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The Discussion on the Impact of the COVID-19 Epidemic on the Macro-economy and the Establishment of the Work and Production Resumption Model

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Abstract: In order to explore the impact of the COVID-19 epidemic on the macro-economy, this paper established the IS-LM model and the AD-AS model, made corresponding adjustments and calculations to the models, analyzed the impact of the epidemic on aggregate demand and aggregate supply respectively, and put forward policy suggestions according to the actual situation by using the models. And in order to help the government better decide the best timing to return to work and production in different industries, this article utilized the total cost model in epidemic control to build a work resumption coefficient evaluation model of different industries, getting the coefficients of the high-density population industry, the industry whose work resumption can be carried out online, the industry of fewer average interactions, highly mechanized industry and special industries, respectively. And we formulated the standard of work resumption based on the work resumption coefficient under the condition of controlling the total cost to be minimized. After getting the work resumption coefficients of different industries and corresponding resumption standard, the government will be easier to balance the cost of the shutdown and the risk of resuming work and production under the epidemic.

Keywords: AD-AS model, macro-economics, work and production resumption

1. Introduction

Pneumonia caused by COVID-19 has a very strong transmission ability, and the mutation renewal speed is very fast, which can cause a large number of people to be infected in a very short time. The COVID-19 pandemic has posed a serious threat to the health and safety of the whole world and caused indelible damage to social and economic conditions. Moreover, the epidemic prevention and control will inevitably lead to the stagnation of some industries, unemployment of a large number of employees and economic backwardness.

From the perspective of history, the emergence of any infectious disease, from the American flu epidemic in 1918 to the European flu epidemic in 1957, from the massive spread of malaria in the 20th century to the massive spread of severe respiratory syndrome (SARS) in the early 21st century, will bring the huge loss in macro-economics to the whole world, especially developed countries and huge economic entities.

The current global epidemic is still ongoing, so exploring the impact of the diseases on the global macro-economy and how to measure the connection between enterprise growth and disease prevention and control has great practical significance, this paper will build multiple models and implement numerical simulation to the models, quantifying the influence of the epidemic on macro-economics in different aspects and providing the basis for the government to formulate the optimal return to work and production measures [1].

The paper collected the data of Shanghai in March to May, 2022 for convenience of the study, because in that time Shanghai experienced the shutdown and stopped almost all work and production to overcome the difficulties of the outbreak in the whole city. We used IS-LM model and AD-AS model to analyze the impact of the epidemic on the macro-economy, changing and calculating the equations based on some assumptions and the truth condition of Shanghai, and then used the work resumption model to calculating the resumption coefficients of different industries based on our classification result, drafting the standard of work resumption based on our models, helping the government to adjust the fiscal and monetary policies more efficiently, and letting the factories to resume work and production using our cost-benefit models and results.

2. Research Methods

2.1. Model Assumptions

In order to reflect the shock and impact of the epidemic on the economy more obviously, it was assumed that the government did not have any policies on the epidemic, so the parameters related to the policy remain unchanged, that means, θ_t and θ_Y remained unchanged. And the Central bank's inflation rate was also unchanged.

The population includes both cured patients R and diagnosed patients I. The daily increase of cured patients is a power function $\delta R(t) = pt^q$ for duration t, and the daily increase of cases $\delta(It)$ is a parameter of $\delta(It) = at^2 + bt + c$ for t (the assumptions about these three parameters a, b, c are based on the predicted daily increment of confirmed cases in Fig.1 below).

The total cost of epidemic management includes both fixed cost and average variable costs, but because the total cost occurs as soon as the epidemic prevention measures are initiated, therefore, the average variable costs did not change with the cost. The average variable cost includes the cost of hospitalization and isolation in a certain period, as well as the daily cost of isolating patients and the potential cost of long-term shutdown. The average variable cost of hospitalization and isolation is also a direct proportional function of the total cost.

The cosine values of α and β (see Fig.2) are considered as parameters of the mean variable treatment cost and mean variable isolation cost as a function of time. That is to say, when $\cos\alpha$ is larger, the expected period of human isolation is longer, and the isolated households will consume more than usual, also the enterprises will incur greater economic losses due to the isolation of workers. When $\cos\beta$ is smaller, the scale of infection will be smaller when the epidemic is contained, and the cost of medical treatment will be smaller either [2].

