ISSN: 1813-4890

Macroeconomic Fluctuations and the Effects of Monetary and Fiscal Policies in China under the Covid-19 Shock

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Abstract

The AD-AS model is used to discuss the negative impact of unemployment on the economy caused by the new crown epidemic and the role of macroeconomic policies of government countercyclical adjustment. In the empirical evidence, a structural VAR model is used to analyze the impact of unemployment on macroeconomic fluctuations and the role of fiscal policy and monetary policy in mitigating economic depression. The impulse response results analysis shows that unemployment has a negative impact on aggregate output, while fiscal policies such as increasing transfer payments and tax cuts have a positive impact on aggregate output, and monetary policies such as increasing money supply and lowering interest rates also have a positive contribution to aggregate output. The variance decomposition results show that the effect of unemployment rate on output is weak in the early stage and becomes stronger in the later stage. The effects of fiscal and monetary policies on output likewise show a trend of being weaker in the early stage and stronger in the later stage. This suggests that there is a long-term impact of the new crown epidemic on the economy, as well as a certain time lag between fiscal and monetary policies.

Keywords

Economic Fluctuations; Economic Policy; Structural VAR.

1. Introduction

In late 2019, a case of pneumonia of unknown origin was detected in Wuhan, Hubei Province, and China was the first to report the outbreak and took prompt action to conduct etiological and epidemiological investigations to stop the spread of the epidemic. in early 2020, the Hubei Provincial Health Commission officially named the pneumonia outbreak the "novel coronavirus pneumonia outbreak". As the outbreak continued to spread and the number of confirmed cases increased rapidly nationwide, the CPC Central Committee established a leading group to respond to the outbreak and sent a central steering group to Hubei and other areas with serious outbreaks. The State Council established a joint prevention and control mechanism and a mechanism to promote the resumption of work and production. The whole country pooled resources and efforts to assist Hubei Province and Wuhan City. Emergency response to major public health emergencies was launched in all regions. The World Health Organization (WHO) declared the "New Pneumonia" outbreak as a "public health emergency of international concern".

Faced with such a serious public health emergency, the Communist Party of China (CPC) and the Chinese government attached great importance to the epidemic and acted swiftly, with General Secretary Xi Jinping personally directing and deploying the epidemic, overseeing the overall situation and making decisive decisions. Under the leadership of the Communist Party of China, the whole country carried out the general requirements of "firm confidence, common help, scientific prevention and treatment, and precise measures", and waged a people's war, a

ISSN: 1813-4890

general war, and a blocking war against the epidemic. After strenuous efforts, China paid a huge price and sacrifice, and strongly reversed the situation of the epidemic, and initially stopped the spread of the epidemic in more than one month, with January 2020. The strategic results have safeguarded people's lives and health and made important contributions to the maintenance of regional and world public health security.

Although the Party and the central government responded quickly after the outbreak and took effective epidemic prevention and control measures to contain the epidemic in a very short period of time. However, this public health emergency still had a huge impact on the economic development of China. The most effective preventive and control measures for such epidemic diseases with high transmission capacity are to reduce the movement of people, such as the nationwide ban on group activities, home quarantine and extended return to work in China to control the spread of the epidemic, and these measures have had a serious impact on the economy. First, the home quarantine reduced the opportunity for people to go out and spend money, especially in the service, restaurant, tourism, and transportation sectors. Second, the delay in resuming work and production caused a sharp drop in labor supply and prevented many factories from opening for business, resulting in a large number of small and medium-sized enterprises going bankrupt and people's incomes falling. Lastly, the impact of the epidemic changed people's expectations and caused a significant drop in investment, which further affected the economy severely. In the face of these challenges, the Chinese government adopted a series of macroeconomic policies, including stronger fiscal policy and more flexible monetary policy, to maintain positive economic growth during the epidemic.

Today, epidemic prevention and control tends to be normalized, and despite the sporadic emergence of domestic epidemics in China due to foreign epidemics, it has not affected our socio-economic production life in general. Our economy has experienced the impact of the epidemic and continues to develop steadily for the better with active state intervention. However, the severe political situation abroad still indicates that the world economic environment will be in greater uncertainty at present and even in the coming period. Against this background, studying the impact of major health emergencies such as the epidemic on the economy and the effects of government macroeconomic policies in response to exogenous shocks will help to enhance the resilience of our economy in order to more effectively prevent future risks.

