Does the Fed’s Interest Rate Policy Adjustment Increase China’s Financial Risk?

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ABSTRACT: This paper selects the monthly data from January 2007 to May 2018, and constructs the financial market pressure index, the comprehensive index of the real economy operation and the comprehensive pressure index of the financial market. This paper empirically tests the impact of the Fed's interest rate policy on China's financial pressure with the help of the SVAR model. The empirical results show that: First, the upward trend of the US federal funds rate has pushed up the financial pressure index of China's foreign exchange market and the banking market, but it has a weak impact on China's stock market pressure index, and there is also a significant spillover effect between domestic financial sub-market pressure indices. Second, although the upward rate of the US federal funds rate has slightly pushed up the domestic real economy prosperity index, it has made the progress of China's comprehensive financial stress index rise, which has aggravated the instability in the financial sector. We must pay close attention to the impact of the Fed's interest rate policy adjustment on China's financial sector.

Key words: Federal reserve; Interest rates; Financial risk; Structural VAR

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I. INTRODUCTION

In 2007, the US subprime mortgage crisis broke out. In order to restore the macroeconomies that continued the recession, the US government introduced a quantitative easing policy in 2008 to stimulate the economy by injecting large-scale liquidity into the market. The policy was introduced not only to the US but to the whole world. The economy has injected a shot of intensiveness, and in the context of the deepening of economic globalization, it has inevitably produced spillover effects, which have profoundly affected the flow of international capital and the fluctuation of commodity prices. Among them, the flow of international capital to emerging market countries has pushed up the investment scale and asset prices of relevant regions; while the rise in commodity prices has generated input inflationary pressure on raw material demanding countries. Under this dual mechanism, The macroeconomic finance of emerging market countries faces more uncertainties and has to passively introduce corresponding macro policies to intervene.

In recent years, the unemployment rate in the United States has been declining, the economy has recovered strongly, and the Fed will gradually shrink its balance sheet. After the Federal Reserve announced its first increase in the federal funds rate in December 2015, as of June 2018, the Fed announced a six-month increase in the federal funds rate, the Fed's contraction process accelerated significantly in 2017. After the announcement of a 25 basis point rate hike in December 2017, the interest rate adjustment was changed from 0-0.25% to 0.25%-0.5%, which indicates that the adjustment range of interest rate will have more room for operation. The expected rise in US interest rates has increased the rate at which capital flows back to the United States, and the rapid withdrawal of international capital from emerging market countries has put pressure on the real economy and financial sectors of the counties concerned. Compared with the quantitative easing policy, does the spillover effect of the Fed's interest rate increase also exist? If so, what is the path of China's macroeconomic transmission? Will this spillover effect exacerbate the uncertainty in China’s financial sector? It is of practical significance to study the impact of the Fed's interest rate policy on China's financial risks.

The follow-up structure of this paper is as follows: The second part is a literature review, which reviews the relevant literature and research results from three aspects: the international perspective of financial risk generation and transmission, the international transmission path of Fed interest rate policy changes and the spillover of emerging market countries. The third part is the construction of China's financial risk pressure index, and introduces related methods and variables. The fourth part is empirical analysis. The structural VAR model is used to measure the impact of US federal funds interest rate changes on China's financial risk pressure index. Part of the article's conclusions and related policy recommendations.
II. LITERATURE REVIEW