2.2. Model Foundation

2.2.1. IS-LM Model

The equation of IS curve:

$$Y = C + I + G \tag{1}$$

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Where Y represents the local GDP per capita, C represents consumption capacity, I represents investment level, and G represents government purchase.

The equation of LM curve:

$$\frac{M}{P} = L(Y, r) \tag{2}$$

Where $\frac{M}{P}$ is the real money quantity, M is the nominal money quantity, P is the price level, Y is the local GDP per capita, R is the interest rate, L is the money demand (which is a function expression of Y and r). In addition, interest rate has an inverse relationship with money quantity, while income has a positive relationship with money quantity (as shown in the equation below).

$$\mathrm{P} \uparrow \rightarrow \frac{M}{P} \downarrow \rightarrow r \uparrow \rightarrow I \downarrow \tag{3}$$

The simple diagram is as follows:

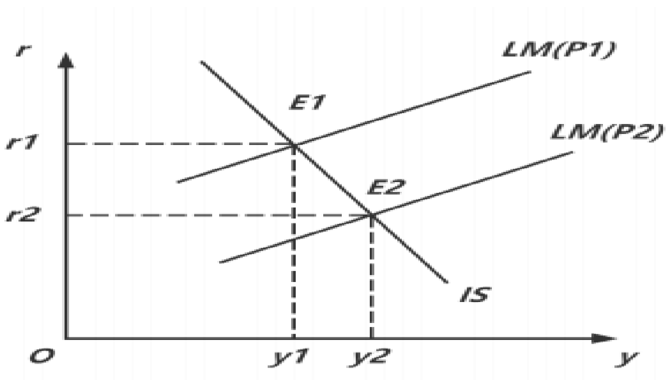

Figure 1: The illustration of the LM model.

Assuming that all the data in the equation are y_0 in t_0 period, and all the data in the equation are y_1 in the t_1 period, the following conclusions can be obtained:

$$\frac{\Delta y}{y_0} = \frac{y_1 - y_0}{y_0} = \frac{\Delta C + \Delta I + \Delta G}{y_0} \tag{4}$$

Taking various data during the epidemic in Wuhan, China as an example, according to the official data obtained by Sina Finance, Wuhan's GDP in the first quarter of 2019 increased by 8.4% year on year, while Wuhan's GDP in the first quarter of 2020 decreased by 40.5% year on year.

According to official data obtained by Tencent News, investment in Wuhan grew by 10% in the first quarter of 2019, and the general public budget points to a 14% growth rate.

Assumes that the first quarter of 2020, the general public of Wuhan budget expenditure growth and investment growth is flat with the previous year, and the major effect of the epidemic, embodied in the national consumption ability, and through the above data can be concluded that, compared with 2019, the consumption growth of Wuhan is 0.64, and its consumption level at least in the first quarter fell by about 64%. Substitute the data to the equation above, we can obtain:

$$-0.4 = \frac{\Delta C}{y_0} + 0.1 + 0.14 \tag{5}$$

Let's expand the formula as follows:

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$$\frac{M}{P} = L(Y, r) = ay + br + c \quad (a > 0, b > 0) \tag{6}$$

Where a、b、c can be obtained by linear regression data fitting of the historical data of one place, for example, Shanghai.

Then after transposition:

$$\mathrm{M} = \mathrm{P}(ay + \mathrm{br} + \mathrm{c}) \tag{7}$$

Suppose r， M both remain constant, then we can get:

$$\Delta\mathrm{P} \approx P'(y_0) \cdot \Delta y = -\frac{aM\Delta y}{(ay_0 + br + c)^2} \tag{8}$$

So we have:

$$\frac{\Delta P}{P_0} = -\frac{aM\Delta y}{P_0(ay_0 + br + c)^2} \tag{9}$$

And then we substitute y_0、a、b、c to the equations above, we can get the specific increase in prices.

2.2.2. AD-AS Model

The demand of the products and services.

$$Y_t = \overline{Y_t} - \alpha(r_t - \rho) + \varepsilon_t \tag{10}$$

Where Y_t represents the total outputs of goods and services in period t, and $\overline{Y_t}$ represents the natural level of output of the economy, r_t is the real interest rates, ε_t is the random shock to the demand, ρ is the natural interest rates, α is a parameter which is larger than 0, representing the sensitivity of demand to the changes in real interest rates.