2. Literature Review

There are two main categories in the domestic literature when it comes to studying the impact of the epidemic on our economy as well as policies. One type is empirical analysis, which either uses empirical data to analyze the impact of the epidemic on China's economy or analyzes its economic impact by comparing the similarities and differences between past epidemics and the new crown pneumonia epidemic. For example, Sheng Fangfu (2020) concluded that the New Crown pneumonia epidemic will have an economic impact at three levels from micro, meso to macro based on a comparative study of the similarities and differences between previous major public health emergencies and the New Crown pneumonia epidemic [1]. He Chengying et al. (2020) analyzed the data of China's macroeconomic operation in detail, and the study found that the New Crown pneumonia epidemic had an important impact on China's economy, causing a decline in output, a decrease in consumption, a decline in investment, a restriction in foreign trade, a huge loss in industrial development, and an increase in risk for financial institutions [2]. The other type is empirical analysis, which focuses on the macroeconomic impact of the epidemic and the effect of economic policies by building macroeconomic models. For example, Guo Dong (2020) studied the economic impact of the epidemic and the effect of monetary policy based on the DSGE model, which models the impact of the epidemic as the

ISSN: 1813-4890

impact of total factor productivity. It is concluded that quantitative monetary policy is effective but with a lag, and therefore a mixed price and quantity monetary policy is the optimal strategy for the epidemic [3]. Zhu et al. (2020) introduced the concept of "health capital" and introduced it into the DSGE model to analyze the economic impact of the new crown epidemic and to assess the effect of fiscal policy during the epidemic. The study shows that the epidemic reduces the size of the effective labor force and disrupts the normal trading mechanism of the market, and that government fiscal intervention is effective in alleviating the downward pressure on the Chinese economy during the observation period [4]. Yin Yanhui et al. (2020) introduced the New Crown pneumonia epidemic shock in a New Keynesian DSGE model to analyze the impact of the New Crown pneumonia epidemic on China's macroeconomic performance, and further introduced fiscal spending policies to explore the policy effects of fiscal spending under the New Crown pneumonia epidemic shock [5]. The results show that the epidemic is dominated by short-term shocks and the long-term effects are not significant. Both increased government investment spending and transfer spending can effectively alleviate the economic downward pressure, but there are negative effects of both types of policy instruments. Lin Yuxing et al. (2021) introduced labor force shocks and total factor productivity shocks in the DSGE model to portray the macroeconomic shocks of the epidemic and investigated the effects of monetary and fiscal policy combinations [6]. Shengdan Tian (2020) quantifies the impact of the new crown pneumonia epidemic shock and its response policies on China's economy using a computable general equilibrium model (CGE) [7]. It is concluded that the epidemic shock has brought serious impacts on China's macroeconomy and various industrial sectors, but active regulatory policies can effectively mitigate the impact of the epidemic on the economy.

