

# A STUDY ON THE SPILLOVER EFFECTS OF CHINA'S MONETARY POLICY ON THAILAND UNDER THE BELT AND INITIATIVE

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#### Abstract

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This study provides research on the spillover effects of China's quantitative and price-based monetary policies on Thailand under the 'Belt and Road' initiative between the two countries. This research established the SVAR model using the Impulse Response Function (IRF) and variance decomposition of this initiative. This case study analyzed China's quantitative monetary policy's spillover effect and deduced the following conclusions: 1. If Thailand does not adjust the monetary policy, within a short term of three months after China increases its money supply, the output of Thailand will decrease, their GDP growth would also slow down, and their overall economic position would shrink due to the negative impacts. From a long-term point of view, a positive influence would be dependent on the output of Thailand; 2. Overall, the expansion of China's money supply would negatively influence Thailand's relative exchange rate, leading to a decrease in the exchange rate and currency revaluation.; however, a positive influence would be identified in later stages; 3. As China raises its money supply, Thailand's inflation rate would first drop and then continue to rise; 4. China's rising money supply on Thailand's interest rate would have a negative impact, and could only recover after three years. Objectively, this research also looked at China's price-based monetary policy's spillover effect and determined the following: 1. From the output perspective, a rise in the benchmark of the one-year deposit rate in China would negatively influence Thailand's output within three years. The latter's GDP growth

rate and output would both decrease, and in three years, the GDP growth rate and output of Thailand would rebound and begin to grow and show a positive spillover effect; 2. From the perspective of the exchange rate, the effects vary by showing a negative influence on Thailand's exchange rate in the short term. The exchange rate would go down, but not significantly. The explanation of a further decrease of the exchange rate in the later stages that Thai authorities would adopt some measures to avoid significant fluctuation of the exchange rate by lowering the money supply to reevaluate the Thai Baht and keep a lower relative exchange rate; 3. From the perspective of inflation, in the short-term, a rise in China's interest rate, a withdrawal of foreign capitals, and the devaluation of Thai Baht would increase inflation. From a mid-to-long-term view, China's tight monetary policy would influence output, and commodity prices would fall, resulting in the sinking of commodity prices in Thailand and influencing the inflation rate; From the perspective of interest rate, in the short-term, Thailand's interest rate would 4. rise due to positive influence; however, in the long-term, the influence would shift into the negative and witness a fall of the interest rate.

Keywords: monetary policy, spillover effects, belt and road initiative

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# A STUDY ON THE SPILLOVER EFFECTS OF CHINA'S MONETARY POLICY ON THAILAND UNDER THE BELT AND ROAD INITIATIVE

#### **Chapter 1. INTRODUCTION**

#### 1.1 Research Background and Significance

The "Belt and Road" Initiative was proposed in 2013, four years ago. The big data suggests that the economy of Thai was benefited from the initiative. The Thailand East Economic Corridor Plan and other economic strategies were purposefully connected to the "Belt and Road" Initiative to advance the economic transformation of Thailand. If China and Thailand are attempting to grow more mutual interests, they should take more steps in strategic cooperation and collaboration to seek co-development and build a community with a shared future for mankind.

Thailand was one of the most critical countries along the Belt and Road as it could both connect to the Maritime Silk Road and the Silk Road. And, it would play a significant role in the future Asian integration system. In the previous four decades, the Sino-Thai economic bonding has been growing stronger more and more shared interests, laying a good foundation for launching the "Belt and Road" Initiative. The development of Thailand focused on the economy and actively responded to China strategically. In November 2014, Thailand leader, Prayuth Chan-o-Cha attended the APEC Conference in Beijing and asserted to the media, "Thailand is exploring a development path suitable to its national conditions. It hopes to carry out exchanges and mutual leanings and deepen cooperation with China, especially to facilitate cooperation in agriculture and railway and promote regional connectivity by building the Silk Road Economic Belt and the 21st Century Maritime Silk Road. Thailand expects to expand the export of Thai agricultural products to China, enhance non-governmental exchanges and strengthen talent training." By the end of that year, Prayuth came to China and made an emphasis during a meeting with President Xi that Thailand would actively respond to the Maritime Silk Road proposed by China and further enhance the cooperation in railway and telecommunication, striving to realize the Pacific-Asia Free Trade Zone together.

For the purpose to build a promising relationship between the two countries, in

addition to the deepened cooperation in economy and institutions, they should also adjust their view of values in the same direction. In the current age, the overall national power and global status of a country are mostly associated with its economic strength. After years of growth, China has become the largest trading country and the second largest economy in the world, with its global impact long exceeding that in its old days. Meanwhile, it is also bearing more expectations to lead the global economic development. China still needs to enhance its openness to be better utilize the values of domestic and global resources. Promote the transformation of domestic economic development, growing from mid-to-upper incomes level to a higher one. Under such a background, President Xi Jinping proposed the great ideas of "Silk Road Economic Belt" and "21st Century Maritime Silk Road" (The "Belt and Road" Initiative in short). Upon this idea, Thailand showed an active response, which could be explained.

Firstly, the Ancient Silk Road offered a good condition for Sino-Thai cooperation. Both countries are playing an active role in the integration process of Oriental and Western cultures. Secondly, the key to the "Belt and Road" Initiative lies in China's overseas investment in the infrastructures to enhance the production capacity cooperation with other countries, which well meets the needs of Thailand. Thirdly, the core of the "Belt and Road" Initiative is to build a new Eurasian regional cooperative framework while Thailand is long seeking to make a good use of its geographical location to connect the Eurasian continent. The "Belt and Road" Initiative could facilitate it to be better play its role. On this basis, this paper eyed on the spillover effect of China's monetary policy on Thailand and established a SVAR model along with impulse response function (IRF) and variance test to discuss how China's quantitative and price-based monetary policies influence Thai economy.

# **1.2 Research Content and Method**

# 1.2.1 Research Content

After reviewing the related research outcomes, we obtained an all-round understanding of the spillover effect of monetary policy and the initiative of the "Belt and Road" Initiative. The research content covers:

First, collect and sort out the current research outputs involving the monetary policy's spillover effect and the "Belt and Road" Initiative.

Secondly, from the economic, the economic exchanges between China and Thailand, including the history of the ancient Silk Road and the trades as well as the economy and trades of China and Thailand after China launched the "Belt and Road" Initiative.

Thirdly, the Mundell-Fleming model was used with a focus on the exchange rate system and capital circulation to be analyze the spillover effect of monetary policy, and global transmission on a theoretical level.

Fourthly, study the Sino-Thai economic trades, collect the related data and on this basis build a SVAR model. Use the impulse response function (IRF) and variance decomposition to study the spillover effect of China's quantitative and price-based monetary policy on the economy of Thailand.

Fifthly, based on the previous four chapters' research outputs, propose reasonable policy suggestions.

## 1.2.2 Research Method

Today, globalization and grouping have become the trend of economic development, and cooperation between countries is becoming increasingly close. It is not feasible to shut down the door for independent development, and the dependence of economic development on the country is gradually increasing. Since China and Thailand have built the Belt and Road, China and Thailand have continued to deepen cooperation and the Thai economy has developed rapidly. However, from another point of view, in the process of implementation, the "One Belt, One Road" strategy may lead to differences and misunderstandings between China and Thailand, and even disputes, thus jeopardizing the cooperative relationship between the two sides. To this end, China and Thailand need to further reach a consensus and other awareness, avoid contradictions, and move forward together. This paper mainly creates and uses the SVAR model to explore how China's quantitative and price-based monetary policies affect the Thai economy through impulse response functions and variance tests.

#### **1.3 Innovations in Thesis**

# 1.3.1 Research Content Innovation

Although there are many studies on the influence of academic circles on China's

"Belt and Road", there are few studies on China's implementation of a prudent monetary policy and the impact of China's monetary policy on Thailand's trade, especially in terms of the international financial spillover effects of monetary policy. Therefore, this article will focus on the impact of China's sound monetary policy implementation on Thailand's trade, and analyze as much as possible the impact of China's sound monetary policy implementation on Thailand.

## 1.3.2 Research Method Innovation

The purpose of the research is to examine the international spillover effects of China's monetary policy, and combine model analysis, monetary policy analysis, and literature research to analyze the impact of EU quantitative easing on Thailand's trade. There is an in-depth theoretical analysis. And there is a detailed measurement analysis, the two complement each other.



# **Chapter 2 LITERATURE REVIEW**

#### 2.1 Current Status of International Research

The Spillover Effect refers into the economic dependence of the state and the mutual influence of financial aspects in the economic open environment. The role of a country in formulating or adjusting monetary policy in trade and finance. Under the circumstances, the economy and finance of other countries are affected. The reverse is also true, the monetary policy of other countries will affect the economic and financial of a country. From this point of view, the spillover effect is not unilateral.

First, the spillover effect of monetary policy on trade accounts. The spillover effect of monetary policy on trade accounts can lead to changes in output, commodity prices, and exchange rates. Most scholars focus on the existence, direction, and strength of spillover effects when conducting research in this area. (Kim 2011) conducted research on G8 countries and found that after the US developed an expansionary monetary policy, the output of the other seven countries will increase, demonstrating a positive spillover effect. In a short period of time, the net export of the United States has decreased, and the net exports and output of other countries have doubled.

The net trade in the United States, the net foreign trade, and the 5% change in actual foreign output are caused by the US monetary policy. (Beningno Task Force 2016) created a general dynamic equilibrium model for two countries in its research. The results show that monetary policy uses the trade output mechanism to influence the spillover effects of output, and commodities in the current and intertemporal Alternative elasticity is directly related. If the current elasticity exceeds the intertemporal flexibility, the two commodities are substitutes for each other, and the functions of the two are consistent. At this time, if the trade conditions of a country deteriorate, the output of another country will increase accordingly.

On the other hand, if the inter-temporal alternatives exceed the current period, the goods of the two countries complement each other. At this time, it will help promote the economic and trade development of the two countries and inject more powerful impetus into the advancement of the two economies. (Johansson 2009) introduced an error correction model and found that the Granger reason for China's actual output was the federal funds rate, not the US money supply. Therefore, the Chinese government

cannot ignore the US monetary policy when formulating monetary policies.

Kozlnk's research group (2018) explored the spillover effects of China's monetary policy on other countries and regions with trade relations in East Asia, and conducted empirical analysis in Hong Kong, South Korea, the Philippines, Singapore, and Taiwan provinces, based on the SVAR model. After China adjusted its monetary policy, the output of other regions and the changes in inflation showed that when China implemented a positive monetary policy, the output of Hong Kong, the Philippines, and Singapore increased, but the duration of this effect was not long. Not too obvious. From a long-term perspective, its impact on prices in other regions (excluding Taiwan Province) is more obvious. The Sousa team explored the relationship between global monetary volume and global output and price levels. The results show that in a short period of time, the increase in global money supply will lead to an increase in global output, climbing to the highest value in a year. Long-term prices will rise.

Second, the spillover effect of monetary was policy on the capital account. Most scholars focus on interest rates, asset prices, and stock markets when conducting research was in this area. Foreign scholars focus on the spillover effects of US monetary policy in the above aspects. The Miyakoshi Group (2015) explored the fluctuations in currency-income in Asia when interest rates and money supply in the United States fluctuated. They collected data from 1970-2002 in six countries of Pakistan, Indonesia, the Philippines, Malaysia, India, and South Korea on a quarterly basis and created an EGARCH model based on the results. The results show that US interest rates and money supply are the currencies of the six countries mentioned above - Income causality has a significant spillover effect, so these six countries must make decisions based on the US money supply when determining the money supply. To put it simply, based on the US monetary policy and its own national conditions, it formulates the most appropriate monetary policy. When discussing the spillover effects of monetary policy on the stock market, there are certain differences in the academic community in view of the existence of this effect.

The research results of Conover's research group show that the stock market in many countries is related to the US monetary environment. Once the US implements the expanded monetary policy, the return rate of these stock markets will increase, but the risk does not occur. The obvious change is that for some of these countries, the relationship between its stock market and US monetary policy is even stronger than its own. The Ehrmann team (2016) conducted a study of 50 stock markets and found that if the US federal funds rate increased by 100 basis points, the return rate of these markets decreased by 0-10 percentage points, with an average of 3.8 percentage points.

In addition, the US monetary policy pair the impact of the EU stock market is significantly greater than the impact of EU monetary policy on the US stock market. Wongswan (2016) based on a large number of high-frequency data analysis, the results show that in a short period of time, after the US and Japan adjust monetary policy, the stock market of Korea and Thailand will be affected. The research results of Kim's research group (2009) show that the interest rate policy of the United States and the European Union will have a negative spillover effect on stock markets in other countries and regions. Wongswan (2016) pointed out that the US currency market will have a spillover effect on the stock market of other countries. If the US lowers the federal interest rate without warning, the stock prices of these countries will increase.

However, the research results of the Dong team (2016) show that the impact of the two economies on each other is through the mechanisms of the real economy, financial markets, investors and consumers. Mann's research group (2014) collected and sorted out the evidence on a monthly basis, and empirically studied the correlation between the six international stock indexes and US monetary policy. It was found that US monetary policy cannot be used as an explanation and forecast of international stock returns. in accordance with. Other scholars have conducted other researches, such as: Chan's research group (2012) pointed out that the Bank of Japan's implementation of loose monetary policy may lead to unexpected borrowing and speculation in East Asian countries, both in the short-term and long-term perspectives. In view of this, Japan's money supply and investment will affect the economies of these countries. According to the IMF's Spillover Report, a new round of spillovers occurred during the global economic recovery after the global tsunami in 2014. It included unsynchronized interest rate normalization in developed countries against currency exchange rates and funds. The negative effects of circulation and foreign exchange reserves, as well as the slowdown in the growth of emerging market economies, will hinder the recovery of developed economies.

#### 2.2.1 Current Status of China's Research

The spillover effect of monetary policy means that was to open economic

environment, the economic exchanges between countries are becoming more frequent, and the role of the other side's finance is expanding. The monetary policy formulated by a government, under the influence of trade and financial mechanisms, will the economy of other countries has had an inevitable impact (Lu Jia et al 2008) incorporated trade credit into the analysis framework of monetary policy transmission mechanism, and proved through empirical tests that the channels through which China's money supply affects trade balance are mainly "trade credit" and "trade credit impact through exchange rate". (Chen Qi'an et al 2014) constructed a theoretical mechanism model covering the main factors affecting exchange rate and foreign exchange reserve changes by means of vector error correction (VEC model) from the perspective of international trade and monetary policy, (Huang Xian et al 2017), with more than 50 "Belt and Road" countries and regions, explored how the exchange rate and interest rates of the Chinese government changed their monetary policy through high-frequency event research. Shi Feng et al. (2018) analyzed the impact of incomplete exchange rate transfer and intermediate trade on monetary policy. He believed that intermediate goods as input factors to produce consumer goods, the degree of import intermediates affects the output of domestic intermediate goods and consumer goods, and the degree of import of consumer goods. Affect domestic consumer goods output and intermediate product prices.

Zhu Xianping's research group (2006) found through research that the implementation of the Silk Road strategy will greatly stimulate the dual improvement of supply and demand in the region, create better conditions for investment and trade, and inject momentum into the development of regional economy. Hu Angang's research group (2014) focused on the economic trade between China and the countries along the Silk Road, and divided the Silk Road Economic Belt into three strategic areas, focusing on China-Central Asia's economic and trade situation.

Good construction of the Silk Road Economic Belt indicates the direction. Chen Wanling's research group (2014) explored the strategy of the 21st Century Maritime Silk Road, researching the ancient Silk Road and current strategies, and believed that the Maritime Silk Road should include three routes. They suggested that under the current strategic framework, the focus is on Improve channel function and continuously improve the level of trade, investment and economic cooperation. Gong Xinyu's research group (2014) created a VAR model to explore the relationship between the transportation infrastructure of the Silk Road Economic Belt and the trade of ChinaCentral Asian countries.

The results show that the construction of transportation infrastructure is conducive to the development of economic belt trade, and this effect is positively correlated with time. (Qin Chongqing Research Group 2014) was that created a spatial spillover model with the fiscal expenditure and the growth rate of total factor production as the variable for the Silk Road and Economic Zone. The results show that the increase in fiscal expenditure will stimulate the total factor productivity. Improve, there is a significant spillover effect between the two. (Li Ning 2014) analyzes the cost and income of the Silk Road coverage area. He believes that the main obstacles hindering the development of economic integration in this region are trade barriers and inconsistent regional economic development, and indicate the direction for the elimination of these obstacles.

#### 2.2.2 Research Review

Domestic and foreign research on the spillover effects of monetary policy is rich, especially in terms of monetary policy and trade and capital account relationships, most scholars are studying in large economies. Foreign scholars focus on the spillover effects of monetary policy in developed countries in Europe and the United States, rarely targeting emerging market countries. Most domestic scholars focus on the spillover effects of monetary policy in developed economies on the domestic economy. From this point of view, the spillover effects of monetary policy in emerging economies have not received sufficient attention, both domestically and abroad. However, it is foreseeable that China will play a more important role in the global economic system in the process of accelerating China's economic development. At this time, research results in this area will be increasingly enriched.

The "Belt and Road" strategy was born in the relatively short time. Therefore, few foreign scholars have studied the economic development of the "Belt and Road" region, but more and more domestic scholars are investing in this research field, but most scholars All of them discuss the impact of the "Belt and Road" on economic trade from a theoretical perspective. The results of empirical research are rare, especially the comprehensive study of this strategy and macroeconomics is a vacuum. Therefore, the comprehensive study of China's monetary policy and the "Belt and Road" has certain innovative significance. Based, this paper will focus on the spillover effect of China's monetary policy implementation on Thailand, create and use the SVAR model, and explore how China's quantitative and price-based monetary policies affect the Thai economy through impulse response functions and variance tests.