Gong and Yang (2013) based on the CCA theory of option pricing, through the construction of the risk factor model, the empirically tested the nonlinear accumulation process and path of financial risk, which is mainly reflected in the economic expansion period. The risk accumulation is slow and the outbreak period is released quickly, and the cross-sectoral infection of risk also has this nonlinear feature. Some scholars have adopted the method of constructing the domestic financial risk pressure index and using the Markov system transfer model to predict the changes of domestic financial risks (Wang and Hu, 2014; Tao and Zhu, 2016), but the Markov model Past data is based on speculative scenarios that may change in the future, without considering external shock effects. He et al (2016) believe that the construction of the financial risk index in the past has focused on the financial system itself, while ignoring the relationship between the real economy and finance. Among them, credit plays a role as a bridge through the construction of entities. The economic status index and empirical analysis of the process of financial risks spreading to the real economy. Wu and He (2014) comb the causes and transmission mechanisms of financial risks based on an international perspective. The early theory of currency crisis talked about the economic fundamentals and the exchange rate system as the origin and attack targets of financial risk outbreaks. When a country’s economic fundamentals deteriorated, The speculative attacks on the domestic currency directly triggered the collapse of the exchange rate system and the spread of financial risks. On the basis of this, the research has formed different international routes of financial risk. Under the open economy, it mainly includes international trade methods and international capital flows: Gerlach and Smets (1995) believe that when a country strengthens the competitiveness of foreign trade, it implements local currency. In order to stabilize the value of assets, investors will sell their own assets, which will cause financial market volatility. When the competitors also implement the depreciation of the local currency, it will increase the transmission of financial risks. The research conclusions of Glick and Rose (1999) also confirm. This point of view. In addition, for commodity importing countries, the rise in raw materials and commodity prices will also cause risks and pressures on domestic input inflation (Liu, 2016). Dooley et al (2008) believe that international investors holding US financial assets will also be infected to varying degrees when the US subprime mortgage crisis occurs.

The general theory holds that the implementation of the Fed's interest rate hike policy means that the US economy will gradually strengthen. The economic fundamentals and the gradual upward trend of interest rates will constitute strong support for the US dollar. If the interest rate parity theory is established, it will attract capital backflow in the short term, making other countries liquidity. Under pressure, which in turn affects the real economy. Xiao (2011) believes that due to the openness of the capital account and the exchange rate system in Asian countries, the exchange rate transmission path of US monetary policy is weak, and interest rates and foreign exchange reserves are important transmission channels. Bian(2013) qualitatively analyzed the conduction path of the Fed's exit from quantitative easing on China's economy. It believes that under the expectation of depreciation of the RMB against the US dollar, the outflow of international hot money will tighten market liquidity and increase monetary policy. The difficulty of regulation. Sheng (2013) believes that the quantitative easing policy in the United States makes its balance sheet expand and changes in China's international reserves and external debt. Changes in foreign exchange reserves and external debt are important channels for the impact changes in the Fed's interest rate policy on China's public sector. Bai (2015) believe that the spillover effect of US interest rate policy can not only be transmitted through international trade channels and capital flow channels, but also change market participants' expectations and thus affect economic fluctuations. This signal is found through empirical analysis. The transfer effect significantly affects the volatility of China's economy. Liu(2016) believes that international trade channels, capital flow channels and exchange rate channels are important paths for the Fed's quantitative easing policy to affect China's economy.

Due to the deepening of economic globalization and the special international status of the US dollar, the Fed's regulation of liquidity has also profoundly affected the economic and financial conditions of other market-based countries. Compared with developed-market countries, emerging market countries have higher marginal returns for capital. And various preferential policies have attracted the attention of international capital. Therefore, the spillover effect of the Fed's monetary policy on the economies of emerging market countries is also called one of the hot issues of research. Ma and Yu(2015) used the PVAR model to test the economic spillover effects of the US quantitative easing policy on the BRICS countries. The empirical results show that the US quantitative easing policy has boosted the short-term growth of the BRIC countries' real economy. Come to the virtual prosperity of the capital market. Based on the event research method, Tan et al (2016) introduced the Fed interest rate statement into the model in the form of dummy variables, and analyzed the impact of the US exit quantitative easing policy on emerging economies. The empirical results show that The Fed’s interest rate policy announcement has intensified exchange rate and stock market volatility in emerging market countries. Yu and Zhang (2017) used time-varying vector autoregressive models to analyze the impact of US monetary policy on China's macro-economy. Research shows that both monetary policy and loose monetary policy will have a negative impact on China's economy. Xiao and Lan (2017) empirically analyzed the impact of US federal
interest rate volatility on China's cross-border capital flows using the VAR model. The rise in federal interest rates has had a negative impact on cross-border capital flows, compared to interest rates and exchange rates. The reaction is more pronounced. Zhang and Chen (2018) sorted out the reasons, process and spillover effects of the Fed's contraction. The continued tightening of the Fed's interest rate policy will exacerbate China's capital outflow and the depreciation of the RMB. The central bank may passively tighten monetary policy, and the financial market is uncertain. Sex will increase.

