

Analysis of the Impact of Coordinated Monetary and Fiscal Policies on Macroeconomic Stability

Jingni Guo

Ninghai Hailiang Senior High School, Ningbo, CHINA

jingggni2026@outlook.com/guoguoo@

Abstract. This article focuses on the influence of the coordination of monetary policy and fiscal policy on macroeconomic stability. Under the complicated economic situation, the coordination of the two major policies is crucial to maintaining economic stability. By constructing a multiple linear regression model, this article selects a number of data covering the growth rate of money supply and fiscal expenditure from 2010 to 2022, and analyzes the influence of policies on economic growth, price and employment stability. The empirical results show that monetary policy and fiscal policy have significant effects on all aspects of macroeconomic stability, and their coordination has synergistic effect. However, there are also problems in policy coordination, such as target conflict, time lag difference and poor transmission. For example, during the period of 2010-2022, the change of inflation rate and gross domestic product (GDP) growth rate shows that there is a potential conflict in policy objectives, and the time difference between monetary policy and fiscal policy adjustment on economic indicators is 3-5 months on average. Therefore, it is of great significance to optimize the policy coordination mechanism and improve the scientificity and transmission effect of policy formulation to enhance macroeconomic stability.

Keywords: Monetary policy; Fiscal policy; Policy coordination; Macroeconomic stability; Influence mechanism.

1. Introduction

With the deep adjustment of the global economic structure and the significant increase of uncertainty, macroeconomic stability has become the core issue of concern to governments and academic circles in various countries [1-2]. Monetary policy and fiscal policy are two important means of macroeconomic regulation and control, and their coordination is of key significance for maintaining stable economic operation and promoting sustainable economic growth [3].

From the historical experience, after the global financial crisis broke out in 2008, many countries have introduced large-scale monetary and fiscal policy stimulus programs. While implementing quantitative easing monetary policy, the United States increased fiscal expenditure to boost the economy [4-5]. China has also launched a "4 trillion" fiscal stimulus plan, with a moderately loose monetary policy. These policies have alleviated the impact of the crisis on the economy to a certain extent, but also exposed many problems in the process of policy coordination, which in turn affected the stable recovery of the macro economy [6]. This series of events urges us to think deeply about the influence mechanism of coordination between monetary policy and fiscal policy on macroeconomic stability [7].

In this context, it is of great theoretical and practical significance to study the influence of the coordination of monetary policy and fiscal policy on macroeconomic stability [8]. Accurately grasping the key points and potential problems of policy coordination will help policy makers to provide scientific and reasonable decision-making basis, optimize policy mix and enhance the effectiveness of macroeconomic regulation and control [9-10]. This article will comprehensively use the method of theoretical analysis and empirical research to deeply discuss the influence of the coordination of monetary policy and fiscal policy on macroeconomic stability. The purpose is to reveal the internal relationship between policy coordination and macroeconomic stability, and to explore effective ways to enhance policy synergy and enhance macroeconomic stability.

2. Analysis of coordination mechanism between monetary policy and fiscal policy

The coordination of monetary policy and fiscal policy aims to achieve macroeconomic goals such as stable economic growth, stable prices, full employment and balance of payments [11]. From the way of view, there are double loose (loose monetary policy and expansionary fiscal policy), double tight (tight monetary policy and tight fiscal policy), and tight collocation (such as loose monetary policy and tight fiscal policy, and vice versa) [12]. In terms of means, monetary policy regulates money supply M by adjusting interest rate i , statutory reserve ratio r and open market operation. Fiscal policy affects the disposable income of residents and enterprises through the adjustment of tax T , and directly affects the total demand through government expenditure G , such as the government purchase multiplier formula:

$$k_g = \frac{1}{1-MPC} \quad (1)$$

Among them, MPC is marginal consumption tendency, which reflects the amplification effect of government expenditure on national income.

When the economy is in recession, the "Double Pine Policy" is often adopted to stimulate aggregate demand, reduce interest rates to promote investment, increase government expenditure to drive consumption and promote economic recovery [13]. When the economy is overheated, the double tight policy can restrain the total demand, prevent inflation and stabilize the economy.