As can be seen, domestic studies on the macroeconomic impact of the epidemic focus on the economic impact of the supply shock of the epidemic. In contrast, foreign studies analyze the macroeconomic impact of the new crown epidemic in terms of the supply shock and demand shock of the epidemic and the interaction between these two. For example, Guerrieri V, Lorenzoni G, Straub L, et al. (2020) argue that a negative supply shock triggers a demand shortage, which leads to a larger contraction in output and employment than the supply shock itself. And this interaction of supply and demand shocks reduces the effectiveness of fiscal policy, so the best policy is to ease monetary policy and adequate social insurance [8]. Fornaro L and Wolf M (2020) use a simple AD-AS model to illustrate that the spread of an epidemic may dampen global demand and that a vicious cycle of supply and demand may occur, amplifying supply disruptions directly caused by the epidemic. In addition, the epidemic may leave the global economy vulnerable to a stagnation trap, a period of low growth and high unemployment brought about by pessimistic expectations. It is finally suggested that to drive the global economy out of stagnation, active fiscal policy interventions are needed to support investment [9]. Faria-e-Castro M (2021) distinguishes between lending and non-lending households in a DSGE model and models the epidemic shock as a cessation of contact-intensive services. He argues that through aggregate demand externalities, the closure of the service sector spills over to the non-service sector and ultimately exacerbates the recession. The presence of endogenous entry and exit in the affected sector implies that demand fluctuations may have a lasting impact on the productive capacity of the sector and that the economy does not recover immediately after the end of the epidemic [10]. Baqaee D and Farhi E (2020) argue that the new crown pneumonia shock decentralizes a chaotic mix of sectoral supply and demand shocks. The demand shock is a change in household preferences and the supply shock is a change in the production possibilities of the economy. Negative sectoral supply shocks manifest as stagflation, while negative demand shocks manifest as deflation, even though both may lead to Keynesian unemployment In addition, production complementarities amplify the Keynesian spillover effects of supply shocks but mitigate the spillover effects of demand shocks [11]. Auray S and Eyquem A (2020) investigate the macroeconomic impact of blockade policies during an

ISSN: 1813-4890

epidemic using a search-and-match model. First, the embargo policy leads to lower labor utilization, in which case the impact of the embargo on output and unemployment is relatively small and short-lived, and the resulting welfare losses are small. Second, the embargo policy leads to high separation rates, in which case the embargo has a large and persistent negative impact on output and unemployment and generates significant welfare losses [12].

3. Theoretical Model

3.1. Basic Model

Fornaro L and Wolf M (2020) proposed a simple AD-AS framework to analyze the macroeconomic shocks caused by the new crown pneumonia and the effects of government macroeconomic regulation policies. However, this analytical framework only considers the impact of the new crown epidemic on labor productivity and ignores the impact of the spread of the epidemic and the corresponding quarantine policy on the maximum amount of employment in the economy, which plays a crucial role in total output. Therefore, this paper adds the impact of the new crown epidemic on employment volume to the above framework to analyze the new crown epidemic and its resulting macroeconomic shocks in an integrated manner.

Assume that output is determined by labor and labor productivity, such that total outputy_t is

$$y_t = l_t + \alpha_t \tag{1}$$

$l_t$for employment.α_t for labor productivity. The level of full employment is$\bar{l}_t$ and changes over time.$\bar{l}_t = (1+n)\bar{l}_{t-1}$. When$l_t = \bar{l}_t$ when the economy is at full employment and when$l_t < \bar{l}_t$ when there is involuntary unemployment and total output of the economy is below potential output.

Define the growth rate of labor productivity.

$$g_t \equiv \alpha_t - \alpha_{t-1} \tag{2}$$

according to the New Keynesian theory, assuming that aggregate demand is.

$$y_t = -r_t + y_{t+1} \tag{3}$$

Aggregate demand depends on expectations of future outputy_{t+1} and real interest ratesr_t . First, current demand is increasing in the expectation of future output. The reason is that consumers are more likely to spend now if they expect higher incomes in the future. Second, lower interest rates boost aggregate demand, for example, by borrowing to spend and by stimulating investment.

Interest rates are determined by monetary policy, assuming that the central bank adopts a price-based monetary policy.

$$i_t = \bar{\imath} + \theta(l_t - \bar{l}_t) \tag{4}$$

The central bank determines the nominal interest rate and the real interest rate is determined by the Fisher equation.

$$i_t = r_t + \pi_{t+1} \tag{5}$$

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Assuming a constant rate of inflation in the short run, the$\pi_{t+1} = \bar{\pi}$. Thus, equation (5) becomes

$$i_t = r_t + \bar{\pi} \tag{6}$$

Combining (1) - (6), the AD curve can be obtained

$$l_t(n - \theta) = -\bar{\imath} + \bar{\pi} + g_{t+1} + \theta\bar{l}_t \tag{7}$$

Assume thatg_{t+1} is a constant, such that$g_{t+1} = g_t$. Therefore, the AD curve time subscript is removed.

$$\mathrm{l}(n - \theta) = -\bar{\imath} + \bar{\pi} + g + \theta\bar{l} \tag{8}$$

Assume that firms can increase their labor productivity by investing to increase their capital stock or by developing innovations that improve product quality, so that the AS curve can be expressed as.

$$g = \gamma\mathrm{l} + \bar{g} \tag{9}$$

of whichγ and$\bar{g}$ are the two constants.γ denotes the endogenous component of productivity growth. The underlying principle is that higher aggregate demand associated with higher employment leads to higher investment and faster productivity growth.$\bar{g}$ Factors that affect productivity independently of demand, such as the spread of the New Coronavirus pneumoniae and related embargo policies.