Through the combing of relevant literatures in the past, we can easily find that the previous research perspectives focus on the domestic macro financial risk measurement and the changes in the Fed's interest rate policy on China's macroeconomic spillover effects. The measurement of macro financial risk is less considered external shock effect. However, the research on the impact of the Fed's interest rate policy on China's macroeconomic spillovers is mostly limited to the economic level or a certain financial sub-market. This makes the Fed's interest rate resolutions have no comprehensive research perspective on the spillover effects of China's financial risks. The work of this paper is reflected in: First, with the help of CRITIC empowerment method and the possible impact of Fed rate hike on China's financial risk, the domestic financial sub-markets and comprehensive risk pressure index are constructed in a targeted manner. Second, the use of structural VAR. The model examines the impact of US federal funds rate changes on China's financial sub-market pressure index and the impact of the comprehensive financial stress index and the real economy prosperity index, and further understands the pressure of US federal funds interest rate changes on China's financial risk through variance decomposition. The extent of the contribution of index fluctuations. This paper focuses on the current hotspots, and through a positive model to a certain extent, reflects the impact of the Fed's interest rate policy on China's financial risks.

III. METHOD INTRODUCTION

The financial stress index measures the pressure faced by a financial sub-market or financial system. There are many factors affecting the fluctuation of financial pressure. When the financial stress index is affected by a certain external impact to a certain extent, it may cause systemic financial risks. Previous studies focused on the financial stress index of the three financial sub-markets of the foreign exchange market, the banking industry and the capital market, and finally synthesized the comprehensive financial stress index, thereby measuring the pressure and risk level faced by the financial system. While considering the financial pressure, based on the close relationship between the real economy and the financial system, and referring to the construction method of the financial stress index, we also constructed the real economy operating prosperity index. This paper mainly draws on the methods used by Wang and Hu(2014) and Deng and Zhao (2018) to construct the financial stress index. At the same time, combined with the changes in the Fed's interest rate policy on China's economic impact, the relevant financial economy is constructed in a targeted manner. Pressure index. This paper selects the macro monthly data from January 2007 to May 2018.

1) Construction of foreign exchange market financial stress index

The stability of a country's foreign exchange market is of great significance to macroeconomic development. The large fluctuations in exchange rates not only affect foreign trade, but may even be attacked by international speculative funds. Generally speaking, the exchange rate is affected by a country's macro economy and interest rates. The macroeconomic strength and higher real interest rate levels will form a strong support for the national currency. The use of foreign exchange reserves to stabilize the domestic exchange rate is the most direct means, and foreign exchange reserves play a "buffer" role in the national financial system that is lower than external shocks. The Fed's interest rate hike affects exchange rate fluctuations through interest rate mechanisms. Therefore, the exchange rate of RMB against the US dollar, China’s spread and China’s foreign exchange reserves will affect the fluctuation of the RMB exchange rate. Referring to the methods of Deng Chuang and Zhao Wei (2018), but the size of the US foreign exchange reserves is not directly related to China's renminbi pressure, so we can simplify its calculation method and use the above indicators to construct the foreign exchange market financial pressure index formula as follows:

\[
    EP_t = \omega_1(\Delta\text{REEP}_t / \text{REEP}) + \omega_2(\Delta(CR_t - AR_t)) + \omega_3(\Delta\text{FER}_t / \text{FER})
\]

REEP represents the real effective exchange rate of the US dollar against the RMB, CR and AR respectively represent the actual interest rate of China and the actual interest rate of the United States. The actual interest rate is calculated by the monthly interbank offered rate minus the price index for the same period. FER represents the size of China's foreign exchange reserves. \(\omega_1\) Indicates the corresponding weight, and the calculation method is:


\[ \omega_j = \frac{1}{\sigma_j} \sum_{i=1}^{3} \frac{1}{\sigma_i} \quad (2) \]

\( \sigma_i \) is the standard deviation of each indicator. When the fluctuation degree of a certain index is too large, the effect of using the reciprocal method to give less weight to balance the reaction indicators.