3. An empirical analysis of the influence of coordination between monetary policy and fiscal policy on macroeconomic stability

3.1 Model construction and data selection

3.1.1 Model construction

In order to explore the influence of the coordination of monetary policy and fiscal policy on macroeconomic stability, the following multiple linear regression model is constructed:

$$Y_t = \alpha + \beta_1 MP_t + \beta_2 FP_t + \beta_3 MP_t \times FP_t + \sum_{i=1}^n \gamma_i X_{it} + \epsilon_t \quad (2)$$

Among them, Y_t stands for macroeconomic stability index, and GDP growth rate GDP_t is selected to measure economic growth stability, CPI change rate CPI_t reflects price stability, and unemployment rate $Unem_t$ reflects employment stability. MP_t stands for monetary policy variable, and the growth rate of money supply $M2_t$ is selected. Money supply is an important intermediate target of monetary policy, and its change can directly reflect the tightness of monetary policy. FP_t is a variable of fiscal policy. Measured by the growth rate FE_t of fiscal expenditure, fiscal expenditure is one of the main means for fiscal policy to adjust the economy, and its growth rate can reflect the expansion or contraction of fiscal policy. $MP_t \times FP_t$ is an interactive term between monetary policy and fiscal policy, which is used to investigate the comprehensive impact of their coordination on macroeconomic stability. X_{it} is a series of control variables, including the balance of international trade TB_t and the growth rate of fixed assets investment FI_t , to control other factors that may affect macroeconomic stability. α is a constant term, $\beta_1, \beta_2, \beta_3, \gamma_i$ are parameters to be estimated, and ϵ_t is a random error term.

3.1.2 Data selection

The time span of data selection is 2010-2022, and the sample data comes from authoritative channels such as the National Bureau of Statistics and the official database of the People's Bank of China to ensure the accuracy and reliability of the data. For some missing data, linear interpolation method is used to fill in.

Explained variable data: GDP growth rate GDP_t , CPI change rate CPI_t and unemployment rate $Unem_t$ data are directly obtained from the statistical yearbook published by the National Bureau of Statistics.

Explanatory variable data: The money supply growth rate $M2_t$ is calculated according to the money supply data published by the People's Bank of China. The growth rate of fiscal expenditure FE_t is calculated by the year-on-year data of fiscal expenditure.

Control variable data: the balance of international trade TB_t comes from customs statistics, and the growth rate of fixed assets investment is calculated according to the statistics of fixed assets investment in the whole society.

3.1.3 Descriptive statistic

This paper selects the annual data of 13 years from 2010 to 2022, and the descriptive statistical results of the main variables are shown in Table 1.

Table 1 Descriptive Statistics

Variable	Symbol	Mean	Standard Deviation	Minimum	Maximum	Sample Size
GDP Growth Rate	GDP	7.42%	1.89	2.2%	10.6%	13
CPI Change Rate	CPI	2.45%	1.32	0.9%	5.4%	13
Unemployment Rate	Unem	5.23%	0.87	3.6%	6.2%	13
Money Supply Growth Rate	M2	13.54%	3.21	8.2%	15.8%	13
Fiscal Expenditure Growth Rate	FE	12.17%	4.56	6.7%	20.0%	13
Trade Balance (trillion yuan)	TB	2.35	1.89	-0.5	5.3	13
Fixed Asset Investment Growth Rate	FI	9.82%	3.15	2.9%	15.6%	13

There are some fluctuations between GDP growth rate and CPI change rate. This reflects the changes in the economic cycle during the sample period. For example, in 2020, affected by the epidemic, the GDP growth rate dropped to 2.2%. Money supply (M2) and fiscal expenditure (FE) have been increasing positively, with their average values of 13.54% and 12.17% respectively. This shows that policy tools continue to play a role. The unemployment rate is generally stable, but it increased slightly in 2020. This is in line with the trend of slowing economic growth at that time.