Suppose that government fiscal policy increases investment during the epidemic, for example, on government subsidies to firms. This increases investment, which in turn increases labor productivity. Thus, the AS curve becomes.

$$g = \gamma\mathrm{l} + \bar{g} + s \tag{10}$$

s denote government policies that increase investment. Higher denotes increased subsidies for business investment, increased public investment, credit support for firms on the verge of bankruptcy, and even subsidies to prevent the breakdown of worker-firm matching. All of these policies, given aggregate demand, lead to higher aggregate investment, which leads to higher labor productivity growth.

3.2. Comparative Static Analysis

Combining equations (8) (10), the equilibrium employment is obtained as.

$$\mathrm{l} = (-\bar{\imath} + \bar{\pi} + \theta\bar{l} + \bar{g} + s)/(n - \theta - \gamma) \tag{11}$$

To ensure the existence of equilibrium employment levels and labor productivity growth rates, it is assumed that$n - \theta - \gamma > 0$. Equation (11) allows to analyze the macroeconomic impact of the new crown epidemic and the effect of regulatory policies.

3.2.1. Macroeconomic Impact of the Covid-19

The new crown epidemic has caused more serious shocks to macroeconomic operations from both supply and demand sides, and the interaction of supply shocks and demand shocks may deepen the degree of economic recession. From equation (11), it is clear that$\partial\mathrm{l}/(\partial\bar{l}) = \theta/(n -$

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$\theta - \gamma) > 0$. It shows that the equilibrium employment is positively related to the maximum employment of the economy. In contrast, the spread of the new crown epidemic and the corresponding quarantine measures substantially reduce the labor supply, especially the employment in contact-intensive industries. The decrease in employment leads to a decrease in workers' current income as well as expected future income, which will lead to a decrease in current consumption and investment, thus causing a decrease in aggregate demand and ultimately a decrease in aggregate output. In addition, the$\partial \mathrm{l}/(\partial \bar{g}) = 1/(n - \theta - \gamma) > 0$. This suggests that the equilibrium employment volume of the economy is positively related to the growth rate of labor productivity. And the new crown epidemic causes a decline in the productive capacity of the economy. At the beginning of the epidemic, a large number of factory firms shut down and many SMEs were even on the verge of bankruptcy, and the home quarantine of workers destroyed the matching between worker firms. Although solutions such as online work and home work emerged during the epidemic, they were limited to a few industries, and overall, the productive capacity of the economy as a whole was severely impacted, leading to a decline in total economic output.

Further, to analyze how supply shocks act together with demand shocks to deepen the recession in the economy. First, assume that the economy is in equilibrium and that the new crown epidemic shock causes the rate of increase in firm labor productivity$\bar{g}$ decreases.$\bar{g}$ This decline leads to a new equilibrium. However, the new equilibrium has a lower rate of productivity growth and employment. The low employment rate reduces workers' income, which reduces consumption, and the negative expectations also reduce investment. Lower consumption and investment lead firms to cut back on investment. This further reduces the growth rate of labor productivity, as well as causing a decline in potential future output. Lower productivity growth in turn leads to a further cut in demand, which in turn reduces investment and output growth. Thus, supply shocks and demand shocks are caught in a vicious circle thus deepening the impact of the epidemic on the economy.

3.2.2. Effect of Macroeconomic Policies

In order to cushion the economic impact of the epidemic and move the economy from recession to recovery as soon as possible. The Chinese government has adopted a series of fiscal and monetary policies. For example, tax cuts to raise the disposable income of the population, thus increasing consumption. As well as providing various subsidies to SMEs to increase employment. Both conventional and unconventional monetary policies have been used to increase liquidity and inject dynamism into the economy.