2) Stock market financial stress index construction

In view of the fact that the Fed's interest rate policy may require a certain time lag for China's capital market transmission, and the stock market reacts quickly and weakly to the data and news, we choose the stock market as the representative of the capital market. In the stock market, we select the Shanghai Composite Index as a sample, using the Shanghai Composite Index growth rate HP and the intraday amplitude ZF (reflecting the degree of volatility) to construct the stock market pressure index. When the amplitude is large during the day, the market volatility is obvious. The higher volatility impacts the stability of the stock market. The stock market faces greater pressure. The regulatory layer also proposes to prevent the stock market from rising and falling. The calculation formula for the stock market pressure index is as follows:

\[ SP_t = \omega_1 HP_t - \omega_2 ZF_t \quad (3) \]

3) Construction of financial stress index in the banking industry

When constructing the banking financial stress index, the bank beta coefficient is usually used as a representative of the bank's stress index to measure the return on the bank's assets relative to the rate of return on the capital market. In the calculation, the bank sector index and the Shanghai index in the stock market are usually used as the index. Representation of bank asset return rate and capital market return rate (Kang et al., 2012). Although this method is relatively convenient, in the relatively underdeveloped capital market, the stock market price fluctuation is difficult to truly reflect the actual operation of the banking industry. And risk factors. As far as bank operations are concerned, the risk factors mainly come from loan losses and inflation risks. Therefore, we choose the bank non-performing loan ratio DK, the deposit-to-deposit ratio CD, the interbank offered rate Shibor and the inflation rate CPI. Among them, the inter-bank lending rate is a market-based interest rate, which can timely reflect the shortage of funds in the banking industry. The calculation formula for the banking pressure index can be given by:

\[ CP_t = \omega_1 (\Delta DK / DK) + \omega_2 (\Delta CD / CD) + \omega_3 \Delta Shibor + \omega_4 \Delta CPI \quad (4) \]

Because the pressure of a certain financial sub-market is difficult to reflect the pressure level of the entire financial system, we use the CRITIC empowerment method to comprehensively consider the three financial sub-market pressure indices, and finally synthesize China's financial stress total index ZP, which is used to comprehensively reflect China. The level of stress in the financial markets. In addition, considering the close relationship between the real economy and finance, we have adopted a similar method to construct China's real economy operating prosperity index EI. In order to construct the real economy operating prosperity index, we have selected the monthly consumer confidence index and manufacturing purchasing managers index PMI. The Consumer Confidence Index reflects the degree of consumer confidence and purchasing intentions in the future. The Manufacturing Purchasing Managers Index PMI is the leading indicator of economic monitoring. It covers various aspects of economic activities and can reflect the real economic situation in a timely manner and trend.

It can be seen from Figure 1 that the overall pressure index of China's foreign exchange market is not large. When the US subprime mortgage crisis broke out in 2007, the foreign exchange market pressure index showed a short-term rise, and the banking market also had a similar reaction. At the same time, the large fluctuations in China's stock market during the same period also reflected, and the stock market increased the stock market pressure index in early 2016 due to continuous large-scale decline. The sharp decline in government investment in 2011 made China's banks and stock markets react strongly, and the bank's stress index, stock market pressure index and foreign exchange market pressure index all reached a high peak in the short term. At present, China's financial stress index is not high, mainly in the state of shock. From the perspective of the real economy operation, after the introduction of the stimulus fiscal policy in 2009, the economic operation index reached a peak near 2011, accompanied by higher inflationary pressures, in recent years, with the downward pressure on China's economy, the real economy operating index has also shown a gradual contraction. On the whole, the financial stress index and the real economy operation index constructed in this paper are in line with the actual situation, which laid the foundation for the following research.
IV. EMPIRICAL ANALYSIS

