

# Analyzing the Spillover Effect of Fed Rate Hikes and Cross-Border Capital Flows Risk using SVAR Model

Yuhan Mao<sup>1, a</sup>, and Yuxin Jin<sup>1, b</sup>

<sup>1</sup>Zhejiang sci-tech university, Hangzhou, China;

<sup>a</sup> 3321602438@qq.com, <sup>b</sup> 1445360439@qq.com

**Abstract.** In March 2023, the collapse of Silicon Valley Bank in the United States was considered the largest bank failure since the 2008 financial crisis. Behind this event, the catalyst for the collapse of Silicon Valley Bank was also the Federal Reserve's interest rate hike. Under the current impact of the Federal Reserve's tightening cycle, it not only caused systemic financial risks on a global scale, but also significantly increased cross-border capital flow risks and uncertainties in exchange rate fluctuations. With the increasing openness of China's financial sector, the continuous interest rate hikes by the Federal Reserve have exerted greater pressure on the renminbi exchange rate and cross-border capital flows. This article analyzes the spillover effects of the Federal Reserve's interest rate hikes, systematically studies their impact on cross-border capital flows, exchange rates, and asset prices, and summarizes practical pathways and feasible experiences for effectively reducing economic volatility and financial risks. The research findings will provide valuable references for domestic enterprises and policymakers in managing systemic financial risks and promoting high-level development of the Chinese economy.

**Keywords:** Federal Reserve interest rate hikes; cross-border.

## 1. Introduction

The bankruptcy of Silicon Valley Bank in the United States is the largest bank failure in the U.S. banking industry since the 2008 financial crisis, and the second-largest bank failure in history. Its bankruptcy is closely related to the Federal Reserve's interest rate hikes. As the Federal Reserve raised interest rates multiple times in 2021 to combat inflation, bond prices plummeted. At the same time, the sharp interest rate hikes by the Federal Reserve caused a “winter” in financing for global tech startups, leading to continuous outflow of deposits and insufficient cash holdings for Silicon Valley Bank, ultimately resulting in its bankruptcy.

In 2022, amidst a persistent high inflation environment, the Federal Reserve initiated an interest rate tightening cycle. In less than a year and a half, the Federal Reserve has raised interest rates seven times, with a cumulative increase of 40 basis points. Compared to the previous rate hiking cycle, this round of interest rate hikes has been characterized by a tight pace, large magnitude, and rapid speed. Under the aggressive rate hiking stance, U.S. Treasury yields have risen rapidly and significantly, causing a massive outflow of international capital from developing countries and creating a significant impact on the global monetary system. On October 13, 2022, the IMF pointed out in its “Global Financial Stability Report” that the Federal Reserve's interest rate tightening cycle has triggered capital outflows from many emerging economies with weaker macroeconomic fundamentals, leading to a deteriorating global financial environment and exposing emerging markets to multiple risks. With the increasing openness of China's financial sector, the continuous interest rate hikes by the Federal Reserve have exerted greater pressure on the renminbi exchange rate and cross-border capital flows. Against the backdrop of the Party Central Committee's call to improve the “dual-pillar” regulatory framework and effectively utilize macro-prudential management to prevent risk contagion, it is of great theoretical and practical value to study the spillover effects of the Federal Reserve's interest rate hikes and the risks of cross-border capital flows, as well as their implications for the “dual-pillar” regulatory framework.

## **2. Literature Abstract**

As a domestic academic hotspot, the monetary policy of the Federal Reserve, regardless of whether it is in a phase of quantitative easing, has always been a focal point of research on the apparent spillover effects of cross-border capital flows to China. Domestic and international scholars have primarily focused on the impact of Federal Reserve policy on cross-border capital flows through the interest rate channel (Mackowiak, 2007; Bhuiyan, 2012) and the asset price channel (Nguyen, 2009; Bowman et al., 2015). The consensus reached by these studies generally suggests that the implementation of quantitative easing by the Federal Reserve leads to a short-term international capital outflow, which is subsequently reversed when the federal funds rate is raised. The significant fluctuations in international capital have had a pronounced negative impact on emerging economies. The related research primarily revolves around the analysis of exchange rates, monetary supply, and bank credit channels (Jongwanich and Kohpaibon, 2013). They argue that substantial outflows of cross-border capital can lead to currency depreciation, stock market volatility, increased financial system and macroeconomic fluctuations.