(1) The effect of fiscal policy. From equation (11), it is clear that$\partial \mathrm{l}/(\partial \mathrm{s}) = 1/(n - \theta - \gamma) > 0$. shows that the amount of equilibrium employment is positively related to government subsidies. Government tax cuts and subsidies to firms raise their investment, which on the one hand increases employment and thus mitigates the decline in income, which facilitates higher consumption and thus higher aggregate demand. On the other hand, the increase in aggregate demand prompts firms to expand investment, which raises labor productivity growth, which in turn raises aggregate output, which likewise raises expected future income, which raises consumption, which raises aggregate demand, which in turn stimulates firms to expand investment.

(2) The effect of monetary policy. From equation (11), it follows that$\partial \mathrm{l}/(\partial \bar{\imath}) = -1/(n - \theta - \gamma) < 0$. This shows that the equilibrium employment is negatively related to the interest rate. If the central bank lowers the interest rate, it causes firms to increase their investment. The increase in investment by firms causes the growth rate of labor productivity to rise, which causes aggregate output to rise. The rise in aggregate output raises unemployment and causes a rise in income, which leads to an increase in consumption and an increase in aggregate

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demand. The increase in aggregate demand causes firms to invest more, which puts the economy into a positive virtuous cycle.

4. Data Description and Analysis

4.1. Descriptive Statistics

This paper uses quarterly data from the first quarter of 2014 to the fourth quarter of 2021 to perform impulse response analysis. For data with monthly frequency, the average value is used instead of the quarterly data. u represents the unemployment rate, r is the 7-day interbank borrowing weighted average rate used to represent the interest rate level. lnc is the logarithm of total social retail sales, lni is the logarithm of fixed asset investment, lngdp is the logarithm of GDP, lnt is the logarithm of tax revenue, lntr is the logarithm of transfer payments, and lnm2 is the logarithm of m2 (money and quasi money). All the above data are obtained from the CEE database, and Table 1 reports the results of descriptive statistics of the variables.

Table 1. Descriptive statistics

Variable Name	Number of samples	Average value	S.D.	Min	Max
u	32	3.933	0.166	3.610	4.240
r	32	2.980	0.516	2.090	4.527
lnc	32	10.22	0.301	9.039	10.52
lni	32	12.57	0.124	12.35	13.00
lngdp	32	12.27	0.194	11.95	12.60
lnt	32	9.251	0.249	8.374	9.746
lntr	32	8.638	0.218	8.048	9.066
lnm2	32	14.33	0.218	13.96	14.67

4.2. Unit Root Test

Table 2. Unit root test results

Time Series	Horizontal Variables				First order differential variables			
	ADF		PP		ADF		PP	
	T-statistic	Is it smooth	T-statistic	Is it smooth	T-statistic	Is it smooth	T-statistic	Is it smooth
r	-2.363	No	-2.332	No	-6.935	Yes	-7.04	Yes
u	-1.786	No	-1.942	No	-3.487	No	-3.284	No
lnc	-4.142	Yes	-4.228	Yes	-	-	-	-
lni	-5.298	Yes	-5.251	Yes	-	-	-	-
lngdp	-0.31	No	-0.161	No	-7.476	Yes	-7.787	Yes
lnt	-5.175	Yes	-5.169	Yes	-	-	-	-
lntr	-3.005	No	-3.041	No	-7.097	Yes	-8.229	Yes
lnm2	-0.997	No	-1.284	No	-6.011	Yes	-6.129	Yes

Note: (1) The critical value of 1% significance level of ADF test is 3.709. The critical value of 1% significance level of PP test is 3.716. (2) The results of the above table are compiled by the authors

In this paper, the ADF test and PP test were used to test the smoothness of the variable series, respectively. The original hypothesis is the existence of a unit root, and the test results are reported in Table 2. As shown in Table 2, the level variables of interest rate level r,

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unemployment rate u, log of transfer payments lntr, log of gdp lngdp, and log of money supply lnm2 failed the ADF and PP tests. After taking first-order differences for the above variables and testing them again, the results show that all the variables except the unemployment rate show smoothness. After taking the 2nd order difference for the unemployment rate, the test results show smoothness.