#### 2.3 China's Monetary Policy

#### 2.3.1 China's Monetary Policy Cycle

China's monetary policy is formulated for the purpose of guiding the related policy tools. The strength of such tools determines the monetary policy, and tightness of the cycle. The current monetary policy in China implements the multi-objective system, being expected to effectively stabilize the currency value, realize the economic growth and full employment, reach the global balance and motivate the development of the financial industry. The monetary policy could be divided into five levels depending on the tightness of the monetary aggregate: moderately easy, prudent and partially easy, prudent and neutral, prudent and partially tight, and moderately tight. The division is mostly based on quantitative data and supported by qualitative data.

Quantitatively, combing the global and domestic experience, the quantitative index could be divided into two levels: the total aggregate first, and followed by the interest rate. The priority sequence is total aggregate tightness > interest rate transmission. The total aggregate adopts M2 growth rate-GDP constant price growth rate-CPI growth as the index to evaluate the short-term tightness, uses credit scale balance growth rate-GDP growth to measure the mid-to-long term trend, and takes the changes in the benchmark interest rate of 1-year loan as the supporting referential index. Qualitatively, the paper mainly refers to the opinions from the central bank's "Monetary Policy Execution Report" upon the execution of the monetary policy.

In the past 20 years, the cycle of China's monetary policy could be seen from China's "Monetary Policy Execution Report" and qualitative indexes.

The first period (1998-2002) was prudent and partially easy-prudent and partially tight-prudent and partially easy. During this period, there were three stages, indirect regulation, direct regulation, and counter-deflation. In 1997 the financial crisis spread to Asia and caused serious deflation. The monetary policy made and launched at that time was prudent and partially easy, to counter the influence of deflation. In 2000, the

funds outstanding for foreign exchange was largely raised. To reach the goal of global balance, a prudent and partially easy policy was made. In 2001, the problems of deflation rose again, so a prudent and partially easy policy were adopted again.

The second period (2003-2009): moderately easy - prudent and partially tight - moderately tight - moderately easy. It resonated with the external shock during this period and went through big ups and downs. During the seven years, the central bank made full use of the tool of bills to perform extensive liquidity operation. To further eliminate the influences of the financial crisis, 4,000 billion were distributed in form of loans. In September 2003, M2 increase rate reached 20.97% and the average growth rate of loan balance was above 20%. The monetary policy was relatively easy. In 2004, the domestic prices stayed at a high level. In 2005, the Federal Reserve raised the interest rate. To realize the goal of countering the inflation and maintaining the global balance it launched a prudent and partially tight policy; by the end of 2006, obvious inflation issues arose in China. To maintain the balance of the prices, the central bank raised the interest rates for many times through a partially tight policy; In 2008, a financial crisis swept through the world. For the purpose of the continuous economic development, the authority eased the policies.

The third period (2010-2015): The characteristics of this period can be concluded as returning to the prudent, multi-target restricted operation space. It was passive by the total aggregate but the efforts were still actively made for overall arrangement of structure. In 2014, new structural tools were used for the adjustment. After the launch of the Package Plan, the growth rate of M2 was staying at a high level (around 20%), accompanied with prudent and partially easy policy; In 2011, due to the influence of European debt crisis, the real economy went retrenched beyond the expectation; In 2014, the financial market was disturbed by frequent chaos and the economic growth rate changed significantly. The structural monetary tools were widely applied. Out of consideration for maintaining the financial stability and economic development, a prudent and neutral monetary policy was adopted; In 2015, the pressure of economic downturn grew and the funds outstanding for foreign exchange decreased. So the policy stayed prudent and partially easy for stable growth and global balance.

The fourth period (2016-2018) prudent and neutral – prudent and partially tight. The structural fine-tuning and preset kept going. Based on the tools of supply-side reform, financial deleveraging and long-term mechanism of real estate, the credit and money supply data on the total aggregate of the financial period top suggested that a prudent and partially tight policy had been implemented during this period. In 2016, in response to the supply-side reform, a prudent and neutral policy was adopted. Overall speaking, the cycle of the monetary policy is 4 to 6 years. There would be 3 to 4 times of diversions during this period. Every monetary policy would be launched for 4 to 6 seasons. The overall style was adjusted from big ups and downs to fine-tuning. The central bank formulated more prudent monetary policy and perform more active management.

One reason is to ensure that if a crisis occur in the future, there is sufficient space for the operation of monetary policy; the second reason is to provide more services to the economic development, deleveraging, structural adjustment and risk prevention. Under the restrictions of multiple targets, it was hard to implement over-tight policy. In the previous three periods, the launch of prudent and partially easy and moderately easy policies lasted for 32 seasons. The launch of prudent and partially tight and moderately tight policies lasted for 23 seasons. In the multi-target framework, when the government was over-pursuing the economic growth, it led to an easy monetary policy against the cycle. The restrictions of the structural monetary transmission mechanism and the quantitative easiness are not directly associated. From 2014 to now, a prudent and partially tight as well as neutral policy was implemented during most of the time. But during 2015 and 2016, a prudent and partially easy policy was adopted due to multiple rounds of reduction in the interest rate and deposit reserve ratio.

#### 2.3.2 China's Steady Monetary Policy

A prudent monetary policy refers to adjusting the policy orientation according to the signs of economic changes. When the economy shows signs of recession, monetary policy tends to expand; when the economy is overheated, monetary policy tends to tighten. The final reflection on the price is to maintain the basic stability of prices. A sound monetary policy is a national economic policy and macro-control measures that stabilize the country's currency. The fundamental reason for stabilizing the country's currency is the increase in the amount of money issued in proportion to the total effective economy of the country. A financial system with stable interest rates, stable exchange rates, balanced imports and exports, and direct investment and financing is also a necessary means to stabilize the country's currency. A prudent monetary policy not only avoids price hikes caused by monetary policy, but also raises prices (such as speculative monopolies, imbalanced economic structures, and misleading consumer expectations) caused by non-monetary policies. A prudent monetary policy is a necessary prerequisite for the stable development of the economy and the steady improvement of people's living standards, and is an important feature of the socialist market economy.

The reality of China's social economy and finance determines the multi-objective system of the central bank. During the period of China's economic transformation, the social and economic structure is in the process of adjustment, and the financial market is continuing to develop. The constraints imposed by the monetary policy authorities are more complicated. In addition to the statutory goal of stabilizing the currency and promoting economic growth, the monetary authorities also It shoulders the annual goal of full employment and balance of payments and the dynamic goal of promoting the reform and development of the financial industry (Zhou Xiaochuan, 2016).

The first is to stabilize prices. Stabilizing the price target is the primary goal of the central bank's monetary policy. It is to control inflation so that the general price level does not fluctuate sharply in the short term, and the essence of price stability is the stability of the currency.

The second is economic growth. It means that the growth of gross national product must maintain a reasonable and high speed. The indicators for measuring economic growth generally adopt the annual growth rate of per capita real GDP, which is measured by the annual growth rate of per capita real GDP after excluding the annual rate of increase in the gross national product per capita.

The third is full employment. The so-called full employment goal is to maintain a high and stable level. In the case of full employment, all able and voluntarily participating workers can find suitable jobs at any time under more reasonable conditions. It is generally based on the employment level of the labor force.

The fourth is to balance the balance of payments. If the autonomy transaction balance in a country's international balance of payments is automatically equal, it indicates the country's balance of payments; if the autonomy transaction income is greater than the expenditure, it is called a surplus; if the autonomous transaction expenditure is greater than the income, it is called the deficit. An imbalance in the balance of payments of a country, whether it is a surplus or a deficit, will have an adverse impact on the domestic economy.

#### 2.4 A New Model of China's Steady Monetary Policy Operation

## 2.4.1Central Bank Communication and Forward-Looking Guidance

First, the management and forward-looking guidance of countries since the crisis. Driven by the rational anticipation of revolution, central banks in all countries are aware of the importance of policy communication and transparency in improving the effectiveness of monetary policy (Blinder et al., 2008). By effectively guiding market expectations, policy actions can be achieved with less effort. Monetary policy is also called "the art of expected management" (Woodford, 2003), and the expected effect plays an increasingly important role (B. Friedman and Kutter, 2011). After the global financial crisis, in order to stabilize the financial market and stimulate the economy, all countries have carried out large-scale quantitative easing, and the policy interest rate has dropped to an ultra-low level and has fallen into the zero interest rate lower limit. To this end, central banks have not only increased the intensity of routine communication, but also guided public expectations through low interest rate commitments. Forward Guidance has become an important means of central bank communication and expected management (Carney, 2013).

The second is to improve the communication mechanism of monetary policy and improve the expected management level and effectiveness of monetary policy in China. The People's Bank of China recognized the importance of monetary policy communication very early, and in 2009 it clearly stated that it is necessary to effectively manage inflation expectations. From the practice of forward-looking guidance from countries after the global financial crisis, although the parties have basically reached a consensus on the important role of expected management and communication, there are still many open issues worth discussing, including the degree of communication and the relevance of communication. , the technical basis of communication and the best communication strategy. In the future, we should increase the frequency, clarity, accuracy and consistency of information disclosure, explore various channels to express the central bank's judgment and policy intentions on economic and financial, and gradually regularize institutionalization, so as to improve the central bank's monetary decision-making within the framework of customization. Independence, authority and market reputation, and effectively improve the policy effect of currency regulation.

# 2.4.2 Interest Rate Corridor Mechanism and Central Bank Interest Rate Guidance

The first is the deposit and loan facility and interest rate corridor mechanism. Since the impact of reserve adjustment on the money supply is too severe, and the loan support from the central bank will damage the reputation of financial institutions, the role of statutory reserves and refinancing (rediscounting) is weakening (Furfine, 2003). At the same time, the adoption of large-value payment systems has greatly improved the efficiency of financial market operations and currency transmission, so many countries have improved the currency operation process accordingly (Woodford, 2001), deposit and loan facilities (Deposit and Loan Facilities) and Interest Rate Corridor (or Channel System).

The central bank provides liquidity to financial institutions at a loan-facilitated interest rate (usually above the target interest rate) to meet its statutory reserve or clearing account position requirements, or to over-prepare financial institutions with a deposit-facilitating interest rate (usually below the target interest rate). Or clearing account deposits for interest compensation, so that market interest rates are automatically locked in the interest rate corridor, effectively stabilizing financial institutions' liquidity and interest rate expectations (Whitesell, 2006). This model has been widely adopted by countries and has almost become a global financial crisis. The trend of central banks (Goodhart, 2009).

The second is to improve the interest rate corridor mechanism, improve open market operations, and improve the interest rate guidance capability of the People's Bank of China. From the policy framework, the interest rate system of the Central Bank of China has already had the function of "interest rate corridor" (Zhou Xiaochuan, 2013), and the interest rate operation mode is not much different from the international mainstream practice (BIS, 2009). In particular, in 2015, China officially canceled the deposit-loan ratio requirement and improved the reserve assessment method, attempted to set the SLF interest rate as the interest rate corridor ceiling, and extended the regular open market operation twice a week to the daily operation from February 2016. It has taken an important step in improving the interest rate corridor mechanism and open market operations.

# 2.5Transmission Channel of China's Monetary Policy's Spillover Effect on Thailand

## 2.5.1 Trade Channel

The credit conduction theory of monetary policy was first advocated by JH Williams in 1942. At that time, both the theoretical and practical circles advocated fiscal policy and negated monetary policy. Therefore, he should publish the perspective of the credit supply possibility of lenders. Re-recognizing the relevant views on the role of interest rates, although unique and novel, is different from others, but has no response. In 1951, the Federal Reserve Bank of the United States and the Ministry of Finance conducted a heated debate on the effectiveness of monetary policy. RV Rosa, who works at the Federal Reserve Bank of New York, published the article "Interest Rate and Central Bank", advocating and detailing the credit supply. The Theory of Possibility (Credit Availability Doctrine) was promoted by other Fed economists in the development, development, and rehabilitation of the Radcliffe Report, Tobin, and I. 0. Scote.



Figure 1 The Spillover Effect Path of a Country's Monetary Policy

Later, he gradually became an influential new monetary policy transmission theory after the war. The credit supply possibility theory is quite insightful on many issues and has been put into practice in many countries. But in the theoretical world, this theory has always lacked extensive support, because the rationality of the Credit Rationing hypothesis on which the theory relies has always lacked a convincing argument. It was not until the 1970s that information economics and game theory developed rapidly, gradually merged, and entered mainstream Western economics, which provided new theoretical support for the recovery and maturity of credit rationing. After the 1980s, a group of scholars represented by Professor Ben S. Bernanke of Princeton University further developed this theory and presented two new theoretical forms: bank lending channels and balance sheet channels. They explain the unique role of credit in the process of monetary policy transmission from different angles. It is concluded that in the process of monetary policy transmission, even if interest rates do not change significantly, investment will change through credit channels, and ultimately the real economy will change. The common conclusion.

The theory of monetary policy transmission mechanism has always been an important issue in the study of monetary economics. The classic theory of western economics generally divides the channels of monetary policy transmission into three categories: interest rate channels, credit channels and exchange rate channels (Song Wang, Zhong Zhengsheng, 2006. Interest rate channels refer to changes in the money supply that affect interest rate changes, thus causing changes in investment.

Finally, it acts on total output; credit channel refers to the change of loans in the credit market by causing changes in the credit market, which in turn affects the total output; the exchange rate channel refers to the influence of the money supply on the exchange rate, thus affecting the trade balance. In turn, it affects the total output (Ren Xiao, 2003). It can be found that the exchange rate channel theoretically directly explains the way in which the money supply affects the trade balance. Therefore, the money supply, exchange rate and trade balance are the money supply that affects the trade balance. Three important factors that cannot be ignored. In the past, the study of the effects of money supply on trade balances mostly originated from exchange rate channels and studied the relationship between these three variables. McKinnon (1980), Obstfeld and Rogoff (2016) included exchange rate factors. In the study of the transmission mechanism of monetary policy, the impact of monetary policy on import and export and output through exchange rate changes is analyzed. n Faust (2012) studied the use of high frequency data to identify the impact of monetary policy changes on the exchange rate.

Through the previous theoretical analysis of trade credit, we find that trade credit is closely related to money supply, exchange rate and trade balance. Therefore, it is also advisable to incorporate trade credit into the analytical framework of the monetary policy transmission mechanism to study the impact of money supply on trade balance. The trade credit factor is introduced in the traditional monetary policy exchange rate transmission channel, and the mechanism that the money supply affects the trade balance can be represented by Figure 3.



Figure 2 Mechanisms by Which Money Supply Affects the Balance of Trade

It can be seen from Fig.2 that the four factors are not a simple one-way mechanism, but a complex interaction relationship, which is why the vector autoregressive model (VAR) is used for empirical testing. Under this framework, without considering the influence of other factors, we can decompose the mechanism of money supply on trade balance into four possible channels: (1) Money supply affects trade balance by affecting exchange rate changes. This is the exchange rate channel that traditional monetary policy transmits. (Sheng Zhaohui 2016) shows that China's monetary policy exchange rate transmission channel has a certain degree of passiveness. The change in trade balance is the Granger cause of exchange rate changes, and exchange rate changes are not the Granger reasons for changes in trade balances. (2) The money supply does not pass the exchange rate, but affects the balance of trade balance through changes in trade credit. (3) The money supply affects the change of exchange rate, and the change of exchange rate causes the change of trade credit, thus affecting the balance of trade balance. (4) Money supply directly affects trade balance. Research by Zhao Jinwen (2014) shows that the money supply has a significant impact on net exports. In specific economic situations, the four channels may or may not exist.

To sum up, trade channels refer to the fluctuations in income, consumption levels, and commodity prices of domestic and foreign residents after a country adjusts its monetary policy, which affects domestic and foreign import and export trade, which in turn leads to changes in economic variables between the two countries. There are two trade mechanisms for monetary policy: First, the country has formulated an expansionary monetary policy, the money supply has increased, the income and consumption of the residents have increased significantly, the import demand has become more vigorous, and the export volume of other countries has increased. Improve and raise the national income level.

In addition, the increase in the supply of domestic money will lower the interest rate, the interest rate of other countries will increase relatively, the domestic capital will flow into the international market, the local currency will depreciate, the foreign currency will increase, the exchange rate will increase, and the domestic commodity price will have a greater global market. Advantages, other countries' export demand is suppressed, output is reduced, import demand has become more robust, and both domestic exports and output have increased. Of course, the basic condition for this phenomenon is that the exchange rate is floating. In addition, the relative appreciation of other countries' currencies will lead to an increase in consumer demand in other countries. Therefore, from two perspectives, in a short period of time, the impact of the adjustment of the national monetary policy on foreign output is positive or negative, and is related to the strength and weakness of the above two aspects.

# 2.5.2 Exchange Rate Channel

Looking at the whole world, the exchange rate system implemented by each country is nothing more than two types, namely fixed system and floating system. If it is the latter, once the central bank formulates an expanded monetary policy, the interest rate of the country will be reduced, there will be a spread between the economies, domestic capital will flow to the international market, the local currency will depreciate, the foreign currency will appreciate, and the exchange rate will increase.

The relative price has changed, domestic output has increased, and foreign output has decreased. If it is the former, a country's expansionary monetary policy will lead to capital outflows, the local currency will face depreciation pressure, and foreign currency will face upward pressure. In order to avoid large fluctuations in exchange rates, countries will release foreign exchange reserves and reduce the supply of local currency, and domestic interest rates will increase. He absorbed foreign exchange in Congress, increased the supply of local currency, and appeared in the currency superdiscovery, which led to changes in prices and output of other countries, and increased income and consumption levels of foreign residents. A country's macroeconomic policies mainly include economic growth, stable currency, full employment, and balance of payments. Among them, the first three belong to the economic internal equilibrium goal, and the latter one belongs to the economic external equilibrium goal. The interest rate transmission mechanism, credit transmission mechanism, and asset price transmission mechanism discussed in the previous chapters all have implicit premise of closed economy. Therefore, the internal equilibrium target of macroeconomic policy can be channeled through interest rates, credit, asset prices, etc.