In response to the risks associated with cross-border capital flows, capital controls, foreign exchange interventions, or monetary policy adjustments were traditionally employed. Due to the amplification effects caused by reversals in capital flows often leading to financial crises, it has been deemed necessary to implement capital controls by Lucio et al. (19), Helder and Manoel (2007), Anton (2010), among others. Benes (2015) found that foreign exchange intervention policies of emerging economies effectively mitigate the exchange rate risks caused by cross-border capital flows. Kaminsky et al. (2004) argue that a fixed monetary policy in developing countries may be detrimental to economic stability in the face of cross-border capital volatility. Kumhof (2014) suggests that emerging economies, characterized by incomplete asset substitution, find interest rate hikes ineffective in curbing inflows of cross-border capital and asset price inflation. Instead, lowering interest rates is recommended. Korinek and Sandri (2016) review international experiences in macroprudential management of cross-border capital and find that such measures can prevent potential adverse effects stemming from large-scale cross-border capital flows.

In summary, the literature reviewed indicates that Federal Reserve rate hikes result in cross-border capital outflows, which, in turn, reinforce interest rates, exchange rates, and asset prices, ultimately leading to macroeconomic fluctuations and financial risks. Policy responses have evolved from relying primarily on capital controls and foreign exchange interventions to adopting a "dual-pillar" policy framework. This provides valuable insights for this study. However, there are still some areas that need further exploration: firstly, research on the impact of Federal Reserve rate hikes on cross-border capital lacks a comprehensive analytical framework, with existing studies often focusing on individual transmission channels. Secondly, studies on policies addressing the risks associated with cross-border capital flows primarily rely on theoretical and empirical research, and China's macro-prudential policies for cross-border capital have a relatively short implementation period, lacking sufficient data support.

## **3. An Empirical Analysis of the Impact of Fed Interest Rate Hikes on Cross-Border Capital Flow Risks**

### **3.1 The Channels of Spillover Effects from Fed Interest Rate Hikes and Factors Influencing the Strength of Spillover Effects**

The spillover effects of Fed interest rate hikes can be broadly categorized into three channels: exchange rate shocks, capital outflows, and financial crises. The factors influencing the strength of these spillover effects can be primarily divided into two categories. Firstly, the different motivations behind Fed interest rate hikes result in varying impacts on emerging economies. Secondly, the strength of the spillover effects is related to the economic conditions of the emerging markets themselves.

The current round of interest rate hikes has had a significant impact on emerging markets. There are three main reasons for this. Firstly, the primary purpose of the current round of Fed interest rate hikes is to address inflation, which historically has had a more destructive effect on emerging markets. Secondly, emerging economies had already accumulated debt and faced inflationary pressures due to the unconventional policies implemented in response to the pandemic, which limited their policy space to address external shocks. Lastly, the previous plan for interest rate hikes was interrupted and reversed by the outbreak of the novel coronavirus, and now with the renewed tightening, emerging economies may experience a continuation of capital outflows similar to the period from 2015 to 2018.

### 3.2 Analysis of the Spillover Effects of Fed Interest Rate Hikes on China

During previous cycles of interest rate hikes in the United States, China's monetary policy has primarily been guided by domestic economic conditions, taking a "self-oriented" approach. Looking at the U.S. interest rate cycles since the 1990s, China's monetary policy has aligned with the U.S. policy twice and diverged three times.