5. Empirical Analysis

Combined with the previous theoretical analysis, it is clear that the transmissibility of the new crown pneumonia epidemic and the corresponding quarantine measures reduce the equilibrium amount of employment in the economy and cause a decrease in labor productivity due to work stoppages and production shutdowns. These shocks reduce people's current and expected incomes, thus reducing current consumption and ultimately aggregate demand. Pessimistic expectations from the new epidemic reduce social investment, and the decline in aggregate demand causes firms to cut back on investment, further causing employment losses and productivity declines, thus plunging the economy into recession. The government's macroeconomic policies were effective in mitigating the extent of the recession. The macroeconomic impact of the New Crown epidemic was dealt with by providing subsidies to firms and tax cuts to increase their investment levels, transfer payments to residents and tax cuts to increase consumption levels, and conventional and unconventional monetary instruments to increase economic liquidity. In order to quantitatively analyze the impact of the new crown epidemic and the effect of macroeconomic policies, this paper uses a structural var model to conduct impulse response analysis.

5.1. Model Setup

The simplified equation of our estimated structural var model is

$$B_0 X_t = B(L) X_{t-1} + \mu_i \qquad (12)$$
$$\mathrm{E}(\mu_i, \acute{\mu}_\iota) = \Omega$$

where, X_t is a column vector containing four variables, including unemployment rate, fiscal policy variables, monetary policy variables, and aggregate output. $B(L)$ is the parameter matrix of the lagged terms of each order. μ_i To simplify the residual term vector, the variance covariance matrix is Ω . The structure var can be transformed into the approximate form.

$$X_t = {B_0}^{-1} B(L) X_{t-1} + {B_0}^{-1} \mu_i \qquad (13)$$

The residual vector in the reduced form is

$$\varepsilon_i = {B_0}^{-1} \Omega \mu_i \qquad (14)$$

Its variance covariance matrix is given by

$$\sum \varepsilon = E(\varepsilon_i, \acute{\varepsilon}_\iota) = \left[{B_0}^{-1}\right] \mathrm{E}(\mu_i, \acute{\mu}_\iota) \left[{B_0}^{-1}\right]' = \left[{B_0}^{-1}\right] \Omega \left[{B_0}^{-1}\right]' \qquad (15)$$

To identify the covariance matrix from the approximate variance covariance matrix $\sum \varepsilon$ to identify the matrix B_0 and Ω requires eight ($k(k-1)/2$) constraints, given the order of the variables in the structural VAR, can be determined by the Cholesky decomposition of the

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matricesB_0 andΩ , the matricesB_0 is the lower triangular matrix. According to the previous theoretical analysis, the order of variables arrangement in the structural VAR is.

Unemployment rate ⟶ Fiscal policy variables ⟶ Monetary policy variables ⟶ Total output

B_0 is the lower triangular matrix, and the relationship between the residuals of the structural VAR and the residuals of the approximation is

$$\begin{bmatrix}\varepsilon_1\\ \varepsilon_2\\ \varepsilon_3\\ \varepsilon_4\end{bmatrix}=\begin{bmatrix}1 & 0 & 0 & 0\\ \alpha_1 & 1 & 0 & 0\\ \beta_1 & \beta_2 & 1 & 0\\ \gamma_1 & \gamma_2 & \gamma_3 & 1\end{bmatrix}\begin{bmatrix}\mu_1\\ \mu_2\\ \mu_3\\ \mu_4\end{bmatrix} \tag{16}$$

$\mu_1$are the unemployment rate residuals, theμ_2 is the fiscal policy residual term, andμ_3 is the monetary policy residual, andμ_4 is the residual term for aggregate output.