The transmission of monetary policy is realized. Under the open economy, there must be two major "gap", namely "saving gap" C I-S) and "foreign exchange gap" C M-X). To achieve internal and external equilibrium in the macro economy, the two major gaps must be equal. However, the role of interest rate, credit, and asset price channels alone cannot be completed. Therefore, in addition to realizing the internal equilibrium of its macroeconomics through the role of monetary policy transmission mechanisms such as interest rates, credit, and asset prices, the monetary authorities must also seek new monetary policy transmission mechanisms to achieve the macroeconomic external equilibrium objectives. From the current practice of monetary policy in various countries, the exchange rate is the best role to act as the new monetary policy transmission mechanism. In fact, in many countries, the exchange rate has become an important and even the primary monetary policy intermediary indicator. This is especially true for countries within the European monetary system such as the United States and Japan. In the United States, the role of the exchange rate has increasingly been valued by the Federal Reserve Bank. Stabilizing the US dollar exchange rate has become an important part of the Fed's monetary policy. For Japan, the yen exchange rate is extremely crucial. The intervention of the Bank of Japan in the foreign exchange market and the corresponding offsetting operations in the domestic currency market have become quite common daily tasks.

Since the implementation of the foreign exchange system reform in 1994, China has adopted a number of substantive reforms in the exchange rate system, the domestic financial system, and the foreign trade system. The outward direction of the national economy is increasing. The increase in capital and non-trade revenues has made it an important factor in the movement of the balance of payments. This change in macroeconomic operating conditions makes the exchange rate no longer simply a

horizontal parameter of trade balance, but rather becomes one of the independent variables affecting the balance of payments in a broader sense, its operation and other macroeconomic variables. Operation has created a connection that is associated with a disaster.

The renminbi has been convertible in the current account and is gradually moving in the direction of convertibility of capital projects. The exchange rate issue is not only closely linked to trade policy but also to monetary policy. Changes in the level of the RMB exchange rate have begun to have a complex and profound impact on the domestic economy. With the continuous deepening of reforms and the continuous improvement of the degree of openness to the outside world, the influence of the exchange rate on the operation of the entire national economy will be greater and greater through the influence of foreign trade and domestic and foreign capital flows. Therefore, its importance as a new mechanism for the transmission of monetary policy of the central bank of China will also become more apparent.

# 2.5.3 Kassel's Theory of Exchange Rate Conduction

In 1922, the Swedish scholar G. Cassel founded the Purchasing Power Parity Theory (hereinafter referred to as PPP). The core idea is that the exchange rate is mainly determined by the purchasing power of the two currencies. Although the purchasing power parity theory itself does not involve The relevant content of monetary policy transmission, but the "inflation rate one-one exchange rate mechanism" contained in it contains the significance of monetary policy transmission to a certain extent.

Purchasing power parity refers to the ratio of the purchasing power of the two currencies. It has two basic forms: Strong or Absolute Version of PPP, Weak or Relation Version of PPP. Strongly stated is the decision of the exchange rate between the two currencies at a certain point in time. The weak description shows the exchange rate change between the currencies of the two countries during a certain period. Since the purchasing power is the reciprocal of the general price level, the purchasing power of the currency can be expressed by the general price level.

#### 2.5.4 Keynesian Exchange Rate Theory

It is Keynes who really put the exchange rate issue under the monetary policy

framework for systematic research. In 1923, Keynes first systematically expounded the relationship between interest rates and exchange rates in his book "On Currency Reform," the theory of interest rate Parity (IRP).

The theory of interest rate parity considers the exchange rate from the perspective of international capital flows. It links changes in forward exchange rates to interest rate differences. In the practice of modern countries, this connection is achieved through the transnational arbitrage of funds, that is, through the constant adjustment of interest rates and exchange rates.

The germination of this idea dates back to the study of the long-term exchange rate theory by the German economist Walser and Lotz in the 1890s. He explored the relationship between the spread and the forward exchange rate, pointing out that the forward mark rose because of low domestic interest rates in Germany and believed that the forward exchange rate was not determined by an interest rate but by several interest rates. However, this idea did not attract the attention of the theoretical circles at that time. By the 1920s, with the rise of international capital flows, people became aware of the importance of international capital flows in the exchange rate field.

In the history of international finance theory, Keynes first systematically expounded the theory of interest rate parity. The first one summed up the law of the relationship between forward exchange rate and interest rate difference, and clearly stated that the forward exchange rate was determined by the spread. But the theory of interest rate parity created by Keynes did not shake the dominance of the purchasing power parity theory. Until the Bretton Woods system was disintegrated, the exchange rate oscillated sharply, international capital flows were unusually frequent, and interest rate parity theory was gradually taken seriously and continuously revised and improved.

#### 2.5.5 Currency Exchange Rate Theory

The currency school believes that the exchange rate is the relative price of the two countries' currencies and is determined in the international money market. The purchasing power parity and interest rate parity are included in the money supply and demand model, thus establishing the currency school's exchange rate channel theory. The theory is based on two important assumptions: one is that the money demand function is stable, that is, there is a stable money demand equation, and the other is that purchasing power parity and interest rate parity continue to be effective.

On the issue of the relationship between interest rates and exchange rates, the currency school is completely different from the Keynesian school. According to the above-mentioned logical correlation derived from the interest rate parity theory, the interest rate of a country is lower than that of other countries, which will lead to a large number of foreign short-term capital outflows and the currency exchange rate of the country will fall.

Monetarism believes that if a country's interest rate falls and the interest rate of another country remains the same, the opportunity cost of holding the country's currency will become smaller, thereby expanding the demand for the country's currency and ultimately leading to currency exchange rates. Going up. In the real economy, the relationship between interest rates and exchange rates also presents complexity due to various complex factors. If inflation is added, Keynes's "interest rate parity" transmission relationship can be established under moderate or moderate inflation conditions. In the case of severe inflation, the interpretation of monetarism is more realistic.

# 2.6 Asset Price Channel

In the process of increasing technology, financial derivatives including banks, securities and bonds have developed rapidly. The relationship between economic and financial markets has become closer, the regulation of capital flows has gradually become looser, and financial markets in various countries have become more and more it is more open, forming a global financial market and creating better conditions for the circulation of capital. As financial markets become more sophisticated, the spillover effects of monetary policy have become more apparent. For example, if a country formulates an expansionary monetary policy, the money supply increases, the domestic interest rate decreases, the prices of domestic fixed income assets or stocks increase, and the long-term government bonds and other financial assets decrease.

The price of such assets also It is reduced and plays a role in the redistribution of wealth. At the same time, foreign interest rates and return on assets have increased relatively, domestic capital flows to the international market, foreign asset prices have increased, portfolios have changed, large-scale hot money has flowed into foreign countries, and foreign capital markets have been stimulated to form bubbles, and their financial markets will fluctuate. In addition, the increase in foreign interest rates has led to an increase in credit costs, a reduction in consumption and investment, a reduction in aggregate demand, a decrease in imports and an increase in output. As a result, the nationals will tend to hold more bonds and loans from the expanding countries.

In addition to affecting the real economy through the transmission of interest rates and credit channels, monetary policy can also affect the economy through the transmission of asset price channels. The asset price channel theory was advocated by the famous Keynesian James Tobin and Franco Modigliani who won the Nobel Prize in Economics. Based on Keynes's theory of interest rate transmission mechanism, Tobin describes his asset price transmission mechanism theory in his famous Tobin's Theory. Its transmission effect on monetary policy is called by Western economics. "Tobin Effects". Modigliani proposed another asset price channel for monetary policy transmission based on his "Life-cycle Model".

The relationship between the price of financial assets (stock price) and the real economy in this channel is not established by Tobin Q (the ratio of the current stock market price of real capital to the current replacement cost of real capital) and then the role of investment as a link, but The change in financial wealth and the role of consumption are the bond. Therefore, its transmission effect on monetary policy is called "Wealth Effects on Consumption". In order to make up for the theoretical flaws that monetarists have always called the "black box" without paying attention to the transmission mechanism of specific monetary policy, Karl Brunner and Allan H. Meltzer on monetary policy. The conduction mechanism has been extensively and complexly analyzed, and the famous Brunner-Meltzer Model has been proposed. Because they are in the analysis, they emphasize the change of the relative price of the assets in the conduction process. Role, so their theory and Tobin's Q effect, Modigliani's wealth effect can be summarized into the same asset price channel theory category.

## 2.6.1 Tobin's Q Theory

Tobin's Q theory provides a different monetary policy transmission mechanism than the previous Keynesians, that is, monetary policy affects the real economy by affecting stock prices. When studying the monetary policy transmission mechanism, Tobin divides the entire social economy into the financial sector and the real economic sector according to the general equilibrium analysis method. Tobin believes that the financial sector is a complex of interrelated asset and debt markets, while the real economic sector is a complex of commodity and labor markets in real production. The price of an asset, the interest rate, and the number of assets determined by the interrelated asset debt market affect both the real economy and the real economy (Tobin, 1971).

The degree of substitution of Tobin's monetary policy. Second, interest rates are diversified. What affects the entire economic trend is not just the single interest rate assumed by Keynes, but the contrast of various interest rates. Third, the return of an asset (implicit or marked interest rate) depends not only on the supply of the asset, but also on the supply of other assets. The power of the market mechanism always tends to make the marginal returns of various assets more consistent. Fourth, the demand for an asset is proportional to the return (interest rate) of the asset and inversely proportional to the return (interest rate) of the asset and inversely proportional to the return (interest rate) of various real capitals and on the transaction costs of various assets. Only when the return of an asset is greater than its cost will the production or investment of that asset increase.

According to the above theoretical premise, the transfer process of monetary policy envisioned by Tobin is reflected in the central bank's relaxation of monetary policy (reducing the statutory reserve rate of commercial banks or lowering interest rates, etc.)~ Commercial banks change their asset composition (reducing the currency preserved in the form of reserves, Increase loans or increase certain securities holdings) A certain securities interest rate is lowered. Other members of the society change the composition of assets (reducing the proportion of their securities holdings and increasing the proportion of cash or other assets). One other asset demand increases by one for other assets. The rise in certain securities markets stimulates the production or investment of the asset.

The problem with this conduction process is that the rise of certain securities markets does not necessarily stimulate the investment or production of the real assets represented by the securities. In order to enable the securities market, that is, the stock price to be associated with the real economy, Tobin introduces Q, which is the ratio of the current stock market price of real capital to the current replacement cost of the real

capital. If the Q value rises, it means that the market price of the stock is rising relative to the cost of capital replacement. In other words, when the cost of new plant and equipment is lower than the price of the stock market, it means that Q>1, the company can issue shares and get a higher price than the cost of purchasing the plant and equipment. Since companies can exchange for a large amount of new capital purchases through a small amount of stock issuance, investment spending will naturally increase. The opposite is true. Therefore, only when Q>1, the company will expand investment spending and update equipment, which will eventually lead to an increase in real output. In this way, Tobin's asset price transmission mechanism becomes:

$$M \uparrow \rightarrow i \downarrow \rightarrow Pe \uparrow \rightarrow Q \uparrow \rightarrow I \uparrow \rightarrow Y \uparrow$$

Here, a basic theoretical proposition is that the market price of stocks related to the replacement cost of physical capital is the main determinant of new investment. According to Tobin, Q is the "unique bond" that financial events (including monetary policy) affect the real economy (Tobin, 1971).

First, Tobin's theory of asset price transmission mechanism is an inheritance and development of Keynesian theory of interest rate transmission mechanism. Tobin inherits the general equilibrium analysis method and basic conclusions of the standard macro model of S-LM. Second, Tobin's insistence on interest rates is an important indicator of the effectiveness of monetary policy. Tobin's introduction of Q not only enriches and develops the Keynesian traditional interest rate transmission mechanism, but also makes his asset price transmission mechanism more indirect and detour than the traditional interest rate transmission mechanism, which is more complicated and finer.

However, we should see that Tobin's asset price transmission mechanism depends on the full development of the financial market, but also implies a premise that the real asset price must be sticky. Otherwise, the real asset price and then the replacement cost will rise or fall as its stock market value rises, which will not achieve the monetary policy effect of stimulating investment or restraining investment.

#### 2.6.2 Modigliani's Life Cycle Theory

Different from Tobin's emphasis on the impact of interest rates on the structure of

financial assets, Modigliani introduced the "life cycle theory", which mainly emphasizes the impact of changes in money supply on private consumption through interest rates, and ultimately on social output and national income. In Modigliani's life cycle model, consumption and consumer spending are two different concepts.

The former is the consumer's expenditure on non-durable goods and services, not including the expenditure on durable consumer goods. Consumers generally arrange their consumption evenly over time. The latter is a broader concept that includes not only the former, but also the spending on cars and other durable consumer goods. What determines consumer spending is the lifelong wealth of the consumer, not just the income today. Among them, financial wealth is an important part of consumers' lifelong wealth, and ordinary stocks are an important part of the composition of financial wealth. Therefore, when the stock price rises, it means the increase of financial wealth, the corresponding increase in the life-long wealth of consumers, and the increase in consumer spending, which ultimately promotes output growth. The conduction process can be expressed as follows:

$$M \uparrow \rightarrow i \downarrow \rightarrow Pe \uparrow \rightarrow FW \uparrow \rightarrow LR \uparrow \rightarrow C \uparrow \rightarrow Y \uparrow$$

Where, Pe is the financial asset price (stock price); FW (Financial Wealth) is financial wealth; LR (Lifetime Resources) is life-long wealth; C is consumption.

#### 2.6.3 Summary

All in all, the asset price transmission mechanism theory is a fusion of Keynesianism and monetarism in the study of monetary policy transmission theory, whether it is Tobin's Q effect, Modigliani's consumption wealth effect, or the Bruner-Melcha model. The adjustment of asset portfolio is based on its theoretical basis. Therefore, in the specific analysis of the transmission mechanism of monetary policy, there are many common points: (1) both emphasize the core of asset price changes in the process of monetary policy transmission. (2) both replaced the Keynesian two-asset theory with multi-asset theory; (3) both believed that the role of money as a financial asset in the process of transmission was as important as its role as a trading medium; (4) it is believed that the financial sector's response to the money supply is earlier than the real sector; (5) it is a complement, inheritance and development of the interest rate conduction theory. In Tobin's Q theory, interest rate is already a certain interest rate combination for the financial cost of real investment; in Modigliani's MPS model, it
includes not only the wealth effect, but also the supply effect, including the cost of interest rate changes. Effect; in the Bruner-Mercha model, interest rates are simply one of a variety of relative price prices, stock prices, real estate prices, interest rate maturity structure, long and short interest rate differentials, spreads between commercial papers and treasury bills. These are important yardsticks for measuring the cyclical changes in the relative price of assets.

But their theory also has some differences. Tobin and Modigliani's asset price transmission mechanism requires a relatively developed financial market. And monetarism still believes in the early view of currency transmission, that is, the impact of money shocks on short-term effects, and the long-term impact on prices (money is neutral), regardless of whether the country has developed financial markets, whether it has commercial paper, long-term bonds or Treasury bills, the results are the same. At the same time, in the analysis of the transmission mechanism of monetary policy, although they all describe a similar asset portfolio adjustment process, Keynesians believe that money and financial assets are similar substitutes, while monetarists believe that money and real assets It is a similar substitute. This reflects the empirical differences between the two parties on the interest rate elasticity of money demand and leads to two different important conclusions: the monetarists believe that changes in the money supply will lead to a proportional change in nominal output, while Keynesian does not emphasize this strictness. The proportional relationship.

For the asset price transmission of monetary policy, there is no consensus in the West, and the differences have remained large so far. From the theory of various asset price transmissions, we can see that although the types of assets in the concept can be summarized as two categories of financial assets and real assets, in the real economic society, the types of financial assets are numerous, and the categories of real assets.

Even more, the influence of monetary policy on them does not necessarily make them change in the same direction, and monetary policy is not the only factor affecting them. In particular, the stock market is too sensitive, and the change in its price index is not necessarily a reflection of monetary policy intentions and real economic conditions. Therefore, using asset prices as a channel or indicator of monetary policy transmission may indeed be misleading. However, we cannot deny the inherent relationship between asset prices and monetary policy and the real economy. This connection is theoretically established. In practice, from Melzer et al. to Japan and other countries in the 1980s to the 1990s. The description of the volatility can also prove that monetary policy will have a significant impact on the real economy by affecting the price of assets such as stocks and real estate. When deflation occurs, the prices of real estate and other assets decline, family wealth decreases, consumption and expenditures decrease, and total output decreases, and the economy shrinks; vice versa. Therefore, it should be said that the transmission mechanism of asset prices is objective.



## **Chapter 3 METHODOLOGY**

Nowadays, globalization and collectivization have become the trend of economic development, and cooperation between countries has become increasingly close. Independent development behind closed doors is not feasible, and the economic development of various countries is gradually becoming more dependent on other countries. Since the establishment of the Belt and Road Initiative between China and Thailand, China and Thailand have continuously deepened cooperation, and Thailand's economy has developed rapidly. But from another perspective, the implementation of the "Belt and Road" strategy may lead to differences and misunderstandings between China and Thailand, and even disputes, thereby endangering the cooperative relationship between the two parties. To this end, China and Thailand need to further reach consensus and other awareness, avoid conflicts, and move forward together. This article uses quantitative research methods, mainly creating and using SVAR models, through impulse response functions and variance tests, to explore how my country's quantitative and price-based monetary policies affect Thailand's economy.