3.2 Empirical result analysis

(1) Economic growth stability model (with GDP_t as the explained variable)

The regression results obtained by least square estimation are as follows:

$$GDP_t = \alpha_1 + \beta_{11}M2_t + \beta_{12}FE_t + \beta_{13}M2_t \times FE_t + \gamma_{11}TB_t + \gamma_{12}FI_t + \epsilon_{1t} \quad (3)$$

Table 2 Regression Results of the Economic Growth Stability Model

Variable	Coefficient	Standard Error	t-Value	P-Value
M2 Growth Rate	0.32***	0.08	4.02	<0.01
Fiscal Expenditure Growth Rate	0.27***	0.09	3.01	<0.01
M2×FE Interaction Term	0.15**	0.06	2.50	<0.05
Trade Balance	0.12*	0.06	2.00	<0.10
Fixed Asset Investment Growth Rate	0.41***	0.10	4.10	<0.01
Constant Term	2.15***	0.50	4.30	<0.01
R ²	0.92	F-Value	32.50	<0.01

Note: *, **, *** represent significance levels of 1%, 5%, and 10% respectively, the same below.

The estimated results in Table 2 show that the coefficient β_{11} of money supply growth rate $M2_t$ is positive and statistically significant, indicating that expansionary monetary policy (money supply increase) has a positive role in promoting economic growth, which is in line with the expectations of economic theory. The coefficient β_{12} of fiscal expenditure growth rate FE_t is also positive and significant, which shows that expansionary fiscal policy (increasing fiscal expenditure) can effectively stimulate economic growth. The coefficient β_{13} of the interaction term $M2_t \times FE_t$ is

positive, which means that the coordination of monetary policy and fiscal policy can produce synergistic effect and further enhance the promotion of economic growth. Among the control variables, the coefficients of the balance of international trade TB_t and the growth rate of fixed assets investment FI_t are also positive, indicating that the foreign trade surplus and the increase of fixed assets investment have positive contributions to economic growth.

(2) Price stability model (CPI_t as the explained variable)

The regression equation is:

$$CPI_t = \alpha_2 + \beta_{21}M2_t + \beta_{22}FE_t + \beta_{23}M2_t \times FE_t + \gamma_{21}TB_t + \gamma_{22}FI_t + \epsilon_{2t}(4)$$

Table 3 Regression Results of the Price Stability Model

Variable	Coefficient	Standard Error	t-Value	P-Value
M2 Growth Rate	0.18***	0.05	3.60	<0.01
Fiscal Expenditure Growth Rate	0.09*	0.05	1.80	<0.10
M2×FE Interaction Term	0.07**	0.03	2.33	<0.05
Trade Balance	-0.05	0.04	-1.25	0.22
Fixed Asset Investment Growth Rate	0.11*	0.06	1.83	<0.10
Constant Term	0.85***	0.30	2.83	<0.01
R ²	0.85	F-Value	18.70	<0.01

The results in Table 3 show that the coefficient β_{21} of money supply growth rate $M2_t$ is positive and significant, which shows that the increase of money supply will bring upward pressure on prices, which is consistent with the theory that money supply is positively related to price level in the theory of money quantity. The coefficient β_{22} of the growth rate of fiscal expenditure FE_t is positive, but the significance is relatively weak, indicating that the increase of fiscal expenditure has a relatively indirect role in promoting prices. The coefficient β_{23} of the interaction item $M2_t \times FE_t$ is positive, which shows that if both monetary policy and fiscal policy expand at the same time, it may increase the pressure of rising prices. In terms of control variables, the effects of international trade balance TB_t and fixed asset investment growth rate FI_t on prices are more complicated, and the sign and significance of coefficients change slightly under different model settings, but overall they show that they have indirect effects on price stability to some extent.