5.2. Impulse Response Analysis

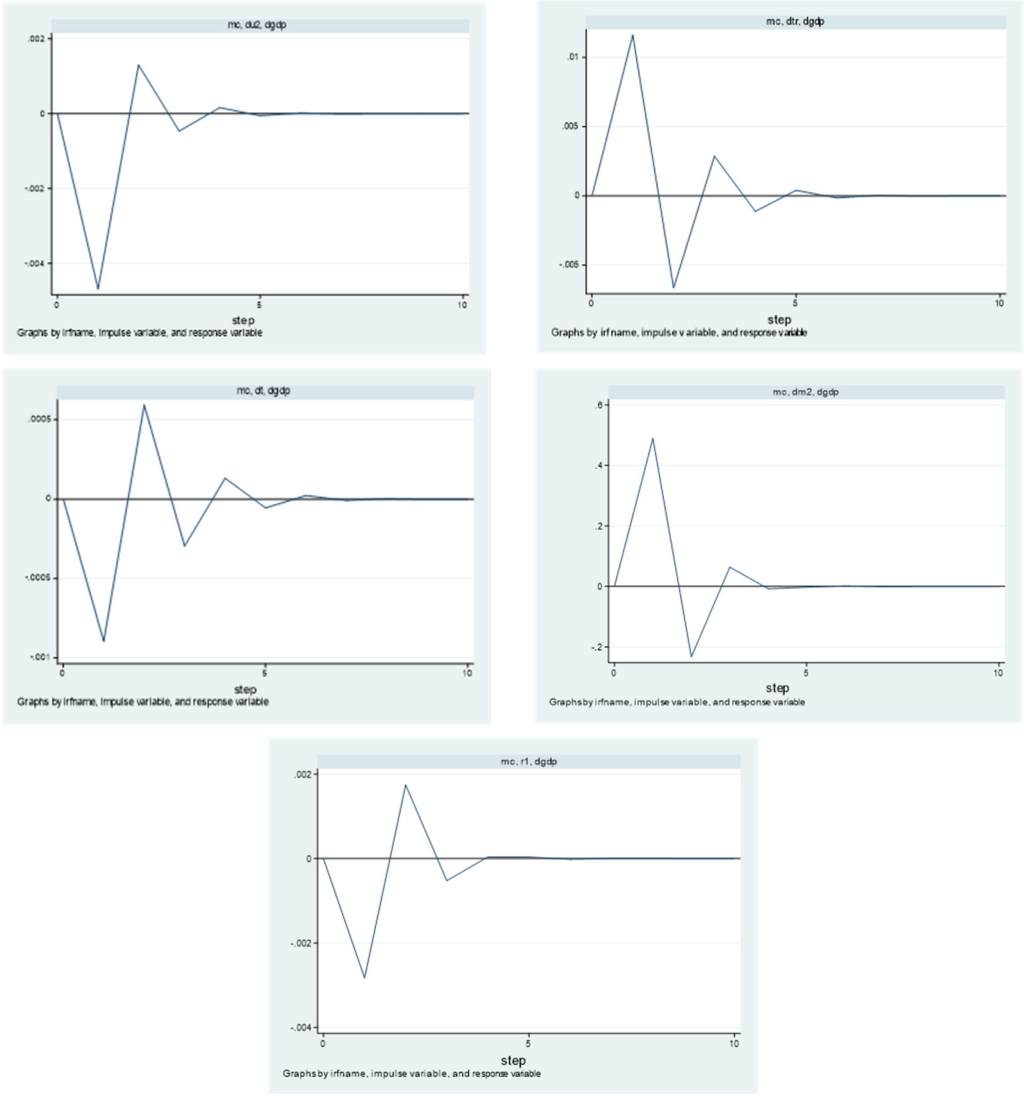

Figure 1. Impulse response of total output to each economic variable

The VAR model is not used to interpret the significance of the regression coefficients, but rather to illustrate the impact of a shock to a random new variable on the endogenous variables and

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their relative importance. Figure 1 reports the impulse response plots of shocks to aggregate output for each economic variable.