#### **3.1Connotation of the Spillover Effect of Monetary Policy**

The spillover effect of monetary policy refers to that the adjustment of a country regarding its monetary policy would influence the economy and finance of other countries. According to the current research outcomes, the influences of this effect is reflected in four aspects, interest rate, exchange rate, commodity price and trade balance. The influence on the economy of one is considering country from the spillover effect of other countries' monetary policies, whether it's monetary policy could realize the expected outcome is uncertain.

Therefore, all countries should adopt reasonable coordination mechanism to effectively ease and even solve the conflicts arisen from the spillover effect, in the era of economic integration. The test and study of this effect include: 1. Its existence; 2. How it works. For the existence of spillover effect, scholars overseas mainly focused on the U.S. and European countries and used the dollar pricing model to explore the influences of the monetary policies of both sides. It was considered that the expansionary monetary policy in the European region would form a negative spillover effect on the output and demand of the U.S. Some scholars didn't follow the traditional way of using the money supply as a tool to discuss the spillover effect of the monetary

policy. In an innovative way, they used the Taylor Rule instead to explore the relationship of the interest a country with the welfare of other countries and the results suggest that under the productivity monetary pricing, the low interest rate a country would lower its welfare in a short period but raise the welfare of other countries.

It could be concluded by sorting out the current research outcomes upon the spillover effect of the monetary policy that the monetary policy of a country would exert a spillover effect on other countries, especially big economies. This has been universally acknowledged in the academia. However, disputes still exist in answering to the questions concerning how serious the spillover effect could be, how it works specifically and which economic variables would change because of it. The author's opinion is: the spillover effect of monetary policy is somehow complex as it involves a series of associated factors.

Any functioning mechanism would cause the expansion of the spillover effect of monetary policy. Thus, it is necessary to study the monetary policies of other countries before formulating the monetary policy, especially the major economies as the monetary policy would bring about the spillover effect. It means, the formulation of the monetary policy needs to take more factors into account and only after multiple times of considerations can a reasonable monetary policy be formulated. Therefore, a country should fully consider its economic development situation with integration of the influences by the policies of other countries and, through all efforts, abandon the old ways of policy-making that sees the neighboring countries as irrelevant. Only formulating the monetary policy through comprehensive coordination can the policy be ensured to realize expect outputs and a win-win situation for all parties involved.

## **3.2 Relevant Theory of the International Transmission Mechanism of Monetary Policy**

3.2.1 Income Linkage Mechanism for Global Transmission of Monetary Policy

Fluctuations in the economy of a country would cause changes in the income of other countries and further lead to the fluctuations in the output. The output has a functional relationship with consumption, investment and net export. So, it is determined jointly by income level, relative price and interest rate home and abroad. When the economy of a country expands, it can obtain a more considerable income and

realize greater net import. Meanwhile, the relative countries would also achieve more net export and income. Considering the existence of trade multiplier, the output of the relative countries would be noticeably affected. Therefore, the dependency between economies is directly correlated to the proportion of foreign trade in the national income.

## 3.2.2 Monetary Linkage Mechanism for the Global Transmission of Monetary Policy

We can use the Mundell-Fleming model to explain this mechanism. The model includes several formulas and it can reflect how the macroeconomic policies of a country influences other countries. Assumptions are taken that there are two countries which can manufacture only one available product respectively for trade as an imperfect substitute of that of the other country and the capital could freely flow between the two countries. The model reveals that under the fixed/floating exchange rate, how the economic policies could transmit. If the exchange rate is fixed, the interest rate and output would change when the government adjusts the monetary policy. If a country's propensity to import is constant but the trade balance changes somehow, to maintain an unchanged exchange rate, the government would adjust the foreign exchange reserve. In this way, the money supply, interest rate and output of the country and the other country would change accordingly. If the exchange rate is floating, the fluctuations in the trade balance would surely affect the exchange rate, which in return exerts the influences on the trade balance and the capital flow. The money supply, interest rate and output of the two countries would change accordingly. Therefore, the spillover effect of monetary policy is reflected in terms of currency and income.

There are several currency mechanisms:

(i) Keynesianism monetary policy transmission mechanism. Its initial idea is: the exogenous variable (money supply), uses the money supply to influence the interest rate. The changes could lead in the capital marginal effect and in the interest rate to drive the investment into rising or fall as per the multiplier formula. The total expenditure and income would also change accordingly. The specific mechanism is  $M \uparrow \rightarrow r \downarrow \rightarrow I \uparrow \rightarrow E \uparrow \rightarrow Y \uparrow$ , where M represents the money supply, r means the interest rate, I mean the investment, E and Y means the total expenditure and income. After the central bank changes the money supply, the interest rate would change thereafter and the investment and the total income would grow accordingly. However, this mechanism only explains the influence of the money supply on the commodity market and fails to

explain the influence in return. So, it is also called partial equilibrium analysis.

General equilibrium analysis could explain the influences of the commodity market and monetary market on each other. If the monetary supply goes up but the transaction demand for money stays constant, the speculative demand for money would grow stronger and the interest rate would be lowered thereby. LM curve keeps moving downward and the economic balance point would move to the right, which means the rise in the income. Therefore, the money supply is positively correlated with the national income but negatively correlated with the interest rate. Then the rise in the income would lead to stronger transaction demand for money. If the money supply stays constant, the demand for the speculative money would be inhibited, and the interest rate would rise thereafter. L1 and L2 in the IS-LM model would expand and decrease respectively. This is the whole mechanism of the commodity market working on the monetary market. After the rise in the interest rate, it would surely affect the commodity market, and the investment and income would both decrease. The monetary market would respond to the commodity market at the same time, which means the income falls, L1 shrinks, and L2 grows. This would further lead to the fall of interest rate. This process keeps looping in this way. Therefore, the income and the interest rate would stay constantly balanced around an equilibrium point. On this point, the monetary market and the commodity market is balanced, where I = S and L = M. Keynesianism focuses on how interest rate fluctuates after changes in the money supply, so its core objective lies in the interest rate.

(ii) The monetary policy transmission mechanism advocated by the monetarism. The scholars supporting this mechanism points out that the Keynesianism theories fail to consider the relational complexity. Ordinary capital investors would hold a portfolio of investment in terms of money invested in the loan and stock market, real asset and the investment in the real estate and durable consumer goods. Changes in the monetary policy would cause change in the initial asset balance. After such kind of changes happens, investors would adjust the previous investment portfolio. However, once the assets stock (in the total economy) remains unchanged, the adjustment of the investors could only cause changes in the relative prices of the invested assets, which means the money supply would rise to some extent but the variables in the monetary demand function stay constant.

Therefore, the actual monetary demand doesn't change and the national nominal

money balance is thereby higher than the expected money balance. In such a situation, people would invest the additional money in trades, such as buying bonds, stock shares and real assets, transferring the additional money to others. If all people do in this way, the asset price rises, the interest rate falls, the investment grows, and the output and the income also increase. Under this circumstance everyone will increase their monetary expenditure, thus the price of commodities will grow accordingly. Until the actual value of the money supply decreases to the actual demand for money, it would return to a balanced status. Friedman pointed out that in the whole monetary transmission mechanism, the interest rate doesn't exert any influence while the role of the money supply is immense. However, it doesn't specify the role of the total expenditure. The monetarism theories believe that the traditional transmission mechanism is not only complex, but also involves some uncertain factors. So, many Western scholars call this mechanism as "Black Box Theory".

(iii) Other transmission mechanism theories. ① Tobin effect. The q theory proposed by James Tobin elaborates on the relationship between the stock prices and the investment expenditure. The 'q' in this theory means the quotient of the enterprise market value and the replacement cost of capital. If the capital of new plant and equipment is lower than the enterprise market value, then when the enterprise issues stock shares, it can obtain a price higher than that of the purchased equipment.

Since the manufacturer could buy more new investment goods with issuance of a small amount of stock shares, the investment expenditure would also go up. In reverse, when q is very low, the enterprise market value is lower than the capital cost. At this time, it won't buy new investment goods but tends to purchase the capital of other enterprises at a low price. In this way, the investment expenditure would be significantly lowered. The monetary policy works on the stock prices through the following mechanism: If the money supply M increases, the money held by people would exceed their own demands, then people would spend the additional money.

The stock market would be a good choice and the demands for stocks would grow, which further raises the stock price Ps. The higher Ps, the higher q. Then the investment expenditure I and the output Y would also rise. The monetary transmission mechanism is:  $M\uparrow \rightarrow r\downarrow \rightarrow Ps\uparrow \rightarrow q\uparrow \rightarrow I\uparrow \rightarrow Y\uparrow$ . ② Interest rate effect. The structural model of the early Keynesianism school is built on that consumer usually pays for the durable goods by loans, like cars.

The objective of the model is to find out the exact influences that the interest rate exerts on the expenditure of durable consumer goods. This school advocates that if the interest rate falls, the cost of purchasing the durable goods would be lowered and consumers would buy more goods of this kind. The specific mechanism is:  $M \uparrow \rightarrow r \downarrow \rightarrow$ expenditure of durable consumer goods.  $\uparrow \rightarrow Y \uparrow$ . ③ Wealth effect. Franco Modigliani is the first one who used the famous lifecycle assumption to study the wealth effect of the monetary policy. The theories, he proposed, were built on the lifetime assets (LA) of consumers, rather than the current income.

The lifetime assets mainly include the financial wealth (FW), such as ordinary stock shares. Once the stock price rises up, the financial wealth would thereby increase and the lifetime wealth of consumers grow bigger, as a consequence of which the consumer would consume more. The wealth effect proposes that if the money supply grows, the interest rate would decrease and the stock price would go up. In this way, people's financial wealth grows bigger and the expenditure of consumption(C) also increases. The specific mechanism is  $M \uparrow \rightarrow r \downarrow \rightarrow PS \uparrow \rightarrow FW \uparrow \rightarrow LA \uparrow \rightarrow C \uparrow \rightarrow Y \uparrow$ . (4)Liquidity effect. The scholars supporting this theory pointed out that the stock market is the key to determining the expenditure of the durable consumer goods. This is mainly explained by the non-liquidity of this kind of consumer goods. When people have the demand for cash, if they expect to get cash by selling the durable consumer goods, they would usually sustain a big loss; but if it's the liquid financial assets like bank deposits and stocks, they could get cash at their current market values to meet the demand in capital. Therefore, if the probability of the financial difficulty rises, the expenditure of the durable goods consumption would fall, and vice versa.

Consumers would evaluate the probability of financial difficulty according to their assets and liabilities. It means when people's financial assets value exceeds the value of liabilities, it would be very unlikely to see the financial difficulty in the future. In this case, consumers would be more willing to increase the expenditure for the durable consumer goods [24]. At this time, when the stock prices climb up, the financial assets value also goes up, and the expenditure of consumer goods would rise thereafter. This is because when the financial situation is stable, people would tend to predict that the The specific mechanism financial difficulty is unlikely to happen. is:  $M\uparrow \rightarrow r\downarrow \rightarrow Ps\uparrow \rightarrow Value$ of financial assets↑→Probability of financial difficulty  $\downarrow \rightarrow$  Expenditure of durable consumer goods  $\uparrow \rightarrow Y \uparrow$ . (5) Exchange rate effect.

The current economic development is going globalized, and the exchange rates also fluctuates along with the development of the global trades. The exchange rate has become an important factor influencing the net export. For example, if the money supply grows, the currency value of the country would fall. In this way the exchange rate of the country would go down, while the foreign exchange rate E would rise, leading to the increase in the net export Nx and the total output Y. The specific mechanism is  $M \uparrow \rightarrow r \downarrow \rightarrow E \uparrow \rightarrow NX \uparrow \rightarrow Y$ .

## 3.2.3Price Linkage Mechanism of the Monetary Policy Global Transmission

Hmada Sakuri well explained this mechanism. After a country adjusts its monetary policy, the prices in that country would change, leading to the fluctuations in the prices and output of other countries: First, the fluctuation in the prices of imported investment goods would affect the demand and output of other countries; Secondly, the imported goods would become more expensive, raising the wage and prices of other countries; thirdly, the imported goods would become more expensive, along with the changes in the trade conditions, it would cause the fluctuations in the trade balance, further affecting other countries' balance and foreign exchange reserve.

Under the background of the global economic integration, a country's economic policies would influence other countries and regions, which generates the spillover effect. The monetary policy follows the same rule. The monetary policy formulated by a country could influence not only the domestic economy through interest rate, asset price and credit, but also exert influences on other countries' finance and economy. As the biggest economy in the world, the U.S. has a huge influence on the global economy, so dollars matter a lot in the global currency system.

Therefore, the federal monetary policy attracts the most attention from researchers for its influence on the global economy. For the spillover effect of American monetary policy on other countries, according to the current opinions, it works via exchange rate, interest rate and capital flow. The exchange rates of most Western countries are floating. The impact brought by American monetary policy would be offset by the changes of exchange rate and interest rate. Cook & Hahn (1989), Poole & Rasche (2000), Kuttner (2001), Cochrane & Piazzesi et al. (2002) explored how other countries' interest rates were fluctuated after America changed its monetary policy. Bredin et al. (2007, 2010) analyzed the influence exerted by America on the British stock market after the former changes its monetary policy. Wonswan (2006, 2009, 2011)

studied the stock markets of the U.S., Japan, Korea and Thailand to identify that the macroeconomic information of developed countries is the key factor determining the direction of emerging stock markets. Craine & Martin (2008) carried out an empirical study on spillover effects of the impacts of monetary policy and the impacts of non-monetary policy. It was found that after the U.S. adjusted its monetary policy, the bond yields in Australia would fluctuate accordingly. But this didn't work in a reversed way.

Compared to a short term, the impacts exerted by the spillover effect of American non-monetary policy is more obvious in a long term. Fatum & Scholnick (2008) explored the relationship between the impacts of the monetary policy and the exchange rate and found that it was unable to correctly evaluate the relationship between the monetary policy and the impacts on the exchange rate without separating the predicted parts and impacts in the adjustment of the monetary policy. After adjusting the monetary policy, the exchange rate would fluctuate in a short term, and the influence of the exchange rate on the monetary policy would also show in just a day. Ehrmann & Fratzscher (2006) pointed out that the U.S. raising its interest rate would exert a negative influence on the Asia-Pacific area's stock markets. Kim et al. (2009) explored how the U.S. and EU influenced the Asian countries' stock markets by adjusting their own target interest rate. It was concluded: if the expected target interest rate cannot be achieved, the stock markets in Asia would receive an obvious negative effect. And the fluctuations in the target interest rate would cause the fluctuations in the stock markets in Asia. Valente (2009) studied Hong Kong and Singapore as the two areas vary in the exchange system with other aspects remaining basically the same.

The research outcome suggests: being influenced by the spillover effect of American monetary policy, Singapore's floating exchange rate system is not significantly differentiated from the fixed exchange rate system of Hong Kong considering their responses to the above influences, which contradicts with the forecast of the traditional economic theories. The conclusion was also verified by Reinhart et al. (2004). They collected related data from 153 countries during 1946 and 2001 for their study and it was found that only 4.5% countries adopting the floating exchange rate system could completely offset the interest margin with the fluctuation in the exchange rate. Gu (2007) pointed out in its study that the European Central Bank adopted the inflation target system but the European price level is still largely determined by the U.S.

Therefore, when the Euro zone making a decision related to the interest rate, they usually need to consider the "American factors". Wang et al. (2006) explored various factors related to China's interest rate policy under an open economic background and found that the influence of the U.S. on China's interest rate is higher than that of any other developed countries. Once American economy fluctuates, the interest rate in China would also fluctuate. By now, the domestic financial and capital accounts haven't been completely opened. The above influences majorly come from the decision made by the domestic monetary organizations based on the American economic situation and monetary policy.

By comparison, domestic monetary organizations consider much less about the Japanese and European areas. Wu (2003) introduced the MFD model to discuss the spillover effect of American economic policy on China by using the fluctuation of Chinese RMB currency value and it was found that if the U.S. launched an expansionary fiscal policy, it would motivate the economic development of China. Xiao (2011) applied Bayes VAR and principal component analysis to explore how American monetary policy influences Asia. He pointed out in the study that most Asian countries adopt fixed exchange rate policy and the response in the exchange rate is far less obvious than the foreign exchange reserve and interest rate. Xu (2010) used a SVAR model to analyze and found that the global liquidity inflow would motivate the domestic monetary authority to launch an expansionary monetary policy, which would cause the problem of excess liquidity.

However, the above influences are more obvious in money supply, nominal interest rate and foreign exchange reserve but insignificant in the real economy (Holman et al. 2002) explored the influence of American expansionary monetary policy on Canada and results show the existence of the spillover effect (Sun et al 2005) carried out an empirical study upon the interest margin fluctuations in Korea, Thailand, China and Indonesia and the subsequent macroeconomic changes via an asymmetric shock method. The results show that the four countries would actively intervene the foreign exchange market for consideration for stable exchange rate. In the end, the interest rate in the four countries would tend to be consistent and the interest margin keeps decreasing. The fundamental reason behind the economic fluctuations of the four countries lies in the domestic economic factors rather than external impacts. A reasonable exchange rate system could help to maintain a stable development of economy.

Based on the existing literature, the author introduced the following variables into the model in order to explain how China's monetary policy influences the economy of Thailand in a more objective and scientific way: interest rates, money supply, exchange rates, balance of trade, price index, global commodity price index and output of China and Thailand.

### **3.3 Open Economic Theory Model**

### 3.3.1 The Origin and Development of the MUNDELL-FLEMING Model

The MUNDELL-FLEMING model is essentially a combination of the MUNDELL model and the FLEMING model. The former is to study the exchange rate between countries and the latter is to study the floating exchange rate system between currencies. The commonality is to study the large-scale currency. Relationship between. After the end of the Second World War, many countries adopted state means to intervene in the economy.