The real interest rates: Fisher equation.

$$r_t = i_t - E_t\pi_{t+1} \tag{11}$$

Where r_t is the real interest rates and i_t is the nominal interest rate, $E_t\pi_{t+1}$ represents the expected inflation rate.

The inflation: the Phillips curve

$$\pi_t = E_{t-1}\pi_t + \varphi(Y_t - \overline{Y_t}) + v_t \tag{12}$$

Where π_t is the inflation rate, $E_{t-1}\pi_t$ is the expected inflation rate for the previous period. And $(Y_t - \overline{Y_t})$ is the deviation of output from its natural level, v_t is the exogenous supply shock, φ is a parameter which is larger than 0, representing the extent to which inflation responds when outputs fluctuates in the vicinity of its nature levels.

The expected inflation: the adaptive expectations.

$$E_t\pi_{t+1} = \pi_t \tag{13}$$

The equation above is to simplify the dynamic AD-AS model by assuming that people form expectations about the next inflation rate based on the inflation rate they have observed in the most recent period.

The nominal interest rate: monetary policy rules.

$$i_t = \pi_t + \rho + \theta_\pi(\pi_t - \pi_t^*) + \theta_Y(Y_t - \bar{Y}_t) \tag{14}$$

Where π_t^* is the target inflation rate of the central bank, θ_π and θ_Y are two key policy parameters, both assumed to be greater than 0, the larger the θ_π becomes, the more sensitive the central bank is to the deviations in the inflation from its target; the larger θ_Y becomes, the more sensitive the central bank is to deviations in the total output from its natural level [2].

Dynamic aggregate supply curve (DAS)

By using an equation for inflation expectations: $E_{t-1}\pi_t = \pi_{t-1}$, we can replace the expected rate of inflation $E_{t-1}\pi_t$ with the past rate of inflation π_{t-1}. So, we can eliminate an endogenous variable of the Phillips equation $E_{t-1}\pi_t$ [3]. Therefore, the Phillips equation can be changed into the following dynamic aggregate supply curve:

$$\pi_t = \pi_{t-1} + \varphi(Y_t - \bar{Y}_t) + v_t \tag{15}$$

Dynamic aggregate demand curve (DAD)

By algebraic substitution of the above equation, the dynamic aggregate demand curve can be obtained as follows[4]:

$$Y_t = \bar{Y}_t - \frac{a\theta_\pi}{1+a\theta_Y}(\pi_t - \pi_t^*) + \frac{1}{1+a\theta_Y}\varepsilon_t \tag{16}$$

2.2.3. Cost Estimation Model

The graph below shows the daily increase in confirmed cases as a function of the number of days the epidemic lasted. The horizontal axis is the independent variable t, which is the distance from the current time to January 21, 2020.

The vertical axis represents the size of the daily increase in diagnosed cases, the peak of the daily increase in the width of AC, and the Angle between BC, AC and AB is respectively equal to α、β.

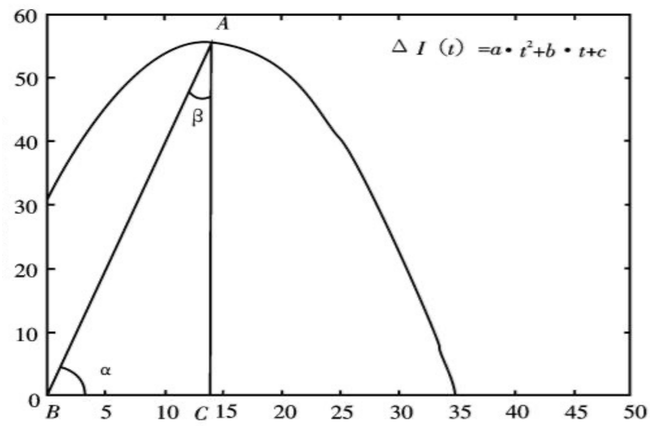

Figure 2: The illustration of the LM model.