Since the VAR model is difficult to reflect the current relationship between endogenous variables, and the foreign exchange market and the stock market are very weak, the changes in the Fed's interest rate policy can be promptly reflected in the foreign exchange market and the stock market. If the VAR model is used, it may not be accurate. In conclusion, the structural VAR model overcomes this shortcoming well. Therefore, this paper uses the structural VAR model to study the impact of the Fed's interest rate policy changes on the financial stress index. The changes in the Fed's interest rate policy are reflected in the US federal funds rate in a timely manner. We choose the Fed federal funds rate UR as a proxy variable for the Fed's interest rate policy changes, and select China's financial submarket pressure index, comprehensive financial stress index and real economic sentiment index. As a research object, examine the impact of changes in US federal funds rate on related markets. Due to the relatively small amount of monthly data and the consideration of variable relationships and SVAR model identification, we constructed two sets of SVAR models for US federal funds rate and financial sub-markets, as well as US federal funds rates and China's comprehensive financial stress index and real economic index.
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1) Unit root test and cointegration test

<table>
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<th>Prob.</th>
<th>Critical value 1%</th>
<th>Critical value 5%</th>
<th>Conclusion</th>
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<td>UR</td>
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<td>CP</td>
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<td>-4.0280</td>
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<td>EI</td>
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<td>-4.0280</td>
<td>-3.4437</td>
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It can be found from Table 1 that the original sequences of the above six variables are stationary sequences at the 1% level. In addition, this paper examines the cointegration relationship between the US federal funds rate and the pressure of China’s financial submarkets, and the cointegration relationship between the US federal funds rate and China’s financial market comprehensive pressure index and the real economy climate index. Johansen test results It shows that there are multiple cointegration relations in these two sets of data. According to the relevant principles, the lag order of the model is determined. The lag order of the two SVAR models is 2 orders, and the AR root maps pass the stationarity test.

2) Identifiable conditions of the SVAR model

For the AB form of the SVAR model, the four variables of UR, EP, SP and CP need to impose at least 22 constraints to make the model meet the identifiable conditions. According to the economic principle, the following constraints are imposed: China’s foreign exchange market The financial stress index was affected by the Fed’s interest rate fluctuations in the current period; the US federal funds rate, the foreign exchange market, and the banking market all had an impact on the stock market pressure index; other variables did not affect the current period. For the UR, ZP and EI3 variables, the following constraints are imposed: the US federal funds rate and the domestic real economy climate index have an impact on the current domestic comprehensive financial stress index, while other variables do not have an impact relationship in the current period. After the constraint is imposed, the relationship between the SVAR disturbance term and the structural impact term is as follows:

\[
\begin{pmatrix}
1 & 0 & 0 & 0 \\
\alpha(1) & 1 & 0 & 0 \\
\alpha(2) & \alpha(3) & 1 & \alpha(4) \\
0 & 0 & 0 & 1 \\
\end{pmatrix}
\begin{pmatrix}
\mu_t^{UR} \\
\mu_t^{EP} \\
\mu_t^{SP} \\
\mu_t^{CP} \\
\end{pmatrix}
= \begin{pmatrix}
\alpha(5) & 0 & 0 & 0 \\
0 & \alpha(6) & 0 & 0 \\
0 & 0 & \alpha(7) & 0 \\
0 & 0 & 0 & \alpha(8) \\
\end{pmatrix}
\begin{pmatrix}
\varepsilon_t^{UR} \\
\varepsilon_t^{EP} \\
\varepsilon_t^{SP} \\
\varepsilon_t^{CP} \\
\end{pmatrix}
\]

Figure 2 shows the impulse response function of the US federal funds rate change to itself and China’s three financial sub-markets. As can be seen from Figure 2, after giving a positive impact on the US federal funds rate, China’s three financial sub-market pressure indices are mixed: China’s foreign exchange market pressure index and stock market pressure index are negative in the first period, and then gradually rise. The foreign exchange market pressure index gradually stabilized after reaching the peak in the fourth period. In comparison, China’s stock market is less responsive to US federal interest rate fluctuations, and the foreign exchange market is more sensitive to changes in the US federal funds rate. However, China’s bank pressure index has been affected by the upward trend of the US federal funds rate in the short-term, and it has gradually increased after reaching the peak in the 2.5th period. This may be because the choice of China’s monetary policy may be passively affected by the US interest rate policy. On the other hand, despite the downward pressure on China’s domestic economy in recent years, China has maintained a stable or even tight monetary policy, which has led to an increase in capital outflows due to the upward interest rate of the Federal Reserve. On the other hand, China’s capital and financial account surplus has been collected. The narrowness makes the decline in foreign exchange holdings also tightens the market liquidity, which will make the Shibor interest rate have the characteristics of downward rigidity, which will affect the pressure of commercial bank operations in China. On the whole, the upward trend of the US federal funds rate has increased the pressure index of China’s foreign exchange market and the banking industry, while the impact on the stock market is relatively small.
Figure 2 Structural impact of changes in US federal interest rates on EP, SP, and CP