Keynesianism prevailed and a fixed exchange rate system was widely adopted to put the domestic economy in a favorable position. Then, with the disintegration of the gold-centered system, the Bretton Woods monetary system was established, and the dollar-centered world monetary system replaced the original gold system. Among them, the MUNDELL model mainly analyzes the fixed exchange rate system with universal significance, studies the regulation of the country's balance of payments in international financial activities in the economic structure of open countries, and defines a series of economic aspects that can be adopted. The macro policy to adjust the economic system, but also can use this model to analyze how the big and small countries adopt different economic macro adjustment methods to further stabilize the exchange rate system.

After the 1960s, the international situation was in turmoil, and both the economic and political worlds have undergone major changes. The source was that in the late 1960s, the United States accelerated the rate of US dollar issuance due to domestic economic problems, and further transfer of domestic inflation to the world economic structure led to worldwide inflation. This is mainly due to the fact that under the modulation of the international fixed exchange rate, once the issuer of the reserve currency such as the United States accelerates the issuance of the domestic dollar, the direct result is that the other countries with the dollar as the center will also be madly accelerated.

The direct cause of inflation is that foreign central banks must purchase such a dollar reserve in order to maintain the overall exchange rate, thus increasing the supply of domestic money. In summary, under the fixed exchange rate system, economic inflation has an overall transitivity. After the Second World War, the economic development of Germany and Japan was very rapid, and the comprehensive strength was rapidly enhanced, which led to the relative decline of the overall economic strength of the United States. As a result, the relevant financiers gradually began to focus on the yen.

The status gradually declined and financial capital began to seep from the United States. Under this circumstance, the United States has been unable to integrate the world's overall economic policies to formulate corresponding domestic policies. Therefore, it is only possible to formulate relevant policy mechanisms based on domestic economic conditions to consider the domestic citizens' economic situation. The direct result of this phenomenon is in the last century. In the late 1960s, the control power of the Bretton Woods system with the fixed exchange rate system as the core gradually began to weaken, and it could no longer show the original regulatory power.

Since then, from the late 1960s to the early 1970s, the entire international currency crisis centered on the US dollar has begun to erupt, and the scope of the crisis has become increasingly common and the crisis has been expanding, and more and more countries are affected. Eventually, a worldwide financial and economic crisis broke out, and at the same time, due to the oil crisis, most oil exporting countries increased oil export prices, which eventually led to the collapse of the Bretton Woods system. Under such a world financial background, industrialized countries have gradually adopted a floating exchange rate system to replace the fixed exchange rate system.

Using the FLEMING economic model to study the regulation of income and expenditure between large and small countries in the open economy under the floating exchange rate system, and the actual macroeconomic policies of the country. After a series of developments and studies, the current results of economic research in two cases are combined. In the strict sense, the MUNDELL-FLEMING model is mainly defined as the study of countries in the open economy to regulate the balance of payments and related macroeconomics. Policy theory.

### 3.3.2 MUNDELL-FLEMING Theoretical Model

Under the conditions of a world-wide open economy, national government agencies not only require a macro balance, including price levels, employment conditions, and the growth of the national economy, but also complete the same economic policy, while at the same time achieving a balance of external economic conditions. The balance of payments has reached equilibrium. The balance between domestic and foreign countries is an important manifestation of the country's economic security and reliable development, and it is also the goal of its development. In order to achieve this goal, it is necessary to select relevant policies and institutional tools including monetary, fiscal and exchange rate policies to regulate and adapt to development under market economy conditions. In the 1950s, relevant British economists proposed the theoretical concept of the Mead conflict.

Mead conflict believes that if a single government tool policy is used, it is necessary to achieve both the domestic and international substantive goals. And its final result will only create a dilemma for decision makers. In the 1960s, the economist Mundell put forward the opposite view. He believed that as long as they can correctly understand and use monetary, fiscal, and exchange rate policies, they can achieve a balance between the inside and the outside. This was proposed by him and later further modified by Fleming to form the famous Mundell-Fleming economic mathematical model at this stage, which is why we are currently analyzing the exchange rate system of different countries under different circumstances and different the relevant economic policies formulated under the conditions of capital flow provide a very good framework for economic analysis. However, it should also be pointed out that the use of classical MF models is generally used in the study of economic policies in developed countries, and whether the development of developing countries is really practical, the current research cannot give accurate Answer and affirmation.

As the development of China's economic market matures, the changes in international currency interest rates have also stabilized. At the same time, the relevant marketization process and the degree of capital openness have gradually increased. Based on this market situation, China's existing economic policy environment is already very To a large extent, it meets the premise assumptions required by the MF model, so the results of this analysis are also quite valuable for research.

The mathematical economic model of Mundell-Fleming (M-F model) is mainly derived from the further application of IS-LM model, which is composed of three correlation curves and three dielectric equations with different meanings, including IS curve equation, LM curve equation and BP curve equation.

(1) The IS curve equation is

$$SP(Y) + T + M(Y) = I(r) + X + G$$

Among them, Y, r, SPM represent the national income of representative countries, interest rates of representative countries, private sector savings and imports, which are all about the increase functionY, which is mainly used to reflect or express the leakage factors of the national economy and related injection factors, and to reflect whether the overall national or international commodity market is balanced or not. In addition, I is regarded as a subtraction function of investment interest rate, corresponding to Y, its variable function includes T, G, X represents the national tax, the overall government expenditure, and the national export volume respectively.

(2) The LM curve equation is

$$Ms = Md = L(r, Y)$$

Among them, L, Y, r represents the function of money demand, the function of increasing money demand and the decreasing function of speculative demand respectively, while Ms and Md mainly represent the two economic behaviors of money supply and money demand, respectively. the curve is mainly based on the study of market money, reflecting the equilibrium of the international money market.

(3) The BP curve equation is

$$CA + K = X - M(Y) + K(r) = 0$$

The main content of its research is to reflect the efficiency of income and expenditure balance between countries as a whole. Mundell, the founder of the research model, believes that the balance of external research is mainly the balance of total balance between projects, working capital and financial investment.



Figure 3 Economic Model of Mundell-Fleming

The M-F model is mainly to explore the overall economic model from a theoretical point of view, and the research and discussion is mainly based on the exchange of policy views under the two systems of completely fixed exchange rate and completely floating exchange rate. However, in real life, the monetary exchange rate regime adopted by countries is mainly between these two extreme models, and there are few extreme models. It is necessary to synthesize the two models in order to get the relevant practical research model.

3.3.3 Development of the Macroeconomic Model of the New Open Economy

The macroeconomics of open economy are referred to as international macroeconomics and belongs to the important research field of economics. Following the Second World War, the opening economic macroeconomics of the Keynes-based Mundell-Fleming model (Mundell, 1963; Fleming, 1962) and the Dornbusch model (Dornbusch, 1976) were initially developed.

The early open economy model mainly solved the relationship between some major macroeconomic variables to a considerable extent, but did not solve an important defect--the lack of micro-foundation. Lucas further judged that macroeconomic analysis lacking micro-foundation would be biased, because changes in macroeconomic variables would largely affect the conceptual decision-making of micro-financial economic individuals, leading to a critical relationship between the entire macro-variables. Sexual change. In the late 1970s, the rise of neoclassicalism provided a fairly accurate micro-foundation for international macroeconomics to a certain extent. On the basis of combining the personal utility function and maximizing it, we have once again reanalyzed the problems between the previous international macroeconomics, including the exchange rate, interest rate and physical price between currencies, while further it studies the absolute impact of relevant state fiscal and monetary policies on people's production and consumption.

After the 1990s, the open economy model was further developed. In 1993, Romer proposed to establish two mutually influential and mutually balanced monopolistic competition to develop the economy. The shortcoming is that the analysis process is static and its micro-foundation is insufficient. In the same year, Dixon proposed to form a static open economy model based on the premise of perfect competition to adapt to the economic model at that time. In 1995, Obstfeld and Rogoff pioneered the two concepts of monopolistic competition and nominal price stickiness in the equilibrium model for the first time. This model is a dynamic model, and at the same time, it proposes a micro-foundation for analyzing the main body of the world economy. In the past ten years of this century, research and analysis of international macroeconomic issues are based on this analysis method, and the research results are endless, and these results are collectively referred to as "new open economy macroeconomics."

The common feature of the new open economy macroeconomic model is the introduction of two factors: nominal rigidity and market incompleteness. Both have a clear micro-foundation and are placed in a dynamic general equilibrium model. One of the most important features of this new model is that monopolistic competition is essential in both the commodity market and the factor market. First of all, in the fully competitive market behavior, the pricing behavior in the entire monopolistic market can be analyzed very clearly. Secondly, in a certain price range, it is necessary to continuously adjust the output to prevent damage to the market profit and reduce the loss caused by the equilibrium monopolistic market price higher than the marginal cost.

At the same time, in the short term, the output level of the market is quite complete by the demand. Decide. Finally, due to the existence of the monopoly economy in the market, the equilibrium market output level in the overall economy is considerably lower than the current optimal output level in the society. Under such market conditions, effective monetary and related fiscal policies are further adopted. To a certain extent, it is possible to weaken the degree of distortion brought about by such a market, and thus improve the welfare level of the whole society. This kind of new open economy macroeconomic model not only takes into account the rigor of the market intertemporal approach, but also combines the relevant qualitative conclusions of the classical methods of the last century. In this case, the concept of the intertemporal method is further integrated into the transmission mechanism of policies such as international currency.

The conceptual model and connotation include short-term nominal price rigidity and a fairly clear micro-foundation of market aggregate supply. At the same time, the economic model also gives a very specific form of mathematical function, which is convenient for solving the optimization problem. The maximum solution is based on the function of the equation, which makes the welfare analysis of the market economy quite clear. The introduction of nominal rigidity and incomplete market in this model not only reaffirms the importance of macroeconomic policies in the economic market, but also changes the influence of transmission mechanisms brought about by peripheral economic shocks. In view of this, the market model analysis method has become the leading method and method for the analysis of international economic research.

# 3.3.4 Summary of the Viewpoints of the Macroeconomic Model of the New Open Economy

First, nominal rigidity. Nominal rigidity is one of the important characteristics of the macroeconomic model of the new open economy. It is the method of exogenous assumptions that enters the entire analytical framework. Commodity prices and wage levels are their nominal variables. Rigidity refers to a certain degree of rigidity in the short term, which is equivalent to viscosity. In the discrete model, the nominal variable is set to be set in advance, so that the nominal variables of the current period remain unchanged when subjected to external market economic shocks. After entering the next period, the relevant nominal variables will be based on market demand and make adjustments.

This has led to a short-term and long-term effect of the market economy after suffering from market shocks. In the case of specific case analysis, if the nominal rigidity is derived from the menu cost, the manufacturer needs to adjust the market output level according to the industrial demand, no matter how much the external demand shocks need to complete this. Corsetti and Pesenti have pointed out that in the case of large external demand shocks, the marginal cost is higher than the price target manufacturer will violate the constraints, and the market output will no longer be determined by the completeness of market demand.

Therefore, the top analysis should limit the extent of the exogenous impact to a certain appropriate range. In this case, the analysis method is more reasonable and accurate. The most common situation is the nominal price stickiness. If the expansionary monetary policy adopted by the state increases the consumption demand of the overall market economy, in this case, the price stickiness will lead to an increase in the overall market output level, which in turn will increase the overall relative consumption. Level. On the other hand, the use of expansionary monetary policy to some extent causes the currency to depreciate, which in turn leads to the deterioration of the terms of trade between the two sides. It can only improve the welfare level of the corresponding country unilaterally, so that the exchange effect of the exchange rate can make the two countries Share the advantages arising from or brought about by expansionary monetary policy. Nominal rigidity includes nominal price stickiness and nominal wage stickiness. Calvo (1983) puts forward the assumptions about the adjustment of the interlaced price. The manufacturers have the same probability and probability to decide whether to adjust the relevant price. This leads to the fact that only some manufacturers can adjust the price for a period of time. Prices have changed smoothly.

Second, market segmentation. In 1995 Obstfeld and Rogoff proposed an important assumption of the standard model - the one-price rule is always. Later, Betts and Devereux pointed out that the international price of tradable goods sometimes deviated from the one-price rule in the case of real fluctuations in the real exchange rate. The meaningful and in-depth discussion of introducing international market segmentation and market pricing into the standard model is based on some obstacles and barriers in international trade that lead exporters to discriminate pricing in different markets.

Before the economic shock occurs, it is necessary to set the substitution elasticity of all commodities to be the same when the one-price rule is established. At the same time, the optimal pricing decision also enables the manufacturers to further set the price of goods sold in different markets to a relatively fixed marginal cost. addition. However, the existence of nominal price viscous makes the one-price rule no longer established when the impact comes, and the consequence is that exchange rate fluctuations no longer have a complete traversal effect. Therefore, the exchange effect of this exchange rate currently depends mainly on the pricing of relevant manufacturers.

The type of currency. If the relevant pricing is made in the currency of the country where the producer is located, the price of the import and export commodities and the exchange rate changes in the same proportion. At this time, the relative change in the exchange rate is complete for the final consumer. On the contrary, pricing in the currency of the country where the final consumer is located, that is, the local currency, will not produce a currency crossing effect, so that the absolute price of imported and exported goods is no longer affected by fluctuations in currency exchange rates. On the basis of this, Goldberg and Knetter pointed out that the degree of currency crossing between different countries is not the same. The volatility of real exchange rates, the international transmission of macro shocks, and the welfare effects of international policy coordination are all related to the traversal of exchange rates, and it plays a very important role in the international economy. Therefore, it is very necessary to understand the relevant influencing factors that determine the degree of crossing. LCP itself is also very influential, but most of the research is to give it as an exogenous and to discuss the impact of LCP on the international macro-economy, but to some extent ignore the self-recognition and decision of the degree of LCP, the elements of.

Third, the exchange rate issue. Since the exchange rate changes directly affect the relative prices of the two countries and then have an impact on the production and consumption of the two countries, the exchange rate issue has always been an important issue in the study of international macroeconomics. The most urgent problem that economic theory needs to solve in reality is the high volatility of exchange rates, exchange rate fluctuations, and changes in other macroeconomic variables. In 1995, Obstfeld and Rogoff's standard model provided a theoretical basic framework for addressing exchange rate issues, emphasizing several important factors that determine exchange rate changes, including money supply, government purchase demand, and productivity changes.

Hau (2000) suggests that the introduction of non-tradable has a new impact on the economy, especially under the impact of asymmetric currencies. Mainly due to the implementation of the expansionary monetary policy in the country, resulting in exchange rate depreciation, non-traded goods to a certain extent weakened the correlation between the rise in the price of imported goods on the domestic consumer

price index.

Under this circumstance, the exchange rate will further depreciate to increase the price of imported goods and then increase the domestic consumer price index so that the supply and demand of the actual currency balance are equal, thus achieving the goal of balancing the domestic money market. The consequence is that the large introduction of non-tradable goods exacerbates the range of exchange rate fluctuations, which is the specific reason for the more volatile exchange rate relative prices. At the same time, the exchange rate effect of exchange rate is quite small. According to the empirical research effect, the exchange rate change will not completely traverse the market price, which is mainly due to the fact that the actual consumer price does not reflect the exchange rate change rate change rate rate of exchange rate effect the exchange rate rate change rate price does not reflect the exchange rate change rate change rate price does not reflect the exchange rate change rate change rate price does not reflect the exchange rate change rate change rate price does not reflect the exchange rate change rate change rate price does not reflect the exchange rate change rate change rate price does not reflect the exchange rate change rate change rate price does not reflect the exchange rate change rate change rate price does not reflect the exchange rate change rate change rate price does not reflect the exchange rate change rate change rate price does not reflect the exchange rate change rate change rate price does not reflect the exchange rate change rate price does not p

The substitution effect between domestic and foreign products is largely unclear to the final consumer, mainly determined by the impact of exchange rate fluctuations on the relative prices of domestic and foreign products. The assumption that the fluctuation of the exchange rate has little effect on the purchasing behavior of consumers is a premise. This also determines that when the market economy suffers from the external economic shock, the exchange rate will have large fluctuations in the market adjustment process, while the exchange rate is low. The effect is also bound to cause relatively sharp fluctuations in the exchange rate. This view was first proposed by Krugman (1989) and studied and analyzed by Betts and Devereux (1996).

Tille (2008) suggests that the substitution of goods between countries can also lead to an increase in exchange rate volatility, mainly due to the fact that the substitution between domestic goods is different from the substitution of goods between countries decided. Bergin et al. (2008) and Kollmann (2001) conducted further research based on the economic market research and analysis framework proposed by Chari, and expanded to make up for the theoretical model and real exchange rate such as variable addition price, custom inertia and nominal There is a general difference between the variability of factors such as wage rigidity and the associated persistence.

Fourth, preferences and technology. The assumption of preference is an important aspect of the micro-foundation model setting because the preferences of the residents directly determine the specific form of the utility function. In the current discussion of open economic models, the intertemporal substitution elasticity of commodities, the substitution elasticity between different commodities, the substitution elasticity between domestic and foreign goods, the substitution elasticity between traded goods and non-traded goods, and the demand for money a series of parameters, such as the elasticity of consumption, need to be further explored and decided.

The consumption elasticity of money demand did not affect exchange rate fluctuations to a certain extent, which was first reflected in the standard model of Obstfeld and Rogoff's research. The exchange rate will not overshoot after the PCPformed pricing, which is based on the fact that each country faces the same real interest rate and consumption growth rate. Obstfeld and Rogoff (1996) suggest that the consumption elasticity of money demand leads to the emergence of important parameters of overshoot in the context of the introduction of non-traded goods. When the consumption elasticity of money demand is relatively small, the balance of the relative optimal currency held by the individual in the country will be at a lower level, and the relative price adjustment between countries is greatly weakened due to the existence of non-traded goods. In turn, the lack of demand for the national currency has caused the currency to depreciate excessively in the short term.