For α、β, clearly there was a problem that if the authorities paid more attention to the implementation of the quarantine policies, the cost of isolation will be higher, the number of the infected patients will be lower, and the cost of the medical care will be lower; If the policy goal is to reduce the isolation spending, it could simultaneously increase the cost of the health care substantially.

We try to find a critical point at which the cost of health care and the cost of isolation can be in a relatively balanced state, so as to minimize the total cost estimate.

Based on the above model assumptions 2-4, we consider the necessary cost as the value generated by the medical staff in the two stages of the number of patients diagnosed and the isolation policy, and assume that the average variable cost resulting from diagnosis will be the maximum cost for the cumulative number of patients diagnosed over a long period of time.

Ignoring the possible loss of the average fixed price, the average variable price of the health care in period T will be equal to the product of the integral value over a period and the average changing price of the health care as a function of the change in the quantity of patients treated and the increase in the number of infections over time. Therefore, the total cost of epidemic isolation management activities can be expressed by the following formula:

$$\mathrm{TC} = \int_0^T tcos\alpha \frac{d[I(t)]}{dt} + \int_0^T tcos\beta(\Delta I + \Delta R)dt \tag{17}$$

where $\mathrm{I(t)} = \mathrm{a}t^2 + bt + c$, and $\delta\mathrm{R(t)} = \mathrm{p}t^q$.

3. Empirical Results of the Models

3.1. The Influence on Aggregate Supply (Using IS-LM, AD-AS Models)

On the premise of the assumption 1, due to the fear of the spread of the epidemic, many factories are suspended for work, and the supply is disjointed, leading to the damage to the normal operation of many industries.

The pandemic has reduced the mobility of people and goods, which in turn has reduced the output in the tertiary industry, namely service sector. The tertiary industry accounted for 53.9% of GDP in 2019 [5], so the epidemic has a huge effect on the GDP and the total output Y_t.

Many workers stopped work due to the pandemic, which led to a decline in income and a certain number of workers were directly unemployed. It is expected that the economic development may

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slow down or even stall in the future, and people are more inclined to hold money to maintain liquidity to cope with sudden risks, thus leading to a decrease in consumption.

Under the premise that the central bank does not change the money supply, the amount of money in circulation decreases, leading to a deflationary situation, so the expected inflation level $E_{t-1}\pi_t$ will decrease.

And due to the unknown duration of the epidemic, a large number of service-oriented small and medium-sized enterprises could not operate. A large number of small and medium-sized manufacturing enterprises could not resume work, and enterprises were in panic about the existence of the epidemic and its impact on the whole industry [6], which would lead to the responses of firms to the deviations of output level from its natural level $(Y_t - \overline{Y}_t)$ increase, that means, the parameter φ would become larger.

So the effect of the pandemic on the dynamic aggregate supply curve is that the slope of the curve will increase and the intersection point of the curve with the Y-axis inflation rate π_t will decrease. As shown in the figure below:

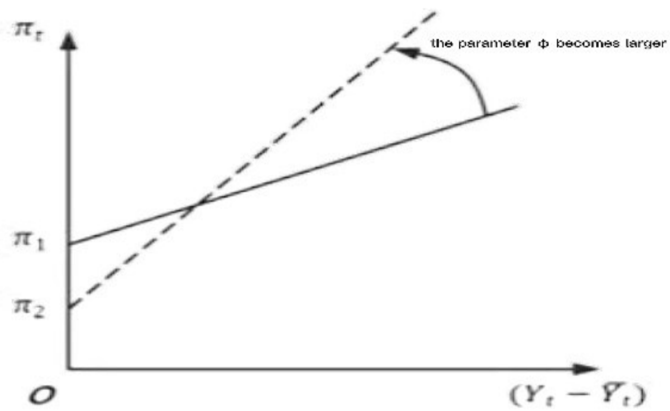

Figure 3: Changes in the dynamic aggregate supply curve due to the pandemic.