Figure 3 shows the impulse response function of the US federal funds rate to China's comprehensive financial stress index and the real economy climate index. As can be seen from Figure 3, after a positive impact on the US federal funds rate, China's comprehensive financial stress index begins to gradually rise, peaking around the third period, and then gradually decreasing, which reflects that the upward trend of US interest rates has increased the pressure on China's financial market. The upward trend of the US federal funds rate is positive for China's real economy sentiment index. This may be due to the fact that the upward trend of US interest rates represents an economic recovery that has increased China's exports. However, the current Sino-US trade relations are complex and changeable. We must be alert to US federal interest rates. Upward and US trade bullying may have an impact on the financial sector and the real economy.

Figure 3 Structural impact of changes in US federal interest rates on ZP and EI
3) Variance decomposition

The variance decomposition can reflect the contribution of different variables to the pressure index fluctuation of each financial sub-market. Table 2 and Table 3 show the structural variance decomposition of China's foreign exchange market pressure index and bank pressure index.

From the decomposition of the pressure index of China's foreign exchange market in Table 2, in the first period, the change of the US federal funds rate explained its 3% volatility, and the domestic stock market pressure index and the bank stress index explained weakly; in the long run The change in the US federal funds rate explains its 4.59% volatility. The domestic stock market pressure index and bank pressure also have obvious spillover effects. The two have explained their 11.45% volatility, which reflects the financial system. The internal linkage characteristics of the market. From Table 3, in the long run, the US federal funds rate explains its 3.35% volatility, the stock market pressure index is relatively high for 6.03%, and the bank stress index can explain 88.55%. On the whole, the changes in the US federal funds rate will have a significant impact on China's financial market pressure index, that is, the changes in the Fed's monetary policy have spillover effects on China's financial market risks.

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V. CONCLUSION

Since 2017, the Fed’s rate hike has gradually accelerated, and the US government has also introduced a large-scale tax reduction policy. The combination of “increasing interest rates and tax cuts” has attracted global capital to return to the United States. Emerging market countries may face lack of funds. A series of problems such as exchange rate depreciation and capital outflows, the number of unstable factors in the financial sector has increased, and financial risks have also increased. This paper constructs China's financial sub-market pressure index and comprehensive financial stress index and real economy operating prosperity index. Using SVAR model to empirically test the impact of US federal funds interest rate fluctuation on China's financial stress index, the following conclusions are drawn: First, The upward trend of the US federal funds rate has pushed up the financial pressure index of China's foreign exchange market and the banking market. The impact on China's stock market pressure index is weak, and the domestic financial sub-market pressure index also has obvious spillover effects. Second, although the upward rate of the US federal funds rate has slightly pushed up the domestic real economy prosperity index, it has made the progress of China's comprehensive financial stress index rise, which has aggravated the instability in the financial sector.

At present, the upward trend of the US federal funds rate has increased the pressure level of China's
financial market. There are also structural contradictions between China's economic downward pressure, monetary policy expansion and capital outflow. This paper proposes the following policy recommendations: First, strengthen China's financial market. System risk prevention measures, continue to promote de-leverage measures in the financial industry, strengthen the risk investigation of the banking industry, promote the reform of the RMB exchange rate system, and reduce the pressure on the financial market. Second, to enhance China's monetary policy independence, reduce the tightening effect of China's foreign exchange holdings due to the Fed's interest rate hike, and use the innovative monetary policy tools to adjust market liquidity in a timely manner to prevent financial risks caused by liquidity tightening. Third, to adjust the domestic industrial structure, while changing the mode of economic growth, we must also prevent the real economy from falling into the short-term temptation of relying on investment. Maintaining the healthy development of the real economy is the fundamental measure to deal with external shocks and reduce financial risks.

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