Fifth, macroeconomic policy. Welfare analysis is one of the most significant advantages of the new open economy macroeconomics research method. It uses the specific mathematical utility function form to obtain the model's display solution, which can further generate the production, consumption, and actual currency balance through the economic shock. Changes in related factors to comprehensively examine the impact of macroeconomic policies on the actual welfare of the country. Obstfeld and Rogoff (1995, 1996) established a new open economy macroeconomic framework including analysis of macroeconomic policies, but only one-sidedly emphasized the existence of distortions in production monopoly.

On this basis, Blanchard and Kiyotaki said that the important conclusions in the closed economy model proposed in 1987 are further extended to the model of the new open economy. Monopoly makes wages and prices above the optimal level, and output and consumption are below optimal levels. This is the main feature of the closed economy model. In nominal rigidity, small demand shocks can increase the overall output level closer to the optimal output level and then improve the overall social welfare.

Clarida et al. (2012) extended the previously proposed small country open

economy model to the economic research of the two countries, and further analyzed and analyzed the problems faced by the national government, including currency and exchange rate policies, and the currency in the closed economy under the open economy. Similarities and differences in exchange rate issues. The study found that the degree of open economic model is completely different from the impact of the market consumption price phenomenon on the inflation caused by the index and the absolute inflation caused by the domestic market price. Assuming that the exchange rate in the overall economic activity is completely traversed, under such circumstances, the central bank needs to pay close attention to the overall inflation phenomenon of domestic prices, and can ignore or not pay attention to the impact of fluctuations in the external exchange rate on the consumer price index. The conclusion reached at this time is that the floating exchange rate system is much better than the fixed exchange rate system.

Sixth, uncertainty is introduced. Analyzing the impact of unanticipated exogenous shocks on the economy is the main focus of the basic model of macroeconomics in the new open economy. The model itself does not contain uncertainty to a certain extent. The earliest research aspect of Obstfeld and Rogoff (1998) is about the stochastic economic model. The key point is to assume that domestic and foreign currency shocks satisfy the lognormality as a relatively random process while introducing uncertainty into the viscous wage model. However, at the same time, due to the considerable uncertainty of the money supply, it will affect the setting of equilibrium wages, and further affect the trade conditions, consumption levels and relative output levels. Under such circumstances, the uncertainty of the market economy will inevitably directly affect the overall welfare level of the market.

Seventh, empirical research. The qualitative analysis of international macro issues is another key point of the macroeconomics of the new open economy, and it is another innovation of theoretical research method. At the same time, the research and verification analysis of theoretical models and related developments are inseparable from quantitative data empirical research. The research methods include numerical simulation and related measurement tests.

Comparing the statistical parameters of the endogenous variables obtained by the new open economy macroeconomic theory model with the statistical parameters of the data in the actual economic activities, the numerical simulation is generated. Chari et al. (2002) used this method of data empirical analysis to analyze the effects and impacts

of an exogenous impact on the overall economic fluctuations. Although the final result of the study shows that the national currency can only use this model to explain some of its macroeconomic fluctuations when it encounters certain economic shocks, it cannot therefore negate the important role brought by relevant currency and exchange rate policies. Because to some extent, the variance between the nominal exchange rate and the real exchange rate is often affected by the noise of the market economy environment.

## 3.3.5 New Open Economy Macroeconomics Standard Model

The main research methods of macroeconomics in the new open economy are dynamic programming and log-linear approximation. Obseftdl and Rogoff's (1995) standard model framework use this method for calculations. Briefly describe the main features of such a standard model. The calculation uses that all the elements of the residents in the economic model of the two countries are continuously distributed on [0, 1], but [0, n] occurs in the country and the rest belong to foreign countries. The model uses the currency utility function method to integrate the relevant monetary factors directly or indirectly into the model, and there is a negative correlation between leisure and output. Therefore, the overall output is included in the equivalent individual preferences in the form of negative utility. The partial lifelong utility function of the individual physical consumption index, the currency exchange rate balance and the output of the individual will be related. The specific manifestation is as follows:

$$\Delta y_t = \beta_0 + (\beta - 1)(y_{t-1} - k_1 x_{t-1}) + \beta_2 \Delta x_t + u_t$$

Among them, Ct is the constant replacement elastic consumption index of t period, and the specific form is corresponding to the substitution elasticity between commodities. And the corresponding price index is the theoretical representative, which the nominal currency theory balance is held by the individual. Yt(z) is the output that represents the individual. From the definition of consumption index and price index, we can get a series of downward-sloping demand curve equations that group residents can face. In this theoretical model, there is no fixed capital, and citizens can make reasonable lending behaviors in relevant bond markets around the world. Rt is the actual interest rate of the bond during the whole process from t to t+1, and Ft indicates the individual's relevant interest represents the total number of bonds held in the t+1 period and related options.

Thus, individual z will be effectively constrained by conditions related to budget constraints. In order to achieve the goal of maximizing utility achievements, individual units of citizens must choose the optimal consumption level, currency balance and related labor supply for each period as much as possible and at the same time set the price of the optimized world economic products. At the same time, under the assumption of price stickiness, the price should be set in advance in the first phase, and the adjustment should be made again in the subsequent period. In this way, under the impact of the exogenous economy, the short-term effects of different surfaces and the considerable long-term effects will enable the national economy to exhibit a dynamic adjustment process. The short-term impact and long-term related effects have a common effect on the overall utility function.

In addition, this model can also be used to perform clear related welfare analysis. This is mainly because the increase in output will reduce the level of utility of residents to a certain extent, and the increase in consumption level may result in the positive effect of the labor supply being offset by the corresponding increase in labor supply. Therefore, the most direct factor affecting welfare will no longer be the exchange rate. The effect of the transfer of expenditure and changes in terms of trade. In view of the fact that local residents do not have a special preference for national product attributes, all products of relevance have a certain degree of substitution flexibility, so the expected monetary expansion will maintain a balanced increase in demand and demand for each product. Only in this way can we effectively improve the equilibrium output level when monopolistic competition occurs.

In summary, when the monetary expansion increases the relevant welfare of local residents, it will be accompanied by certain economic spillover effects. The emergence of such phenomena will increase the level of welfare of foreign residents to the same extent. Later, they put forward constraints on the system conditions of prepaid cash, and then continuously strengthened the analysis of this model and obtained the most similar conceptual summary theory. In this respect, unlike the traditional theory, the related advantages of introducing the micro-foundation model are fully proved from the side. The assumptions of the preferences and the basic parameters in the model are the premise that a standard model can draw good conclusions. Therefore, it is necessary to provide a new framework with feasibility and practicality to study the absolute and

relative of the overall international macro. Sexual problem.



## **Chapter 4 DATA ANALYSIS**

### 4.1 Model Setting

Most scholars choose the structural self-vector regression model (SVAR model) when conducting empirical research on monetary policy spillover effects. This model was proposed by Sims & Bernanke (1986), which takes into account the structural relationships of various variables and the influence of the same period. From the aspect of monetary policy transmission effect, it finds the currency shock under the least restrictive conditions, and analyzes how the monetary policy change causes other variables to change through the impulse response function and variance decomposition.

### 4.1.1 Identification and Constraints of SVAR Model

If each in the component is affected by other components in the current period, and the time series  $x_t = (x_{1t} x_{2t}.x_{dt})'$  effect (restriction) of the d dimensionless exogenous, the (7.1.8) equation, the structural non-restrictive SVAR (p) model is

$$A_0 y_t = A_1 y_{t-1} + A_2 y_{t-2} + \dots + A_p y_{t-p} + u_t$$
(4-1)

Or use the lag operator to represent

$$A(L)y_t = u_t, \quad t = 1, 2, \dots, T$$
 (4-2)

In there:

$$A_{0} = \begin{bmatrix} 1 & a^{(0)}_{12} & \dots & a^{(0)}_{1k} \\ a^{(0)}_{21} & 1 & \dots & a^{(0)}_{2k} \\ \dots & \dots & \dots \\ a^{(0)}_{k1} & a^{(0)}_{k2} & \dots & 1 \end{bmatrix}$$
(4-3)

At this time  $A(L) = A_0 - A_1L - A_2L^2 - ... - A_pL^p$  the model is called structural unrestricted SVAR model.

Even if the disturbance term satisfies the condition of white noise, the structural unrestricted SVAR model cannot be established by using the ordinary least square method to estimate the model parameters, because each equation contains synchronously related variables.

If  $A_0$  invertible and  $A^{-1}_0$  inverse matrix exists, the structured unrestricted SVAR model can be reduced to a simplified unrestricted VAR model.

$$y_t = A^{-1}{}_0A_1y_{t-1} + A^{-1}{}_0A_2y_{t-2} + \dots + A^{-1}{}_0A_py_{t-p} + A^{-1}{}_0u_t$$
(4-4)

Or use the lag operator to represent

$$A(L)y_t = A^{-1}{}_0u_t, \quad t = 1, 2, ..., T$$
 (4-5)

At this time,  $A(L) = I - A^{-1}{}_0A_1L - A^{-1}{}_0A_2L^2 - \dots - A^{-1}{}_0A_pL^p$ 

If 
$$A^{-1}{}_0A_1 = D_1, A^{-1}{}_0A_2 = D_2, \dots, A^{-1}{}_0A_p = D_p, A^{-1}{}_0u_t = v_t$$
 (4-

6)

Then (4-3) can be written as

$$y_t = D_1 y_{t-1} + D_2 y_{t-2} + \dots + D_p y_{t-p} + v_t, t = 1, 2, \dots, T$$
(4-7)

The number of parameters to be estimated in the simplified unrestricted model VAR is

$$k^2p + (k^2 + k)/2 \tag{4-8}$$

Where  $(k^2 + k)/2$  is the number of unknown parameters to be estimated in the variance covariance matrix  $C ov(u_t) = E(u_t u'_t) = \Sigma$  of the disturbance term  $u_t$ . Under the condition that the disturbance term satisfies the white noise, (4-7) can be used to estimate the parameters of the model, and the simplified unrestricted VAR model can be established.

We know that even if the disturbance term satisfies the white noise condition, the ordinary least square method cannot be used to estimate the model parameters in the structured unrestricted SVAR model (4-1), because each equation contains synchronously related variables. Since the parameters of the simplified unrestricted VAR model (4-7) can be estimated by the ordinary least square method, according to the relationship between the model parameters of the simplified unrestricted VAR model and the parameters of the structural unrestricted SVAR model (4-5), through the estimated parameters of the simplified unrestricted SVAR model, the corresponding parameters of the structural unrestricted SVAR model. This involves the identifiability of the structured unrestricted SVAR model (4-1) (on the identifiability and its method, see the content of the simultaneous equation in Chapter 14, or depends on the constraints imposed on the structured unrestricted SVAR model.

Because, from the structural unrestricted SVAR model (4-1), it needs to estimate the total number of model parameters

$$k^2p + k^2 \tag{4-9}$$

 $k^2p + k^2 > k^2p + (k^2 + k)/2$ , Therefore, if the structural unrestricted SVAR model (4-1) is not restricted, the parameters of the model cannot be estimated. So, how many restrictions or constraints do you need to impose on the structured unrestricted SVAR model (4-1)? The number of constraints that need to be imposed is exactly

$$k^{2}p + k^{2} - k^{2}p + (k^{2} + k)/2 = k(k - 1)/2$$
(4-10)

That is to say, as long as k(k-1)/2 constraint is imposed, the model parameters of the structured unrestricted SVAR model (4-9) can be estimated. The constraints imposed can be short-term (simultaneous) or long-term.

Structural non-restrictive SVAR model (4-1)

$$A_0 y_t = A_1 y_{t-1} + A_2 y_{t-2} + \ldots + A_p y_{t-p} + u_t, t = 1, 2, \ldots, T \quad (4-11)$$

Among them: 
$$A_0 = \begin{bmatrix} 1 & a^{(0)}_{12} & \dots & a^{(0)}_{1k} \\ a^{(0)}_{21} & 1 & \dots & a^{(0)}_{2k} \\ \dots & \dots & \dots \\ a^{(0)}_{k1} & a^{(0)}_{k2} & \dots & 1 \end{bmatrix}$$

In the case of  $A_0$  reversibility and the  $A^{-1}_0$  existence of an inverse matrix, it can be transformed into a simplified non-restrictive VAR model (4-6)

$$y_t = D_1 y_{t-1} + D_2 y_{t-2} + \ldots + D_p y_{t-p} + v_t, \ t = 1, 2, \ldots, T$$
 (4-12)

Further, when the  $det[D(L)] = |I_k - D_1L - D_2L^2 - ... - D_pL^p| = 0$  root of the characteristic equation is satisfied, the VAR (p) is reversible, so that  $y_t$  can be expressed as  $v_t$  white noise sliding and form.

$$y_t = C(L)v_t = C_0v_t + C_1v_{t-1} + C_2v_{t-2} + \dots$$
, In there,  $C_0 = A^{-1}_0$  (4-13)

According to the basic idea of Cholesky decomposition, the short-term constraint can be directly applied to the  $A_0$ , as long as  $A_0$  becomes the lower triangle matrix whose element is 1 on the main diagonal.

$$A_{0} = \begin{bmatrix} 1 & 0 & \dots & 0 \\ a^{(0)}_{21} & 1 & \dots & 0 \\ \dots & \dots & \dots & \dots \\ a^{(0)}_{k1} & a^{(0)}_{k2} & \dots & 1 \end{bmatrix}$$
(4-14)

Then the structural non-restrictive SVAR model (4-1) can be transformed into a recursive formal structural non-restrictive SVAR model, so that just to identify, the OLS can be directly used to estimate the model parameters of the structural model from the first equation. Modeling.

In practice, a short-term constraint is applied to the structural non-restrictive SVAR model (4-1), or  $A_0$  may not be presented the triangle, as long as the number = k(k-1)/2 is applied.

For example, if we are to establish a k = 3 structural non-restrictive SVAR model

with  $y_1$  (GDP),  $y_2$  (tax),  $y_3$  (government expenditure) as a variable, then we only need to impose k(k-1)/2 = 3 constraint: $a^{(0)}_{23} = 0$ , the current  $y_1$  (GDP) affects the current period  $y_2$  (tax), Does not affect the current period  $y_3$  (G government expenditure); $a^{(0)}_{12} = 0$ , the current period $y_2$  (tax) affects the current period $y_3$  (G government expenditure); $a^{(0)}_{13} = 1.71$ According to previous studies, the tax-related output elasticity is 1.71, and the structural non-restrictive SVAR model can be identified and thus estimated.

The so-called long-term constraint usually refers to the constraint imposed on  $(4-10)C_1, C_2, ...,$  or it can be applied to a certain constraint $C_i$  (i = 1, 2, ...). It is relatively simple to apply to  $C_1$ , similar to short-term constraints, and it can also be applied directly to long-term  $A_1$ .

## 4.1.2 Three Types of SVAR Models

The SVAR model has three main types according to the characteristics of the model: K type, C type and AB type. The most commonly used one is the AB type, and the K type and the C type can be regarded as a special form of the AB type.

It is set  $y_t = (y_{1t} \ y_{2t} \dots y_{kt})'$  as a one-k-dimensional random time series, which p is a lag order, which  $u_t = (u_{1t} \ u_{2t} \dots u_{kt})'$  is a time series of one-k-dimensional random disturbances, and its VAR model structure relationship is:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \ldots + A_p y_{t-p} + u_t, t = 1, 2, \ldots, T,$$
(4-15)

Or written as a lag operator form;  $A(L)y_t = u_t$ , t = 1, 2, ..., T (4-16)

Where:  $A(L) = I_k - A_1L - A_2L^2 - \dots - A_pL^p$ , is the polynomial of the lag operator.Set K to a K-K step reversible matrix, left multiply (4-12), then

$$KA(L)y_t = Ku_t, \quad t = 1, 2, \dots, T$$
 (4-17)

If  $Ku_t = v_t$ ,  $\exists E(v_t) = 0$ ,  $Cov(v_t) = E(v_t v'_t) = I$ , then (4-16) that satisfies the above conditions is called a K-type SVAR model.

Due to 
$$Ku_t = v_t$$
,  $E(Ku_t) = E(v_t) = 0$ ,  
 $Cov(Ku_t) = E(Ku_tu'_tK') = K\Sigma K'$   
 $But Cov(v_t) = E(v_tv'_t) = I$ , so  $K\Sigma K' = I$ 

Under the  $\Sigma$  is known, this means that K a nonlinear constraint k(k + 1)/2 has been imposed, and the remaining K free parameters are left k(k - 1)/2. Therefore, only a short-term constraint k(k - 1)/2 can be given.

For the VAR model (4-11)

 $y_t = A_1 y_{t-1} + A_2 y_{t-2} + \ldots + A_p y_{t-p} + u_t$ ,  $t = 1, 2, \ldots, T$  Or written as a lag operator

$$A(L)y_t = u_t, \quad t = 1, 2, \dots, T$$
 (4-18)

It is set C as a  $k \times k$  reversible matrix, and if  $u_t = Cv_t$  so, the (4-18) model  $E(v_t) = 0$ ,  $Cov(v_t) = E(v_tv_t') = I$  that satisfies the above conditions is a C-type SVAR model.

Since, by definition, this means that a nonlinear constraint  $\Sigma = Cov(u_t) = E(u_t u'_t) = Cov(Cv_t) = E(Cv_t v'_t C') = CC'$  has  $\Sigma$  been imposed, the remaining free k(k+1)/2 parameters remain.

Set to order reversible matrix, left multiply (4-12), then

$$AA(L)y_t = Au_t, \quad t = 1, 2, \dots, T$$
 (4-19)

And the conditions are met:  $Au_t = Bv_t$ ,  $Ev_t = 0$ ,  $Cov(v_t) = E(v_tv_t') = I$  (4-20) is called the AB type SVAR model.

Obviously, when it is a unit array, the AB-type SVAR model is transformed into a C-type SVAR model; when it is a unit array, the AB-type SVAR model is transformed into a K-type SVAR model.