3.2. The Influence on Aggregate Demand (Using IS-LM, AD-AS Models)

Also based on the assumption 1, the epidemic would lead to the decrease of the consumers' demand in different regions, and also have a significant impact on the import and the export, leading to a sharp decline or even stagnation of global trade activities, and a heavy blow to the normal operation of the global industrial chain [7]. If the epidemic lasts for a long time, it may even lead to the rupture of part of the industrial chain. Year-on-year growth in the value of China's exports and imports has been at its lowest level in recent years for months since the pandemic began. It fell to -11.0% in February 2020 and remained negative for several months thereafter. So according to the dynamic aggregate demand curve:

$$Y_t = \overline{Y}_t - \frac{a\theta_\pi}{1+a\theta_Y}(\pi_t - \pi_t^*) + \frac{1}{1+a\theta_Y}\varepsilon_t \quad (18)$$

Where ε_t will decrease due to the shock of the demand, leading the DAD curve to shift down [8].

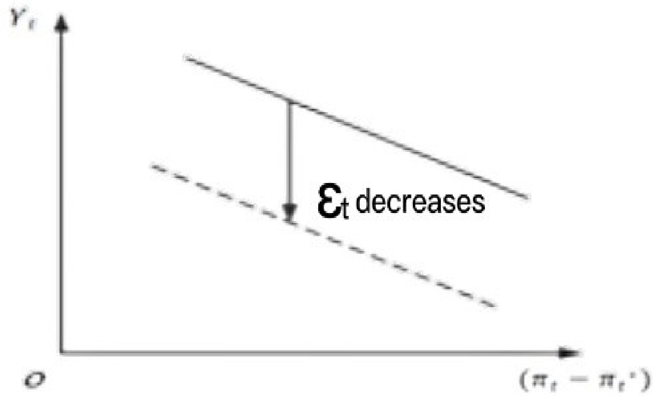

Figure 4: Changes in the dynamic aggregate demand curve due to the pandemic.

3.3. Calculations of the Coefficient of the Work Resumption in Different Industries and the Standards of the Work Resumption

According to the Total Cost model:

$$TC = \int_0^T tcos\alpha \frac{d[I(t)]}{dt} + \int_0^T tcos\beta(\Delta I + \Delta R)dt \tag{19}$$

where $I(t) = at^2 + bt + c$, and $\delta R(t) = pt^q$. Using the epidemic data of Shanghai from March to June and selecting the corresponding regions for simulation. The paper chose the number of diagnosed cases of Shanghai, and used the data to fit for quadratic function form, at the 95% significance level on the fitting, using MATLAB to fit the curve and get the fitted equation, and finally obtained the corresponding parameters for subsequent operations, and after fitting, the parameters are as follows:

$$\begin{cases} a = -0.1146 \\ b = 3.7672 \\ c = 28.98 \\ p = 1.7232 \\ q = 1.0208 \end{cases} \tag{20}$$

And by calculation we can get: $\cos\alpha = 0.2644$, $\cos\beta = 0.9643$.

Substitute it into the original equation of the total cost, and draw the image of the total cost TC fluctuating with time t through MATLAB as follows:

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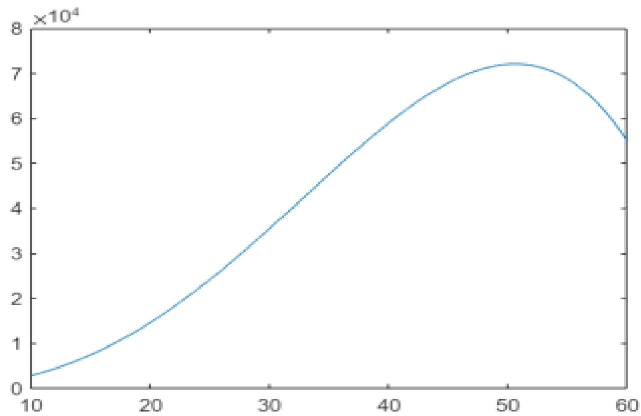

Figure 5: The total cost TC fluctuating with time t.

By analyzing the figure, we find that when the total cost TC reaches the critical value of growth, the work and production resumption should be considered.

But how to determine the resumption plan cannot only reduce the economic pressure, but also effectively prevent the rebound of the epidemic is the most important. The following is to calculate the resumption coefficient of different industries according to the above data.

Because of the different risks of COVID-19 and corporate profits caused by the work and the production resumption in different industries, the standard we set cannot be one-size-fits-all.

