreasing trend in volatility, opposite to the increasing trend in RMB volatility, which aligns with economic principles.

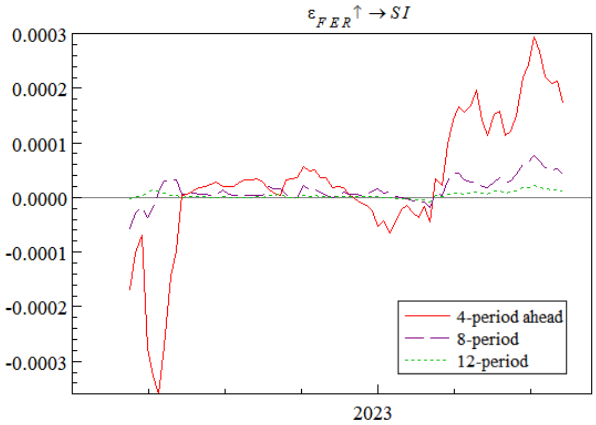

Figure 5. Full Sample Period Impulse Response Function of the Shanghai Composite Index

Figure 5 illustrates the short-term fluctuating impact of the Federal Reserve's tight monetary policy on the Chinese stock market. Early negative shock effects were significant, while later fluctuations shifted towards positive impacts. The peak negative shock effect occurred in April 2022, ending in mid-second quarter of 2022. It then showed an insignificant negative shock until mid-March of the following year, after which it shifted towards a positive impact, reaching its peak positive effect in late June and early July. The overall impact remained positive with an 8-period lag. From the perspective of corporate value, listed companies adjust their production, labor, operation, and investment strategies based on exchange rate expectations and interest rate differentials, affecting their fundamentals and stock value. The dollar interest rate hikes, widening the interest rate differential with the RMB, lead to the short-term appreciation of the dollar relative to the RMB. This makes it more profitable for international capital to hold dollar assets rather than A-shares, as holding dollar assets can gain from exchange rate changes, prompting international capital to flow back and invest in U.S. companies.

4. Conclusion

This paper investigates the impact of Federal Reserve interest rate hikes on the Chinese economy using the TVP-VAR model. The results indicate that Federal Reserve rate hikes have a negative impact on China's output, with the effect largely absorbed after a lag of 8 to 12 periods. Chinese monetary policy exhibits short-term behavior opposite to that of the U.S., but the overall impact is relatively small. Federal Reserve rate hikes suppress fixed asset investment in China and impact actual GDP, but the effect diminishes over time. Federal Reserve rate hikes negatively affect the RMB exchange rate and Chinese exports, with the USD/RMB exchange rate increasing, thus inhibiting exports. Federal Reserve rate hikes widen the interest rate differential between the USD and RMB, impacting the Chinese stock market and making international capital more inclined to invest in the U.S. Federal Reserve interest rate hikes introduce uncertainty to the Chinese economy, necessitating responsive measures. It is recommended to continue implementing a prudent monetary policy to maintain RMB exchange rate stability; promote RMB internationalization and exchange rate marketization reforms to strengthen foreign exchange reserve supervision; increase market liquidity by lowering interest rates and the reserve requirement ratio; improve stock market and institutional development to enhance market maturity and stability, and strengthen risk management and education for investors. These measures will help China address the challenges posed by interest rate hikes, maintaining economic stability and sustainable development.

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