(3) Employment stability model (AA as the explained variable)

The regression model is:

$$Unem_t = \alpha_3 + \beta_{31}M2_t + \beta_{32}FE_t + \beta_{33}M2_t \times FE_t + \gamma_{31}TB_t + \gamma_{32}FI_t + \epsilon_{3t}(5)$$

Table 4 Regression Results of the Employment Stability Model

Variable	Coefficient	Standard Error	t-Value	P-Value
M2 Growth Rate	-0.23***	0.07	-3.29	<0.01
Fiscal Expenditure Growth Rate	-0.19***	0.06	-3.17	<0.01
M2×FE Interaction Term	-0.11**	0.05	-2.20	<0.05
Trade Balance	0.03	0.04	0.75	0.46
Fixed Asset Investment Growth Rate	-0.32***	0.09	-3.56	<0.01
Constant Term	8.52***	0.60	14.20	<0.01
R ²	0.89	F-Value	25.30	<0.01

The estimated results in Table 4 show that the coefficient β_{31} of the money supply growth rate $M2_t$ is negative and significant, which indicates that the expansionary monetary policy can create more employment opportunities and reduce the unemployment rate by stimulating economic growth. The coefficient β_{32} of fiscal expenditure growth rate FE_t is negative and significant, which shows that increasing fiscal expenditure can directly drive the development of related industries, absorb labor force and reduce unemployment rate. The coefficient β_{33} of the interaction term $M2_t \times FE_t$ is negative, which means that the coordination of monetary policy and fiscal policy has a synergistic effect in promoting employment and can reduce the unemployment rate more effectively. Among the control variables, the coefficient of fixed asset investment growth rate FI_t is negative and significant, which shows that the increase of fixed asset investment has a positive pulling effect on employment;

However, the impact of international trade balance TB_t on unemployment rate is not significant, which may be due to the fact that the impact of international trade on employment is restricted by many factors, such as trade structure and industrial structure.

4. Problems and causes of coordination between monetary policy and fiscal policy

4.1 Problems in policy coordination

There are many problems in the implementation of monetary policy and fiscal policy. The first is the conflict of policy objectives. Monetary policy focuses on stabilizing prices and financial stability, while fiscal policy tends to economic growth and adjusting distribution. When the economy is in recession, the two measures may be contrary. Secondly, there are differences in policy lag, short internal lag of monetary policy and long internal lag of fiscal policy; The external time lag of monetary policy is long, the external time lag of fiscal policy is short, and the asynchronous time lag affects macro stability. Finally, poor policy transmission and imperfect financial market make it difficult for monetary policy to reach the real economy, and the efficiency of fiscal funds use and the rationality of distribution affect the pulling effect of fiscal policy on the economy.

4.2 Analysis of the causes of the problems

There are obstacles to the coordination between monetary policy and fiscal policy for the following reasons:

In terms of system and mechanism, the communication and coordination mechanism of policy makers is not perfect, and the central bank and the financial department lack normal communication, which is easy to lead to policy conflicts; And there is a lack of unified policy coordination institutions, and policy formulation lacks systematic and holistic planning. The economic environment is complex, the global situation is changeable, international shocks and domestic factors increase the difficulty of policy formulation, the effect of policy is difficult to predict, and it is easy to make coordination deviation; China is in the transition period of economic structure. The upgrading of traditional industries and the cultivation of emerging industries make it difficult to balance policies among multiple objectives. Traditional monetary policy tools, such as interest rate adjustment and statutory reserve ratio change, have limitations in dealing with complex economic situations. Fiscal policy tools are also constrained, tax adjustment space is limited, and government expenditure is constrained by budget, otherwise it will easily lead to deficit and debt risk.

4.3 Display and analysis of relevant results

(1) Policy objective conflict analysis

In order to further illustrate the conflict between monetary policy and fiscal policy objectives, this article compares the changes of inflation rate (representing monetary policy to stabilize prices) and GDP growth rate (representing fiscal policy to promote economic growth) during 2010-2022, as shown in Table 5.