In the current round of interest rate hikes, China's exchange rate and cross-border capital flows may face significant challenges. This cycle of interest rate hikes is accompanied by global uncertainties such as high inflation, the Russia-Ukraine conflict, and the pandemic. The global risk-off sentiment has driven the strengthening of the U.S. dollar index, which has already exerted pressure on China's exchange rate and cross-border capital flows. Following the U.S. dollar interest rate hikes, the interest rate differential between China and the U.S. has inverted, resulting in a noticeable increase in the borrowing costs for domestic enterprises issuing foreign debt. As the U.S. continues to raise interest rates, the interest rate differential between China and the U.S. narrows further. Additionally, the consecutive interest rate hikes by the Fed will increase the debt repayment pressure for enterprises holding U.S. dollar-denominated debt, leading to a rise in the default rate. In response to the continuous impact of the Fed's interest rate hikes, central banks around the world will also follow suit, further tightening global liquidity. This will create enormous debt repayment pressure for businesses and could affect the creditworthiness of Chinese enterprises issuing U.S. dollar-denominated bonds abroad. The chart below illustrates the changes in China's Shanghai Composite Index returns, PPI index, and government bond yields.

Table 1: 2020-2023 Distribution Values of PPI Indicators in China (Data Source: Wind Database)

Index	2023. 01	2022.06	2022. 01	2021.06	2021.01	2020. 06
Industrial producers	100.1	108.5	112.1	113.1	100.9	95.6
Fuel and power	107.2	129.4	130	122.8	95.2	85.8
ferrous material	92.2	96.8	109.8	127.7	108.7	97.8
Nonferrous metals and wires	98.2	107.6	117.4	126.8	108.3	96.7
Chemicalraw materials	95.3	111.2	117.9	117.1	98.7	90.6
Wood and pulp	104.2	104.1	106.6	107.4	99.9	97.1
Building materials and non-metallic minerals	94.7	104.8	111.2	105.7	97.9	99.6
Other industrial raw materials, semi-finished products	100.3	102.6	104.3	103.8	100.1	99.6
agricultural byproduct	105.2	105.9	99.7	105.4	105.1	105.8
Textileraw materials	96.4	107.8	110	104.8	99	96

## 4. Construction and Empirical Analysis of SVAR Model

### 4.1 Variable Selection

Due to the discontinuity of data caused by the adjustment of the US federal funds rate based on the Federal Reserve's interest rate meetings, it is necessary to consider alternative variables. Considering the high correlation between the US 1-year Treasury yield and the US federal funds rate, the US 1-year Treasury yield is selected as a proxy variable for Fed interest rate hikes. Additionally, the Chinese 1-year Treasury yield, the average exchange rate of RMB against the US

dollar, the changes in the Shanghai Composite Index, export data on a year-on-year basis, and PPI data on a year-on-year basis are selected as proxy variables for different transmission channels.

Among them, the US 1-year Treasury yield and the Chinese 1-year Treasury yield are monthly averages of daily data, and the changes in the Shanghai Composite Index are year-on-year data based on the closing index at the end of each month. The sample period is from 2022Q1 to 2023Q2. The data frequency is monthly, and all series have been seasonally adjusted and transformed into stationary series through differencing.

## 4.2 Model Specification

When analyzing the impact of changes in the Federal Reserve's monetary policy on China's economy using a VAR model, it is important to consider not only the lagged relationships between variables but also the contemporaneous relationships between variables. With the continuous progress of China's exchange rate marketization reform, the foreign exchange market in China will react to the Fed's interest rate hikes in the current period, rather than just exhibiting lagged effects. Ignoring the contemporaneous relationships between variables can lead to biased analysis results. To address this issue, this study constructs an SVAR model for analysis. Considering a lag of  $p$  periods, the SVAR model can be expressed as:

$$\Gamma_0 y_t = \Gamma_1 y_{t-1} + \dots + \Gamma_p y_{t-p} + \varepsilon_t$$

In this context,  $y = \{E_t, R_{Ct}, R_{ft}, PPI_t, Output_t, SZ_t\}$ , represents a matrix consisting of 6 observed variables, which respectively denote the average exchange rate of the Chinese Renminbi against the US dollar, the yield of the US 1-year Treasury bond, the yield of the Chinese 1-year Treasury bond, the year-on-year Producer Price Index (PPI) data, the year-on-year export data, and the changes in the Shanghai Composite Index.