Therefore, we take the risk degree and urgency degree of the industry after the resumption of work as the standard to determine the industry resumption coefficient, which is specifically divided into the following categories:

- High population density industries: large population flow, such as consumer goods manufacturing;
- Available online resume industries: education industry, Internet industry;
- Less average interaction times industries: public institutions, etc.;
- Highly mechanized industries: mechanized electronics factory or machinery factory, etc. ;
- Special industries: including protective products, disinfectants, inspection and testing equipment and other epidemic prevention materials manufacturers, as well as nucleic acid testing institutions.

According to the online questionnaire sent to students of Shanghai University of Finance and Economics, a total of 764 samples were collected, of which 637 were valid samples. The score of risk degree and urgency of work resumption in various industries was obtained as follows:

Table 1: The risk degree and work assumption urgency degree of different industries.

Score	Work assumption risk degree	Work assumption urgency degree
High population density industries	94	80
Available online resume industries	90	20
Less average interaction times industries	67	46
Highly mechanized industries	31	86
Special industries	59	99

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For the convenience of description, we give weight to the standard value of risk degree ω_{1i} and urgency degree ω_{2i} in the coefficient of return to work of type j industry as $\omega_i = 0.78\omega_{1i} + 0.22\omega_{2i}$. The coefficients of return to work can be obtained by the following formula:

$$K_{\omega_i} = \frac{5*\omega_i}{\sqrt{\sum_{i=1}^{5} \omega_i^2}} \tag{21}$$

Through the calculation of the model above, the work resumption coefficients of various industries can be obtained as: 0.543, 0.298, 0.875, 1.774, 1.501.

In addition, in order to avoid a rebound of the epidemic situation after the work and production resumption, the daily number of newly confirmed cases in the local area must meet certain conditions to ensure that the previous achievements in epidemic prevention and control will not be wasted.

According to the national epidemic prevention and control instructions, the proportion (known as the epidemic transmission index) of confirmed infected persons found in the risk population (close contacts) and the actual daily number of newly diagnosed patients are important indicators to judge whether to resume work and production. They are $\overline{n_\iota}$ and n_i^*.

Set below the normalized standard: when an area at the same time in the following two situations: for fourteen consecutive days, the number of new infections per day and the ratio of number of screening close contacts per day is a downward trend, and the number of new infections per day is also a downward trend and steady low, then it can be arranged to return to work step by step and production [9]. It can be expressed by the following inequality:

$$\begin{cases} \overline{n_\iota} \le \overline{n_{\iota+1}} \le 0.001 \\ n_i^* \le n_{i+1}^* \le 5 \end{cases}, 0 \le \mathrm{i} \le 14 \tag{22}$$

Then, according to the risk degree and emergency degree of work resumption in each industry, the standard of work resumption in each industry is:

$$\begin{cases} \overline{n_\iota} \le \overline{n_{\iota+1}} \le 0.001K_{\omega_j} \\ n_i^* \le n_{i+1}^* \le 5K_{\omega_j} \end{cases}, \quad 0 \le \mathrm{i} \le 14, \ \mathrm{j} = 1,2 \cdots,5 \tag{23}$$

In conclusion, by formulating the above constraints, the dual effects of different industries and the daily number of newly diagnosed patients can be comprehensively considered, so as to work out the safest, efficient and reasonable resumption plan.

4. Conclusions

In this paper, we built models to analyze the impact of the COVID-19 on the macro-economy and different industries because in these times, people were locked at home, many industries stopped their work and production, the demand and supply of the whole society were influenced, we wanted to use models to better understand the specific impacts in theory. And also, the government needs to resume the work and production of the factories, at the same time they still need to be careful with the resurgence of the outbreak in a city, so we helped them build the work resumption model above, measuring the cost of lockdown and setting the standards of work resumption for different industries based on our classification result.

According to the impact of the epidemic on aggregate supply and demand curves, under the premise of no government intervention, the inflation rate π_t at the intersection of the dynamic aggregate supply curve and dynamic aggregate demand curve will be lower than the original level, that is, the

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inflation rate will fall, deflation will occur, the unemployment rate will rise, and the total output of products and services Y_t will fall. In turn, the national economic income decreases [10].