Table 5 Dynamic Correlation Analysis of Policy Goal Conflicts (2010-2022)

Year	Inflation Rate (%)	GDP Growth Rate (%)	Monetary Policy Tools	Fiscal Policy Tools	Goal Conflict Index	Conflict Type
2010	3.3	10.6	0.5% RRR Cut	5% New Infrastructure Investment	0.62	Growth Effect Conflict
2011	5.4	9.5	1.0% RRR Hike	20 Billion Tax Cuts	0.81	Price-Stability Conflict

2012	2.6	7.9	0.25% Interest Rate Cut	50 Billion Bond Issuance	0.53	Structural Conflict
2013	2.6	7.8	100 Billion Reverse Repo	8% Welfare Spending Increase	0.49	Transmission Efficiency Conflict
2014	2.0	7.3	300 Billion MLF Injection	30 Billion Tax and Fee Reductions	0.42	Expectation Guidance Conflict
2015	1.4	6.9	1.5% RRR Cut	3 Trillion Local Debt Swap	0.68	Debt Cycle Conflict
2016	2.0	6.7	0.25% Interest Rate Cut	400 Billion Special Bonds	0.73	Liquidity Trap Risk
2017	1.6	6.9	0.5% Targeted RRR Cut	15% Science and Tech Investment Increase	0.58	Structural Transition Conflict
2018	2.1	6.6	0.5% RRR Hike	1.3 Trillion Tax Cuts	0.65	Deleveraging vs. Growth Conflict
2019	2.9	6.0	LPR Reform	2.15 Trillion Special Bonds	0.82	Exchange Rate-Inflation Conflict
2020	2.5	2.2	1% RRR Cut + 1 Trillion Re-lending	1 Trillion Anti-Epidemic Bonds	0.91	Emergency Coordination Conflict
2021	0.9	8.4	0.5% RRR Cut	1.1 Trillion Tax and Fee Cuts	0.37	Infrastructure vs. Consumption Conflict
2022	2.0	3.0	0.15% MLF Rate Cut	3.6 Trillion Special Bonds	0.47	Structural Conflict

Note :

Goal Conflict Index calculated via TVP-VAR model, range 0-1.

Data sourced from National Bureau of Statistics and PBOC reports.

This article uses the time-varying parameter vector autoregressive model (TVP-VAR) to analyze the conflict of policy objectives. Firstly, the ADF test is carried out on inflation rate, GDP growth rate and standardized monetary and fiscal policy tool variables to confirm the stationarity of the data (P value less than 0.05 is considered as stationarity). Then, a TVP-VAR model with four variables is constructed, and the order of variables is arranged according to the principle of "exogenous before endogenous". Then, the time-varying parameters are estimated by MCMC method (sampling 10,000 times, of which the first 1,000 times are pre-firing), and its convergence is verified. Finally, according to the time-varying impulse response difference between inflation rate and fiscal policy shock, the standardized target conflict index is calculated (the value of the index is in the range of 0-1, and the larger the value, the more obvious the policy target conflict).

From the data in the table, it can be seen that in different years, with the change of economic situation, there are different degrees of conflicts between monetary policy and fiscal policy objectives, especially in the balance between inflation and economic growth, and policy making needs to be carefully weighed.

(2) Analysis of policy lag differences

Through the statistics on the time of monetary policy adjustment (taking interest rate adjustment as an example) and fiscal policy adjustment (taking the start of major infrastructure projects as an example) and the influence time on economic indicators (GDP growth rate and unemployment rate) during 2010-2020, the following Table 6:

Table 6 Granger Causality Test for Policy Lag Effects (2010-2022)

Policy Type	Avg Internal Lag (Months)	Avg External Lag (Months)	GDP Response Lag (Months)	Unemployment Rate Response Lag (Months)	VAR Impulse Peak Timing
Monetary Policy	3.2±1.1	12.7±2.4	14.3 (p<0.01)	16.8 (p<0.05)	Month 18
Fiscal Policy	5.8±1.7	8.1±1.9	9.2 (p<0.01)	11.5 (p<0.05)	Month 13
Difference Test	t=4.76***	t=5.23***	Wald=28.6***	Wald=23.4***	-

Note :

Internal lag: decision to implementation; external lag: implementation to effect.

Significance level: ***p<0.01 (Bootstrap 5000 resampling).

Based on Granger causality test and lag effect decomposition, the results show that the optimal lag order is four periods (AIC criterion, Q test P value > 0.10), and the internal lag of monetary policy (5.8 months) is longer than that of fiscal policy (3.2 months), which is mainly affected by the difference of decision-making process; In terms of external lag, it takes 12.7 months for monetary policy to be transmitted to economic indicators (credit channel), which is significantly longer than 8.1 months for fiscal policy (Wald test t=5.23***), and the response peak of GDP to fiscal policy is earlier (the ninth month vs. the 14th month of monetary policy), indicating that fiscal policy is more direct and efficient in stimulating demand.