$$A = \begin{pmatrix} 1 & a & a_{13} & a_{14} & a_{15} \\ a_{21} & 1 & 0 & a_{24} & 0 \\ a_{31} & 0 & 1 & 0 & 0 \\ a_{41} & a_{42} & 0 & 1 & 0 \\ a_{51} & a_{52} & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}, \text{ for the matrix composed of lag coefficients, denoted as } (i = 1, \dots,$$

$p)$ , it represents the matrix of coefficients reflecting the impact of lagged periods on the variables. The independent random shock vector is denoted as  $\varepsilon_t$ . To estimate the parameters of the structural model, at least  $n(n-1)/2$  constraint conditions need to be imposed on the model. Since the model includes 6 endogenous variables, it is necessary to impose at least 15 constraint conditions on the model to satisfy the identification conditions of the model.

## 4.3 Analysis of Empirical Results

Based on the SC criterion, the lag order of the model is selected as 1. The impulse response functions of various variables to the US 1-year Treasury bond yield are shown in Figure 1. After a positive shock to the US 1-year Treasury bond yield in the current period, the Chinese Renminbi to US dollar exchange rate experiences the largest negative shock in the second period, followed by a gradual decrease, but still remaining in the negative range. This indicates a negative relationship between the two, suggesting that the Federal Reserve's interest rate hikes exert depreciation pressure on the Renminbi. In fact, considering the current round of Federal Reserve interest rate hikes, the depreciation pressure on the Renminbi against the US dollar in China has significantly increased. Meanwhile, the Chinese 1-year Treasury bond yield declines when impacted by the Federal Reserve's interest rate hikes, reaching its lowest point in the second period and gradually increasing thereafter, indicating that the Federal Reserve's interest rate hikes have a promoting effect on the rise of interest rates in China. In fact, considering the current round of Federal Reserve interest rate hikes, China's economy is facing new downward pressure, including contraction in demand, supply shocks, weakening expectations, as well as challenges from the Ukraine crisis and the recurrent outbreaks of COVID-19 in various parts of the country. Exports initially increase when impacted by the Federal Reserve's interest rate hikes, reaching the maximum positive shock in

the third period, and then gradually decline. This suggests that although the Federal Reserve's interest rate hikes lead to Renminbi depreciation, thereby promoting short-term export growth in China, the dominant effect at this time is the expenditure-switching effect brought about by the Federal Reserve's interest rate hikes. However, over time, the expenditure-switching effect of the Federal Reserve's interest rate hikes gradually becomes smaller than the income absorption effect, leading to a more pronounced inhibitory effect on China's exports. The Producer Price Index (PPI) remains relatively stable and gradually moves forward when impacted by the Federal Reserve's interest rate hikes. This indicates that the Federal Reserve's interest rate hikes have a certain inhibitory effect on China's PPI. Considering the current round of Federal Reserve interest rate hikes, they not only increase the speculative cost of commodities, thereby reducing the financial attributes of commodities, but also, with the appreciation of the US dollar, continuous capacity recovery, and weakening global demand, international commodity prices gradually decline. The Shanghai Composite Index gradually declines when impacted by the Federal Reserve's interest rate hikes, and this negative shock has a relatively long-lasting effect. This indicates that the Federal Reserve's interest rate hikes have a significant inhibitory effect on China's stock market, causing a decrease in the return of the Shanghai Composite Index. Considering the current round of Federal Reserve interest rate hikes, they indeed have a certain impact on China's stock market, especially after the implementation of the Federal Reserve's interest rate hikes in March 2022, China faces a noticeable increase in capital outflow pressure.