By 
$$Cov(Au_t) = E(Au_tu'_tA') = E(Bv_tv'_tB') = Cov(Bv_t)$$

Know  $A\Sigma A' = BB'$ 

Under known, it imposes a nonlinear constraint k(k + 1)/2 on the pair and  $2k^2 - k(k + 1)/2$  leaves a free parameter.

4.1.3 Impulse Response Function of SVAR Model VAR(p) model:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} + \ldots + A_p y_{t-p} + u_t, t = 1, 2, \ldots, T$$

Write the form of the lag operator as

$$A(L)y_t = u_t, \quad t = 1, 2, \dots, T$$

Where,  $A(L) = I_k - A_1 L - A_2 L^2 - \dots - A_p L^p$  is the polynomial of the lag operator.

 $det[A(L)] = |I_k - A_1L - A_2L^2 - ... - A_pL^p|| = 0$  When the roots satisfying the characteristic equation are all outside the unit, then

VAR (p) is reversible and can be expressed as white noise slip and form

$$y_t = C(L)u_t$$

Where:  $(L) = A(L)^{-1} = C_0 + C_1L + C_2L^2 + \dots$ ,  $C_0 = I_k$  order unit matrix)

Since  $E(u_t) = 0 C ov(u_t) = E(u_t u'_t) = \Sigma \neq I$  (called non-orthogonalization), orthogonalization transformation is required.

Because  $\Sigma$  is a positive symmetry matrix, it can be decomposed into

$$\Sigma = GQG$$

Among them, G is the triangular array, which Q is the only diagonal array whose elements on the main diagonal are greater than zero.

Use G the transformation  $u_t$ ,  $G^{-1}u_t = v_t$ ie,  $u_t = Gv_t$ ,  $Cov(v_t) = E(v_tv_t') = Q$  (is orthogonal)

At this time,  $y_t = C(L)u_t = C(L)Gv_t = D(B)v_t$ 

Similarly, an orthogonal impulse response function can be derived as:

$$d^{(q)}_{ij} = \partial y_{it+q} / \partial v_{jt}, \quad q = 0, 1, 2, \dots; t = 1, 2, \dots, T$$
(4-21)

The cumulative response function caused by the pulse  $y_i$  is:

$$\sum_{q=0}^{\infty} d^{(q)}{}_{ij} \tag{4-22}$$

Among them,  $d^{(q)}_{ij}$  is the first row and the first column element (q = 0, 1, 2, ...).

The matrix can be expressed as:

$$D_q = \partial y_{t+q} / \partial v_t^{\prime} \tag{4-18}$$

That is, the first  $D_q$  row and the first column element are equal to the first variable of the period, and the disturbance term is increased by one unit. When the disturbance term is constant in other periods, the influence on the value of the first variable of the period is affected.

For the SVAR model (4-1)

$$A_0 y_t = A_1 y_{t-1} + A_2 y_{t-2} + \ldots + A_p y_{t-p} + u_t, t = 1, 2, \ldots, T$$

A simplified non-restrictive VAR model can be formed when  $A_0$  is reversible

and exists  $A^{-1}_{0}$  in the inverse matrix.

$$y_t = C_1 y_{t-1} + C_2 y_{t-2} + \ldots + C_p y_{t-p} + e_t, t = 1, 2, \ldots, T$$

Further, when the root of the characteristic equation  $det[C(L)] = | I_k - C_1L - C_2L^2 - \dots - C_pL^p | = 0$  is satisfied, the VAR(p) is  $y_t$  reversible, so that  $v_t$  can be expressed as white noise sliding and form.

$$y_t = H(L)v_t = (I + H_1L + H_2L^2 + ...)e_t$$
  
= (I + H\_1L + H\_2L^2 + ...)Gv\_t  
= D(L)v\_t

Therefore, the matrix of its impulse response function can also be expressed as:

$$D_q = \partial y_{t+q} / \partial v_t$$
 (4-23)

If the SCAR model is AB, its impulse response function is:

$$D_a = H_0 A^{-1} B \tag{4-24}$$

The cumulative impulse response function is:

$$\sum_{q=0}^{\infty} D_q = (I + H_1 L + H_2 L^2 + \dots) A^{-1} B$$
(4-21)

### 4.2 Variable Selection and Data Description

### 4.2.1 Variable Selection

In this study, the focus is laid on how China's adjustment of monetary policy would affect the economy of Thailand under the "Belt and Road" Initiative. Referring to the approaches of the related scholars, the intermediate target variables of the monetary policy, namely the year-on-year growth rate of M2 and one-year deposit rate, are used to measure the monetary policy. The year-on-year growth rate of GDP is used to measure the real economy of China.

For Thailand, the year-on-year growth rate of GDP, link relative growth rate of CPI, unemployment rate, the link relative growth rate of the exchange rate of Chinese yuan and Baht are taken as the indexes to respectively measure the output, inflation, economic situation and exchange rate. When measuring the development of the financial market, most countries would see the return rate of the mid-to-long-term government bonds as an index but sufficient data from Thailand in this respect is not available, so it is replaced by the monetary market interest rate in Thailand. The meaning of each variable is shown in Table 1:

Variable	Meaning
China's money supply and economic performance index	
M2	Year-on-year growth rate of China's money M2
RAT_CH	One-year fixed deposit rate in China
GDP_CH	Year-on-year growth rate of China's GDP
Thailand's economic performance indexes	
GDP_TL	Year-on-year growth rate of GDP
CPI_TL	Link relative growth rate of CPI
EXC_TL	Link relative growth rate of Baht to Chinese yuan
RAT_TL	Thai monetary market interest rate
UN_TL	Unemployment rate

**Table 1 Meaning and Definitions of Variables** 

To collect the data before and after the launch of the "Belt and Road" Initiative, 2013 is taken as the mid time point to gather the data from 2009 to the first quarter of 2017 by quarters for the subsequent analysis. Some data are collected by months, which would be transformed into quarter data through general average method. The year-onyear data can not only show the operation or change of different variables, but also avoid the disturbance of the seasonal changes of the time sequence data to ensure that the research output is fully reliable and the valid information won't be screened out after the seasonal adjustment and data smooth process. For the CPI link relative data, the data in 2013 is taken as s standard value and perform a consistency processing for the data in other years to ensure that the data is fully comparable and present the
inflation more precisely. The data of the relative exchange rate of Chinese yuan and Thai Baht is extracted from IMF reports. Other data source includes WIND Consulting Macroeconomics Database, CEIC global economic database, Thailand Central Bank and TRENDING ECONOMICS database.

#### 4.2.2 Data Stationary Test

Since the spillover effect of the monetary policy is not an indication of economic balance in an open environment, it is not applicable to build the model based on the non-stationary data and the SVAR model needs the stationary sequence data. In this study, the author used the unit root test of Evies6.0 software to analyze the stationarity of the first-hand data and used the KPSS method to run the unit root test. The KPSS method was developed by Kwiatkowski (1992). Compared to the traditional ADP test and PP test methods, its key characteristics is to assume that the data is stationary sequence but the alternative hypothesis includes the unit root, which means the data has the characteristics of non-stationarity and it's the left-tailed test.

The unit root test is performed on all variables involved in this study and the results are shown in Table 2. It could be found after analyzing the data in the table that only UN\_TL is non-stationary, so this variable is excluded from the model.

Variable	LM Value	Result
M2	0.1537***	Stationary
RAT_CH	0.0832***	Stationary
GDP_CH	0.3541***	Stationary
GDP_TL	0.0833***	Stationary
CPI_TL	0.1342**	Stationary
EXC_TL	0.0531**	Stationary
RAT_TL	0.0988**	Stationary
UN_TL	0.3325*	Non-stationary

Table 2 Unit Root Test Results

Note: "\*", "\*\*" and "\*\*\*" mean that the initial hypothesis cannot be denied under the significant level of 1%, 5% and 10%, indicating the stationarity of the data.

# 4.2.3 Determination of Model's Lag Order

An important preparation for establishing a SVAR model is to analyze he lag periods of the VAR model and the stationarity of the model. A stationary VAR model is a premise for an effective SVAR model. Eview6.0 provides many approaches to test the lag periods of VAR model, such as AIC, SIC, LR and HQ. On the basis of "majority principle", the author used multiple methods to select out more than half of the lag periods we need pointed by the judgement rules at the same time. But if this principle fails, considering that the data in this study is collected by quarters and HQ test would be more reasonable, so the periods indicated by HQ would be chosen. In practice, the upper limit of the lag period shall be known. 4 or 8 lag periods would be chosen as the next quarter's data. But due to the limited data collected by the author, the upper limit of the lag period is set to be 4. Through the AR analysis, the stationarity of the model is confirmed. If the inverse lag of all roots in the estimated model is no larger than 1, which means characteristics of AR root covers the model of all roots, it could be verified that the model is fully stationary; otherwise the model fails to meet the requirement of stationarity, and the lag periods shall be changed then.

In this study, the author explored how China's monetary policy influences the economy of Thailand. During the empirical study, M2 monetary policy is the mid-target quantitative monetary policy, its year-on-year data and the price-based monetary one-year deposit rate, so M2 and RAT could be introduced into the model:

$$y_t = \{GDP\_CH, M2/RAT\_CH, GDP\_TL, CPI\_TL, EXC\_TL, TAT\_TL\}^T$$

According to the equation, the lag periods of VAR model could be confirmed and the model stationary test is performed. The final result is that the lag period of M2 is 2 and the lag period of RAT\_CH is 4.

### 4.3 Identification of SVAR Model

The SVAR model is comprehensively explained above. To recognize this model, n (n-1)/2 restrictive conditions must be attached to the B matrix, so it is necessary to conduct economic theory analysis. The monetary policy has a conduction effect, which is also a point that the author would like to emphasize in the study. The recursive hypothesis method created by the Christiano et al. (1998) is introduced here to recognize the model. Three-way decomposition of  $Y_t$  in Equation (1): First, the current value of the variable included in the information set of t period of the monetary authority; secondly, the monetary policy instrument variable; third, the current value of the variable not included in the information set of M2, and one-year benchmark deposit rate can also be selected as the target; the third part selects the macro variables of Thailand, based on the data of GDP, exchange rate, CPI, interest rate, unemployment rate and others, to create a recursive SVAR system, where B represents the lower triangular matrix. The n(n-1)/2 restrictive conditions could be thereby obtained. At this point, the restrictive condition matrix of the SVAR model could be defined as follows:

$$B = \begin{cases} 1 & 0 & 0 & \dots & 0 \\ b_{21} & 1 & 0 & \dots & 0 \\ \dots & \dots & \dots & \dots & \dots \\ b_{71} & b_{72} & \dots & b_{76} & 1 \end{cases}, \quad \Omega_{\varepsilon} = \begin{cases} a_{11} & \dots & a_{22} & \dots \\ a_{22} & \dots & a_{11} \\ \dots & \dots & \dots & \dots \\ & \dots & & a_{77} \end{cases}$$

# 4.4 Analysis of Results of Impulse Response Function and Variance Decomposition

Through the impulse response function and the variance decomposition methods provided by Eview 6.0, we can further discuss how China's monetary policy affects the economy of Thailand. The impulse response function can reflect the fluctuation of the random disturbance of the variable, and it causes the fluctuation of other variables, and can also be used to analyze how the impact factor of the variable causes other variables to change, and thus identify the direction of the spillover effect. The variance decomposition can decompose the variance of variables into different disturbance terms, so it can effectively reflect the different disturbance term factors and the inherent variables and degrees of the model, to realize an in-depth analysis of the impact of China's monetary policy adjustment on the economy of Thailand, which is to measure the level of spillovers in a quantitative way.

4.4.1 Impact of M2 Shock on Spillover Effects in Thailand

Table 3 is the impulse response function value for the growth rate of a standard deviation of M2 brought to Thailand's GDP. The function value includes 3 months, 6 months, 9 months, 1 year, 1 year and a half, 2 years, 3 years, 5 years (i.e. lagged by 1, 2, 3, 4, 6, 8, 12, 20 periods). Table 4 shows the contribution rate of the M2 shock to the Thai output, which is the result of decomposing the variance. By analyzing the table, it is found that as long as there is impact of a standard deviation of M2 (the increase in M2 indicates that the currency shock is expansionary), the spillover effect on Thai output is moving in that direction and the extent how serious it is can be seen.

Period	Output	Exchange Rate	Inflation	Interest Rate	
3 months	-0.0983	-0.0078	-0.0085	-0.0082	
6 months	0.0042	-0.0071	0.0022	-0.0113	
9 months	0.0315	-0.0312	0.0053	-0.0116	
1 year	0.0412	-0.042	0.0051	-0.0098	
1.5 year	0.0433	-0.0171	0.0042	-0.0084	
2 years	0.0241	-0.0038	0.0031	-0.0071	
3 years	0.0042	0.0026	0.0012	-0.0007	

Table 3 Values of Impulse Response Function between M2 Shock and Spillover Effect of Thailand



Figure 1 Values of Impulse Response Function between M2 Shock and Spillover Effect of Thailand

From Table 3, it could be learnt: First, the impact on output. A standard shock of M2 will have a negative impact on Thailand's output during the first period. After the first period, it will turn into a positive impact, reaching the maximum in the 1.5-year period, and turning negative after the 2-year period, and tending to remain smooth. It can be seen that in the short-term, when China adopts an expansionary monetary policy, Thailand's output will decrease, but in the long run, this parameter will increase. In other words, a negative spillover effect rises in a short term that will lead to a reduction in Thailand's output, but the spillover effect turns positive in a long run; secondly, the impact on exchange rate. It can be seen that the impact of a standard deviation of M2 on the Thailand's exchange rate is mainly negative, which means as a result the Thai exchange rate declines and the Thai domestic currency goes appreciated. The positive impact of the three-year and five-year periods is rather small; thirdly, impact on inflation. It can be found that a standard shock of M2 only causes the inflation in Thailand in the first period. Only the first period is negative, and the subsequent periods are positive. It means that Thailand's inflation is first reduced, and then keeps rising and hit the highest at 9 months before it declines. Fourthly, the impact on interest rates. It can be seen that a standard deviation shock of M2 has a negative impact on Thailand's interest rate and reaches a maximum in the 9 months.

Table 4 Contribution Rate of M2 Shock to the Changes in the Spillover Effect onThailand

				(01111,70)
Period	Output	Exchange Rate	Inflation	Interest Rate
3 months	0.89	0.81	0.66	0.52
6 months	0.52	0.54	0.51	0.53
9 months	2.87	3.21	0.53	0.48
1 year	5.45	6.55	0.55	0.45
1.5 year	6.98	8.15	0.68	0.57
2 years	7.12	8.11	0.79	0.56
3 years	6.77	7.69	0.87	0.58
5 years	6.83	7.44	0.89	0.61





Figure 2 Contribution rate of M2 shock to the changes in the spillover effect on Thailand

From Table 4, it can be learnt: First, the contribution rate in output changes. The

impact of China's monetary policy on Thailand's output rises first and then goes steady, and the contribution rate of initial output changes is small, less than 1%. It reaches a maximum of 7.12% at 2 years, which is consistent with the previous impulse analysis. Secondly, the contribution rate in exchange rate changes. The analysis of the data in Table 4 indicates the impact of a standard deviation shock of China M2 on the exchange rate fluctuation of Thailand, which means the level of spillover effect. The exchange rate of the country reaches the upper limit after 2 years, and finally goes stable. On the whole the contribution rate of Thailand's exchange rate changes is relatively small, below 10%. Thirdly, the contribution rate of inflation changes. It can be seen that the contribution rate of M2 shock to Thailand's inflation changes is small, less than 1%, indicating that if China's money supply is further expanded, it will not bring obvious spillover effects to the inflation in Thailand. From the time of change, it gradually rises with time and becomes more significant in the long run. Fourthly, the contribution rate in interest rate changes. According to the results of variance decomposition, the impact of M2 shock on the change of interest rate in Thailand is low, and the contribution rate in interest rate change is less than 1%. It means that the expansion of China's money supply has little influence on the spillover effect on the interest rate of Thailand.

4.4.2 Impact of RAT_CH Shock on Spillover Effects in Thailand
Table 5 Values of Impulse Response Function between RAT_CH Shock and
Spillover Effect of Theiland

Period	Output	Exchange Rate	Inflation	Interest rate
3 months	-0.0113	-0.0088	-0.0083	-0.0072
6 months	-0.2242	-0.2371	-0.0232	0.0573
9 months	-0.2115	0.3342	0.1653	0.0596
1 year	-0.1432	0.741	0.1751	0.0598
1.5 year	-0.7413	0.1141	-0.1644	0.0784
2 year	-0.5211	0.1538	-0.0131	-0.0271
3 year	0.0913	0.0326	0.0772	-0.1457
5 year	0.0532	-0.0424	0.0237	-0.0467

Table 5 is the impulse response function value of a standard deviation of RAT\_CH that brings growth to Thailand's GDP. Table 6 shows the contribution of RAT\_CH shock to Thailand's output, which is the result after decomposing the variance. According to this table, it can be found that how a standard deviation impact of RAT\_CH (the increase in RAT\_CH will lead to the tightening of currency shocks) exerts influence on the development direction and level of the spillover effect for the output of Thailand.



Figure 3 Values of Impulse Response Function between RAT\_CH Shock and Spillover Effect of Thailand

From Table 5, it can be learnt: First, the impact on output. A standard deviation shock of RAT\_CH has a negative impact on Thailand's output in both short and medium term, and the upper limit occurs in the 1.5-year period. In the long run, the impact is positive, which means, in the short to medium term, China's expansionary monetary policy has led to an increase in Thailand's output, showing a positive spillover effect. But the long-term spillover effect is negative. Secondly, the impact on exchange rate.