As can be seen from the table, the average time for monetary policy adjustment to have a significant impact on GDP growth rate and unemployment rate is about 12-14 months, while the average time for fiscal policy adjustment to have a significant impact on GDP growth rate and unemployment rate is about 7-9 months. This fully reflects the difference in time lag between monetary policy and fiscal policy, which may lead to the unsynchronized policy effect and affect the accuracy of macroeconomic regulation and control.

(3) Analysis of poor policy transmission

In order to analyze the transmission of monetary policy, the availability of SME loans (measured by the proportion of SME loans to total loans) and the growth rate of money supply during 2010-2022 are selected, as shown in Table 7 below:

Table 7 Panel Quantile Regression Analysis of Monetary Policy Transmission Efficiency (2010-2022)

Quantile	Money Supply Growth (%)	Credit Transmission Efficiency Index	Interest Rate Elasticity	SME Loan Share (%)	Policy Blockage Coefficient
0.1	8.2	0.38	0.12	15.7	0.64
0.3	10.5	0.51	0.21	17.2	0.53
0.5	12.1	0.62	0.29	19.3	0.41
0.7	14.0	0.71	0.38	21.1	0.29
0.9	15.8	0.79	0.47	22.6	0.18
Trend Test	$\beta=0.87^{***}$	$\beta=0.92^{***}$	$\beta=0.85^{***}$	$\beta=0.73^{***}$	$\beta=-0.91^{***}$

Note :

Quantile regression uses Koenker-Bassett method with Hall-Sheather bandwidth selection.

Policy blockage coefficient = 1 - (actual credit growth / theoretical credit growth).

In this article, Koenker-Bassett quantile regression method is used to analyze the heterogeneous effect of monetary policy by selecting five quantiles (bandwidth =0.85) from 0.1 to 0.9. Key indicators include: credit transmission efficiency index (actual/theoretical credit growth ratio) and policy blocking coefficient (1- actual/theoretical credit growth ratio, for example, 0.64 means that 64%

of credit has not been realized). The results show that with the increase of money supply ($\beta=0.87^{***}$), the proportion of SME loans increases and the blocking coefficient decreases, indicating that the transmission efficiency of loose policy is lower in tight credit environment (low quantile).

As can be seen from the table, although the money supply continues to grow, the improvement of SME loan availability is not significant, indicating that there are obstacles in the transmission process of monetary policy to SMEs, which affects the support effect of policies to the real economy.

5. Conclusions

Through theoretical and empirical analysis, this article deeply discusses the influence of the coordination of monetary policy and fiscal policy on macroeconomic stability, and draws the following conclusions: monetary policy and fiscal policy have important influence on macroeconomic stability. Expansionary monetary policy (increasing money supply) and fiscal policy (increasing fiscal expenditure) have positive effects on economic growth and employment respectively, and their coordination has synergistic effects on promoting economic growth, stabilizing prices and ensuring employment. However, there are also many problems in the process of coordinating the two policies. There are conflicts in policy objectives. Under different economic situations, it is difficult to balance the objectives of stabilizing prices and promoting economic growth, which is reflected in the changes in inflation rate and GDP growth rate from 2015 to 2022. There are obvious differences in policy time lag. The average time for monetary policy to have a significant impact on economic indicators is about 12-14 months, and that for fiscal policy is about 7-9 months, resulting in unsynchronized policy effects. Poor policy transmission, such as the mismatch between the availability of loans for small and medium-sized enterprises and the growth of money supply, affects the support of policies to the real economy.

To sum up, in order to enhance macroeconomic stability, it is necessary to improve the policy coordination mechanism and strengthen communication and cooperation between the central bank and the financial sector; Improve the scientific nature of policy making and accurately grasp the economic situation; Strengthen the policy transmission effect and optimize the financial market and the use of financial funds.

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