Compared with China on fiscal policy adjustment, the United States is to rectification of monetary policy, but the American response to the epidemic of the policy is similar to those of China, is lower interest rates, making a lot of money from the state flood the market, increase liquidity, improve the expected inflation rate, so the effects achieved are expected to be similar with China [11].

However, compared with China, which is more inclined to adopt a fiscal policy, the United States is more inclined to adopt a monetary policy, and its money supply has increased far more than that of China. Although the effect of 'market rescue' is more rapid and obvious, the 'flood irrigation' policy also brings greater uncertainties.

At the same time, the fiscal deficit of the US government has further increased, and the current credit scale of the Federal Reserve has reached about $4.6 trillion, exceeding the previous maximum scale [12]. Such a huge scale of credit is bound to make the subsequent monetary policy space limited, increasing the risk of further expansion.

Although the influx of so many currencies into the market will stabilize the economic downturn and reduce the unemployment rate in a short period of time, it will keep a large increase in the inflation rate, which will lead to the depreciation of the dollar and even threaten the status of the dollar as a foreign exchange settlement. And welfare is reduced because of the income effect of rising prices, the substitution effect and the increase in the size of the national debt.

So, according to the conclusions above, the US government still need to work out the problem of the increasing inflation rate, and corresponding depreciation difficulties of US Dollar, and with the price of the goods still going up, people's welfare is decreasing. The US government should not only rely on monetary policy and just print and distribute dollars. The key is to expand domestic demand and promote productions of the whole country, also they need to actively engage in foreign trades, because America still has comparative advantages in many goods, international trade can only bring benefits.

And for China, the key to stabilize the economic development is to balance the lockdown policy and the work and production. It must be concerned that the cost of the lockdown should be considered, and the timing of resuming work and production is significance. They need to make sure that the factories can start and the disease will not resurge, also that's all based on the cost to be minimized and people's health to be secured.

References

[1] *Sun H. W., Wang H. Y., The impact of major emergencies on international capital Flows -- An empirical analysis based on TVP-SV-VAR model. Journal of Henan Normal University (Philosophy and Social Sciences Edition), 48(06), 60-66 (2021).*

[2] *Zhang S., Xu Y. X., A theoretical model of the economic impact of COVID-19. Journal of Tianjin University (Social Sciences), 23(04): 300-306 (2021).*

[3] *Danjuma, M. A., Shamzaeffa S. and Shazida J. M. K., Macroeconomic Effects of HIV/AIDS: Protocol for a Systematic Review. International Journal of Economics, Finance and Management Sciences, 3(6) (2016).*

[4] *Kim, S. and Mehrotra A., Examining macro-prudential policy and its macroeconomic effects - Some new evidence. Journal of International Money and Finance, 128 (2022).*

[5] *Yan M. S., Li S. Y., The impact of COVID-19 on China's macro economy and its response. China Economic and Trade Guide, 6: 15-16 (2020).*

[6] *Li S. M., Fei F., Su H., Qin Y. L., Analysis on strategies of local finance to break the "epidemic dilemma". Financial Supervision, (08): 12-17 (2020).*

[7] *Yan M. S., Li S. Y., The impact of COVID-19 on small and medium-sized enterprises and countermeasures. Journal of Commercial Economics, 21: 134-138 (2020).*

[8] *Chang R. G., The Impact of the New Global Epidemic on China's Macro Economy and the Analysis of Regulatory Policies. International Journal of Frontiers in Sociology, 3.0(3.0) (2021).*

DOI: 10.54254/2754-1169/13/20230755

[9] Ma W. C., He C. F., Chen X. D., The impact of supportive policies and their combina tion on the work and production resumption in small industries: a PSM analysis in the context of COVID-19. Soft Science Studies, 1-18 (2022).
[10] Pan M., Zhang X. P., COVID-19, macroeconomic stability and fiscal policy choices: a dynamic stochastic general equilibrium model. Fiscal Studies, 5: 38-54 (2021).
[11] Cai X. Y., Qi M. J., Ming Du, The current Fed monetary policy compared with the 2008 financial crisis. The Banker, 5: 43-46 (2020).
[12] Li J. W., Comparison of systems for dealing with major emergencies in capitalist and socialist countries: A case study of the COVID-19 outbreak. Modern Business Trade Industry, 42(21): 112-114 (2021).