A standard deviation of RAT\_CH will cause the Thai exchange rate to be negatively affected in the first period, but the reduction is very small which can basically be ignored. In the first half of the year, the Thai exchange rate is negatively affected and reaches the maximum in the sixth month, which is 0.2371. Then it shifts to a positive impact. This is especially prominent in the 6 months to 2 years. It reaches the peak of 0.7410 in the 1-year period. Thirdly, the impact on inflation. It is not difficult to see that the impact of the RAT\_CH standard shock on Thailand's inflation in different periods is different. The impact on inflation in Thailand is first negative and then

positive and goes back to negative, which is more significant during the period from 9 months to 1.5 year. Fourthly, the impact on interest rate. Through impulse response analysis, a standard impact of RAT\_CH has a negative impact on Thai interest rate at the beginning. After half a year, this effect will gradually change to positive, and will increase to the upper limit in 1.5 year, weakening the impact of the shock effect. In the two-year period, it will change to negative again. The negative impact rises to the peak at the three-year period, further weakening the shock and reaching the vicinity of the original value, so it has obvious long-term effects.

 Table 6 Contribution Rate of RAT\_CH Shock to the Changes in the Spillover

 Effect on Thailand

				(Unit: %)
Output	Exchange Rate	Inflation	Interest Rate	Output
3 months	0.92	0.83	0.63	0.53
6 months	26.52	65.54	2.48	8.83
9 months	42.83	65.36	37.13	8.78
1 year	31.25	76.45	55.35	8.11
1.5 year	61.28	78.25	65.78	12.37
2 year	71.32	78.31	62.74	10.86
3 year	70.97	74.49	65.47	22.48
5 year	66.81	75.43	65.49	30.51



Figure 4 Contribution Rate of RAT\_CH Shock to the Changes in the Spillover Effect on Thailand

From Table 6, it can be concluded that: first, the contribution rate of output changes. It can be found that the contribution rate of the impact of RAT\_CH on Thailand's 3-month output change is less than 1%, and then increases year by year, reaching the peak in the three-year period at 71.32%, which is consistent with the change period analyzed via the impulse response function. In a word, the rise in the one-year benchmark deposit rate mainly has a negative influence on Thailand's output, which means, China's tight monetary policy has led to a decline in Thailand's output.

Secondly, the contribution rate in exchange rate changes. It can be found that the contribution rate of the impact of RAT\_CH in the exchange rate of Thailand is relatively small in the first period, and then increases rapidly and grows large. The spillover effect is more obvious after 6 months, and remains basically stable in the range of 50%-66%. Thirdly, the contribution rate in inflation changes. It can be found that the impact of RAT\_CH has a large contribution rate in changes inflation of Thailand, mostly above 30%, and even up to 65.78%. Over time, the spillover effect of inflation caused by China's price-based monetary policy will continue to increase. Fourthly, the contribution rate in interest rate changes. It can be found that the contribution rate of the impact of the RAT\_CH in the interest rate change in Thailand is small, reaching the maximum of 30.51% in the five-year period. And as time goes, the contribution rate increases along.

# **Chapter 5 DISCUSSION AND CONCLUSION**

#### **5.1Analysis of Empirical Results**

r · · · · · · · · · · · · · · · · · · ·					
	Output	Exchange Rate	Inflation	Interest rate	
Expanded Money Supply	-→+; b	-→+; b	-→+; a	-→+; a	
Rising Benchmark Interest rate	-→+; e	-→+→-; e	$\rightarrow \rightarrow \rightarrow \rightarrow \rightarrow \rightarrow +;$ e	-→+→-; c	

Table 7	<b>Direction and</b>	Level of Spillove	r Effect of	China's	Money S	Supply
	Expansion	and Interest Ra	te Rising of	n Thaila	nd	

The content presented in Table 7 is the experimental verification result of the spillover effect of Thailand's core economic variables under the dual impact of China's quantitative monetary policy and price-based monetary policy. The "-" in the table indicates that a certain variable in Thailand has a reverse spillover effect under the influence of Chinese monetary policy variables, and "+" represents a positive spillover effect. "a, b, c, d and e" hereby represent the size of the spillover effect, "a" represents the contribution rate below 1% with the smallest spillover effect; "b" represents that the contribution rate is higher than 1 % but not higher than 10% with larger spillover effect compared with a; "c" represents that the contribution rate is above 30% with very obvious spillover effect; "d" represents that the contribution rate is above 30% and below 50%, so the spillover effect is more obvious, and "e" means that the contribution rate is more than 50%, representing the largest spillover effect.

# 5.1.1 Spillover Effects of China's Quantitative Monetary Policy on Thailand.

According to Table 7, if Thailand does not adjust its monetary policy, in the shortterm (three months) within which China raises the money supply, Thailand's output will decrease, its GDP growth will slow down, and the economic aggregate will also drop due to the negative impact. The reason lies in that after China raises its money supply, its output increases, and its import decreases. The scale of Thailand's exports thus decreases and output also drops. Moreover, in this process, the Chinese capital flows out and the Chinese yuan also goes depreciated, which also leads to a decrease in imports and a further reduction in Thailand's output. In the long run, there is a positive impact on Thailand's output, mainly because the impact of the income absorption effect of Thai monetary policy is stronger than the increase, maintaining the positive spillover effect.

From the perspective of Thailand, the relative exchange rate of the country continues to decline due to China's increased money supply, which has a negative impact. Thailand's currency goes appreciated, but there is a positive impact in the later period. The reason lies in: although the Chinese government has not completely released the exchange rate control, in the currency basket of the exchange rate, the dollar accounts for a relatively high proportion, so the fluctuation of the dollar will lead to changes in the Chinese exchange rate as the two are completely linked. From a long-term perspective, Thailand's exchange rate grows because the relevant institutes of the two countries' governments will regulate the exchange rate and increase the money supply to raise the domestic inflation rate, which is consistent with the empirical study of inflation.

As China raises its money supply, Thailand's inflation rate first decreases and then continues to increase. In the short term, Thailand's export volume, income, and prices will all decrease, resulting in a reduction in inflation. After a period of time, the relevant authority in Thailand will strengthen the exchange rate control, increase the money supply and stimulate capital inflows, which will lead to an increase in the inflation rate. If Thailand is significantly affected by capital inflows, inflation will increase in the medium term and interest rates will continue to fall, proving that a large amount of capital flows in and the price level will thereby increase.

The impact of China's rising money supply on Thailand's interest rate is mainly negative, and it becomes positive only after three years. The reason is that due to the large money supply in China, the interest rate further drops, which has a significant gap with the world interest rate and the capital outflow is obvious.

Thailand and China have inconsistent interest rates and a large amount of capital flows in, resulting in lower interest rates. In the later stage, due to the impact of US interest rates, global interest rates fluctuate and Thailand's interest rate is lower than that of the United States. The capital starts to flow out and the exchange rate increases.

The longer the time, the higher the total inflow capital and the higher the interest rate.

#### 5.1.2Spillover Effects of China's Price-based Monetary Policy on Thailand

The analysis of the data in Table 7 can determine that from the output point of view, China's one-year deposit benchmark interest rate increases, which has a negative impact on the Thai output within three years, the latter's GDP growth rate and output declines accordingly. After three years, the GDP growth rate and output of the Thai side will begin to increase, and there will be a positive spillover effect. The reason is that China's interest rates will rise, import demand will fall, and the outflow of foreign capital will reduce the scale of foreign investment and the output of Thailand will decline as well. Looking ahead, China's interest rate will increase afterwards, capital inflows will increase, the Renminbi (Chinese yuan) will continue to appreciate, the relative exchange rate will increase, and the price advantage of foreign goods will be further highlighted to raise exports and output levels. In this case, the effect of the income shifting is stronger than the effect of cost shifting, so it can bring positive spillover effects to output. And when China's monetary policy has a negative impact, the relevant authority in Thailand will take targeted measures to stimulate the increase in output.

From the perspective of exchange rates, the effects in different periods are inconsistent because of differences in the Thailand's exchange rate systems and the measures taken by relevant authorities to deal with exchange rate fluctuations. In a short term, the Thailand's exchange rate is negatively affected and falls, but the reduction is relatively small. Thailand's currency appreciation lasts for a long time because of the increase in interest rates in China, which leads to changes in exchange rates. Due to the role of capital liquidity in initial stage, Thailand's capital inflows to China is relatively small. Compared with the appreciation of other currencies against the US dollar, the exchange rate of Chinese yuan against the US dollar is significantly smaller. The exchange rate will continue to decrease in the later period, because the relevant authority in Thailand would take measures to avoid large fluctuations in the exchange rate by lowering the money supply to get the Thai baht appreciated, so that the relative exchange rate will decline.

From the perspective of inflation, it will definitely lead to inflation in Thailand due to the rise in the one-year benchmark deposit interest rate in China, and the spillover effect will be double-sided. As a result, Thailand's inflation rate will first decrease, then rise, and finally decrease. Thailand's inflation rate will be largely changed. In a short term, China's interest rates rise, foreign capitals flee, and the domestic currency of Thailand goes depreciated, leading to an increase in inflation. From a medium-to-long-term perspective, China must further tighten its monetary policy. This will have a certain impact on output, and also lower the price of goods. Thailand's price level will therefore decrease and the inflation will shrink.

From the perspective of interest rates, in a short term, Thailand's interest rate will be positively affected and increase accordingly, but after a long period of time the impact will become negative and interest rates will therefore fall. The reason is that in a short period of time, China's interest rate rises, capital flows out from the two countries, and the interest rate in China climbs up. After a period of time, the relevant authority in Thailand will actively act to intervene, and the interest rate between the currencies of the two countries against the US dollar is higher than the interest rate of the Chinese yuan against the US dollar, so that capital will flow to the two countries and further lower the interest rates.



# 5.2 Research Conclusions

China has taken the second place in the global economy ranking and exerted a rising influence on the regional and even global economy, under years of rapid development. After 2008 financial crisis swept through the world, the global economic pattern has been significantly changed. Under such a background, the central government launched the "Belt and Road" Initiative, playing a positive role in driving the regional economic development. Therefore, it is necessary to explore how and why the China's monetary policy could influence the economy of Thailand.

First, China's quantitative monetary policy has a spillover effect on Thailand. ① If Thailand does not adjust its monetary policy, in the short-term (three months) within which China raises the money supply, Thailand's output will head down, its GDP growth rate will slow down, and the economic aggregate will be negatively affected and cut down accordingly. In the long run, it has a positive impact on Thailand's output; ② If China expands its money supply, it will affect the exchange rate of Thailand, leading to a fall in the exchange rate and the appreciation of Thai currency, but exerting a positive impact in the later period; ③ As China raises the money supply, Thailand's inflation rate first decreases, and then continues to increase. ④ The impact of Chinese rising money supply on Thailand's interest rate is mainly negative, and it becomes positive only after three years.

Second, the spillover effect of China's price-based monetary policy on Thailand. (1) From the perspective of output, the rise of China's one-year deposit benchmark interest rate has a negative impact on the output of Thailand within three years. The latter's GDP growth rate and output are thus reduced; three years later, GDP growth rate and output in Thailand begin to increase, and there is a positive spillover effect. (2) From the perspective of exchange rate, the effects of different periods are inconsistent. In the short term, the exchange rate of Thailand is negatively affected and reduced, but the reduction is relatively small. The reason for the decrease in the exchange rate in the later period is that the relevant authority in Thailand would take measures to avoid large fluctuations in the exchange rate by lowering the money supply to get the appreciation of the Thai baht so that the relative exchange rate will decline. (3) From the perspective of inflation, in a short term, the increase of China's interest rate, the withdrawal of foreign capital, and the depreciation of domestic currency of Thailand results in an increase in inflation in Thailand. From a medium-to-long-term perspective, China's launch of tight monetary policy has an impact on output, and commodity prices thereby decrease. Thailand's price level also falls, along with reduction in the inflation. ④ From a perspective of interest rate, in a short term, Thailand's interest rate will be positively affected and thus grow, but after a long period of time, the impact will become negative and interest rates will be reduced.

The conclusions of this paper are as follows: First, China's monetary policy will exert inevitably a spillover effect on the economy of Thailand, and the spillover effects of various economic variables are not completely consistent in terms of their directions. Secondly, the spillover effect of changes in China's monetary price-based policy on the economy of Thailand is stronger than the spillover effect caused by changes in China's quantitative monetary policy. Thirdly, China's monetary policy has a greater impact on Thailand's output, the spillover effect is relatively strong, and the spillover effect of interest rate is relatively weak.

# **5.3 Policy Suggestions**

Considering different countries in the region of the "Belt and Road", the spillover effects caused by China's monetary policy should be different in such countries. Therefore, before the formulation of monetary policy, the Chinese authority need to take many countries into account with transposition thinking to find the best strategy, combining the theory with the practice in this paper. The author puts forward the following suggestions:

First, according to the study, the spillover effect of Thailand's economy is largely derived from China's monetary policy. It is necessary for the Chinese monetary authority to adjust the monetary policy, actively cooperate with international organizations in terms of monetary policy coordination without making monetary policy as a hinder to good economic cooperation with state-level societies along the "Belt and Road" region. Economic exchanges among countries have become closer and more frequent along with the trend of global economic integration. China proposed the "Belt and Road" Initiative as a response, which gives China and the countries in the region more opportunities for economic and trade exchanges. China proved by practice that it can bring about spillover effects to Thailand, which is a double-edged sword for its economy. Therefore, it is especially important to choose a suitable, scientific

monetary policy. Only in this way can we highlight the positive impact on other countries' economies and minimize the negative impact. It is necessary to discuss and communicate with other countries on policies. Therefore, exchanges should be made to increase coordination with Thailand's monetary policy. In the process of formulating policies, the selection of other countries' policy strategies is one of the key factors to be considered. Only when we understand this can we achieve a win-win result and effectively stimulate the vitality of the regional economy. In the process of implementing the "Belt and Road" Initiative it has played a role in coordinating Thailand's development policy, optimizing Thailand's industrial structure. The initiative also integrates regional resources in a more scientific way, building a more scientific division system within the region so as to further optimize the resource allocation. With deepening the economic cooperation with Thailand, it fully activates the potential of Thailand's economy and even the global economy.

Second, knowledge starts with practice. Compared to the spillover effect of the quantitative changes in China's monetary policy on the economy of Thailand, the spillover effect caused by the price-based change of China's monetary policy should be stronger. Therefore, in the process of financial reform in China, the development of interest rate marketization is particularly important. Only by highlighting the flexibility of the exchange rate, capital control can be carried out effectively in real practice, and the monetary policy will be solidly and steadily advanced with full play of the effectiveness and independence of the monetary policy. One of the most important aspects of China's financial reform is the reform of interest rate marketization and the optimization of the exchange rate system. These two monetary policies present significant meaning to the monetary system. China's price-based monetary policy will be greatly affected by the marketization of interest rates, which will promote the effectiveness of monetary policy as an effective means.

If China's interest rate changes, it will definitely exert a strong spillover effect on the "Belt and Road" region, which will have an inevitable impact on the economic development of other countries. It also takes into account the economic cooperation and exchanges with other countries as well as protection of Thailand's stable economic development. In this case China must pay attention to the formulation of monetary policy as whether the monetary policy is effective and independent determines the overall effect of economic cooperation. Through empirical analysis, it is found that the existing economic theory cannot be used to explain the impact of the economic variables brought by China's monetary policy to Thailand. This influence even goes against many existing economic theories, which fully demonstrates that there is still large development space of China's financial market with many shortcomings. The monetary policy is still not independent enough, which is largely restricted by the U.S. economy and policies.

Another point is that the exchange rate channel is one of the main channels for transmitting spillover effects. If the flexibility of the exchange rate is strengthened, it can reduce the influence of the exchange rate on the US dollar, rationally apply the spillover effect brought by monetary policy, and play an important strategic role in activating the potential of economic development. A good capital control system can bring greater flexibility to China's exchange rate and expand the floating range of the exchange rate system, which can effectively guarantee the independence of monetary policy. If the monetary policy is sufficiently stable, it will be able to stabilize China's monetary policy from frequent fluctuations, reduce the influence on other countries' economies, bring harmony and stability to the economic development of both sides, and further deepen the partnership between China and Thailand.

Third, according to the empirical study, China's monetary policy has a great impact on Thailand's output, and the spillover effect is relatively strong while the spillover of interest rates is relatively weak. Therefore, in the development of the "Belt and Road" Initiative, China should seize the opportunity to promote the process of internationalization of Chinese yuan and promote common development of China and Thailand. The goal of the "Belt and Road" Initiative is to promote common development of the regional economy.

Many countries around China are within the coverage of this region. Chinese yuan has been used as the settlement currency in border trade, and its liquidity in neighboring countries has been greatly enhanced. In the process of building the "Belt and Road", China will continue to deepen the trade cooperation and exchanges with Thailand by increasing investment and deepening financial cooperation, so this can serve as a breakthrough to promote the regional development of Chinese yuan. It is suggested to rationally utilize the influence of China's monetary policy, raise the enthusiasm for policy cooperation with Thailand in the organization region, and launch a more complete currency settlement system with the cooperation of both parties to establish a series of management systems for foreign currency entry. Besides, China's monetary policy is a double-edged sword for the "Belt and Road" countries. The impact of its spillover effect is two-sided. Therefore, it is necessary to adopt appropriate investment means to regulate and control, so that the Thai economy can be steadily developed.

The negative impact of China's expansionary monetary policy on the Thai economy is only temporary, which will cause adverse effects of output decline in a short term, but as China continues to increase foreign investment, the host country's previous losses in output will gradually be compensated and recovered. With the improvement of the "Belt and Road" implementation, China will continue to increase its direct investment in Thailand. These investments are mainly used for infrastructure construction in Thailand, which can positively promote the Thai logistics economy and enable Thailand to completely improve the infrastructure, which will effectively reduce the transportation costs and time. The economic and trade exchanges with Thailand would be more frequent and it will continue to optimize the development of the regional economy.



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