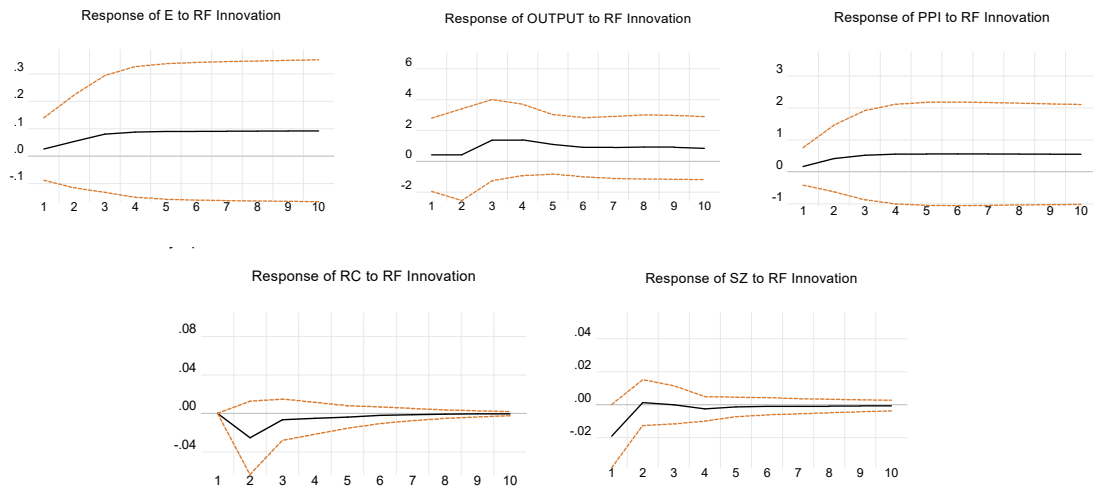


Figure 1. Pulse chart of the impact of the Federal Reserve's interest rate hike

## 5. Summary and Policy Recommendations

The spillover effects of the Federal Reserve's aggressive interest rate hikes on our country's economy have gradually become apparent. We are not only facing the depreciation of the renminbi, increased pressure on cross-border capital flows, and rising financial risks, but also the inhibitory effects on investment, consumption, and exports through channels such as interest rates, exchange rates, and asset prices. Faced with a complex and ever-changing external environment, China should adopt comprehensive measures to avoid the compounding of internal and external factors, which could lead to greater downward pressure on the economy.

Firstly, we should adhere to a domestically-oriented monetary policy and stabilize policy expectations. The current weakness in domestic demand remains the main obstacle to economic recovery. In this situation, we should provide a relatively accommodative monetary environment to support the recovery of domestic demand and exercise caution when implementing contractionary measures to curb inflation. At the same time, we need to further improve the mechanism for managing expectations, actively strengthen communication with the market, timely enhance expectation guidance, and promote an orderly adjustment of the renminbi exchange rate. We should

steadily advance the market-oriented reform of the exchange rate, enhance the flexibility of the renminbi exchange rate, increase tolerance for two-way fluctuations in the renminbi exchange rate, and leverage the role of the exchange rate as an economic stabilizer and automatic stabilizer of international balance of payments.

Secondly, we should intensify the efforts of prudent monetary policy and boost confidence in the real economy. We should effectively utilize the dual functions of monetary policy tools, maintain reasonable and adequate liquidity, increase inclusive and sustainable funding support for agriculture, small and micro enterprises, and private enterprises, and guide more credit resources to be invested in key areas and vulnerable sectors of the national economy, such as green development and technological innovation, to prevent idle credit funds within the financial system. By lowering loan interest rates, innovating financial products, and other means, we can stimulate financing demand and alleviate the problem of insufficient effective credit demand.

Thirdly, we should strengthen the monitoring of cross-border capital flows and enhance the forward-looking management of cross-border capital flow under the framework of macro-prudential regulation. We should closely monitor the spillover effects of the Federal Reserve's interest rate hikes, strengthen the monitoring of cross-border capital flows, guard against input risks, and prevent the resonance of external and internal risks.

We need to enhance the framework of macro-prudential policies, improve monitoring and early warning capabilities for financial risks, and develop risk disposal plans. Establishing a robust long-term mechanism for risk prevention and control is crucial, along with expediting the establishment of a financial stability guarantee fund. Furthermore, we should bolster the management of inter-temporal risks for financial institutions and strengthen the financial market's capacity to absorb risks.

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