Figure 1a shows that after giving a positive shock to unemployment in the current period, total output reacts negatively in the first period, reaches a maximum in the second period, and fluctuates up and down in the first three periods before finally starting to level off in the fifth period. Figure 1b shows that after giving a positive shock to taxes in the current period, there is a negative shock to aggregate output, which reaches its maximum in the second period and fluctuates positively and negatively over the five periods, finally leveling off in the seventh period. Figure 1c shows that after giving a positive shock to transfer payments in the current period, a positive shock to total output is generated, which reaches its maximum near the first period, turns negative in the second period, and plateaus in the sixth period. In Figure 1d, after giving a positive shock to the money supply in the current period, aggregate output generates a positive response that reaches a maximum in period 1, shifts to a negative response in period 2, and levels off in period 7. Figure 1 shows that after a positive shock to interest rates in the period, aggregate output exhibits a negative response in period 1, shifts to a positive response in period 2, and plateaus in period 5.

Combining the impulse responses shows that, consistent with the previous theoretical analysis, the new crown epidemic and the unemployment rate shock from the embargo policy have a negative impact on total output, causing a decline in total output. Fiscal policies such as transfer payments and tax cuts have a positive impact on aggregate output. Increasing money supply and lowering interest rates also have a positive impact on aggregate output.

5.3. Analysis of Variance Decomposition

The variance decomposition represents the degree of interaction between variables in the form of the percentage variance of the prediction error of the variables after a unit shock to one of the system's variables. The ANOVA results show that the effect of unemployment rate shocks on aggregate output is relatively small initially and becomes progressively larger over time. The effect of transfer payment shocks on total output is steadily around 17% in period 8. And the impact of interest rate shocks on aggregate output is likewise smaller at the beginning, larger in the later period, and stays around 1.3% in period 8.

Table 3. Variance decomposition of total output prediction error

Predictive variables	Prediction period	The degree of explanation of the predictor variables			
		d2u2	dtr	dr	dgdp
Dgdp	1	0.002562	0.03537	0.010603	0.951465
	2	0.002447	0.050252	0.009612	0.937689
	3	0.002398	0.09703	0.010185	0.890388
	4	0.002549	0.171398	0.009623	0.816429
	5	0.003279	0.175507	0.00985	0.811363
	6	0.005177	0.174917	0.011829	0.808077
	7	0.005181	0.175965	0.012904	0.80595
	8	0.005401	0.177111	0.013261	0.804227
	9	0.005405	0.177094	0.013261	0.80424
	10	0.005435	0.177069	0.013324	0.804172

6. Conclusion and Recommendations

The New Crown pneumonia epidemic and the ensuing quarantine severely affects labor supply, and the shutdown of firms leads to an increase in unemployment, causing household income to fall, causing a decline in consumption, and ultimately causing a decline in aggregate demand,

leading to a decline in aggregate output. This paper uses a simple AD-AS model to address the negative economic shock caused by unemployment due to the new crown epidemic and the macroeconomic policy role of government countercyclical adjustment. In the empirical evidence, a structural VAR model is used to analyze the impact of unemployment on macroeconomic fluctuations and the role of fiscal policy, and monetary policy in mitigating economic depression. The impulse response analysis shows that unemployment has a negative impact on aggregate output, while fiscal policies such as increasing transfer payments and tax cuts have a positive impact on aggregate output, and monetary policies such as increasing money supply and lowering interest rates also have a positive contribution to aggregate output. Therefore, the policy implications of this paper are mainly the following; First, increase the efforts of fiscal policy, vigorously relieve the difficulties of enterprises, especially small and micro enterprises, and focus on stabilizing the main market and employment. Small and medium-sized enterprises promote the development of the national economy is an important force, but also an important means to stabilize employment. The use of subsidies, tax cuts and other financial to reduce the adverse impact of the new crown epidemic on enterprises. Second, the use of flexible monetary policy. The use of inclusive small and micro loans, lower interest rates, unconventional monetary policy and many other monetary policies to stimulate the vitality of micro subjects, stable employment, promote the internal circulation, and efforts to promote the economy back to normal track. Third, promote the synergy of fiscal policy and monetary policy. The synergy of macro policies is crucial. Affected by the new crown pneumonia, as well as the current complex internal and external environment, fiscal and monetary policies need to be coordinated to ensure supply and price stability, help enterprises to alleviate their difficulties, play a role in protecting market subjects, stabilizing employment and promoting the internal circulation.

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