Economic Policies in Macroeconomy with Stock Market

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1. Introduction

Recently, all the countries in the world are suffered serious damages by the new coronavirus, COVID-19. Our Japanese economy has also a serious bad performance. Nevertheless, the Japanese stock market has a very good performance as same as in modern countries. It is very strange economic phenomena. It is seemed, it is because by the easy-money policy.

This paper analyzed the effects of the stock market performances on the domestic economy and the economic policies by using our mathematical macroeconomic model.

We introduced the following conclusions.

(1) Our macroeconomic model is globally stable.
(2) The fiscal policy is effective in our macroeconomic mode. That is, an increase of public expenditure increases a national income and increases an interest rate.
(3) The monetary policy is not effective in our macroeconomic mode. That is, an increase of money supply decreases a national income and increases an interest rate. This is a unique and strange conclusion. This is our articles original conclusion.
(4) The tax policy is effective in our macroeconomic mode. That is, an increase of tax decreases a national income and decreases an interest rate.
(5) The balanced budget multiplier in a standard macroeconomic theory is 1, but in our macroeconomic model the balanced budget multiplier is positive, not 1.
(6) In our macroeconomic model, an increase of stock certificate increases a national income and decreases an interest rate.
(7) The easy-money economic policy for a long period is not good for the domestic economy during a pandemic of COVID-19.

2. Economic Model

In this article, we assume that our economic model has two markets, a product market and a stock market. We also assume our economic model is a closed economy.

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(1) IS Curve

The equilibrium condition of product market is as follows.

$$Y = C\,(Y) + I\,(r) + G. \tag{1}$$

Here, Y is domestic national income, C is individual consumption, I is private investment, r is interest rate, G is government expenditure,

We assume that the individual consumption function is as follows.

$$C\,(Y) = c_1\,(Y - T) + C. \tag{2}$$

Here, c_1 is a marginal propensity to consume of disposable income, $0 < c_1 < 1$, and C is a basic consumption, $C > 0$. T is tax revenue.

We assume, the private investment function depends on the interest rate. The private investment function has the following character.

$$\frac{dI}{dr} < 0. \tag{3}$$

We assume, the government expenditure is constant.

The equation (1) is represented as follows.

$$Y = c_1\,(Y - T) + C + I\,(r) + G. \tag{4}$$

From the equation (1), we get the following equation.

$$dY = c_1\,dY - c_1\,dT + \frac{dI}{dr}\,dr + dG. \tag{5}$$

Therefore, the slope of IS curve is negative.

$$\frac{dr}{dY} = \frac{1 - c_1}{\dfrac{dI}{dr}} < 0. \tag{6}$$

The IS curve is in Figure 1.

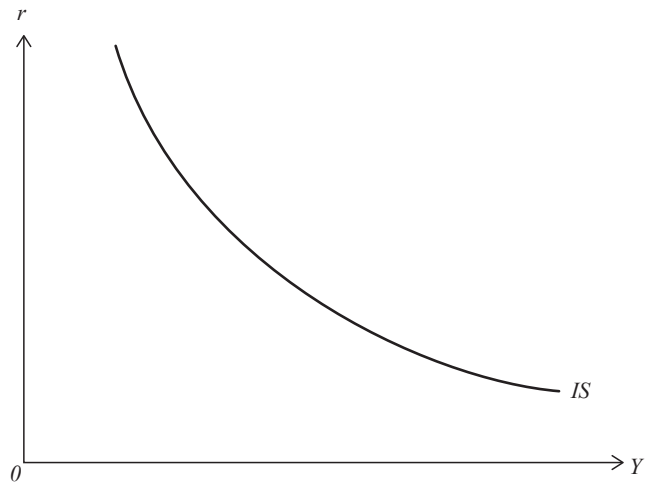

Figure 1

(2) *SK* Curve

We analyze the stock market. is money demand. Here, S is supply of stock supply and is constant. We also assume that M is money supply. K is stock demand.

The equilibrium condition of stock market is as follows.

$$S = K\,(Y, r, M). \tag{7}$$

We assume the following characters. An increase of national income increases demand for stock. And an increase of interest rate decreases demand for stock. We also assume that an increase of money supply increases demand for stock.

$$\frac{\partial K}{\partial Y} > 0, \quad \frac{\partial K}{\partial r} < 0, \quad \frac{\partial K}{\partial M} > 0. \tag{8}$$

From the equation (7), we get the following equation.

$$dS = \frac{\partial K}{\partial Y}\ dY + \frac{\partial K}{\partial r}\, dr + \frac{\partial K}{\partial M}\, dM = 0. \tag{9}$$

Therefore, the slope of SK curve is positive.

$$\frac{dr}{dY} = -\frac{\dfrac{\partial K}{\partial Y}}{\dfrac{\partial K}{\partial r}} > 0. \tag{10}$$

The *SK* curve is in Figure 2.

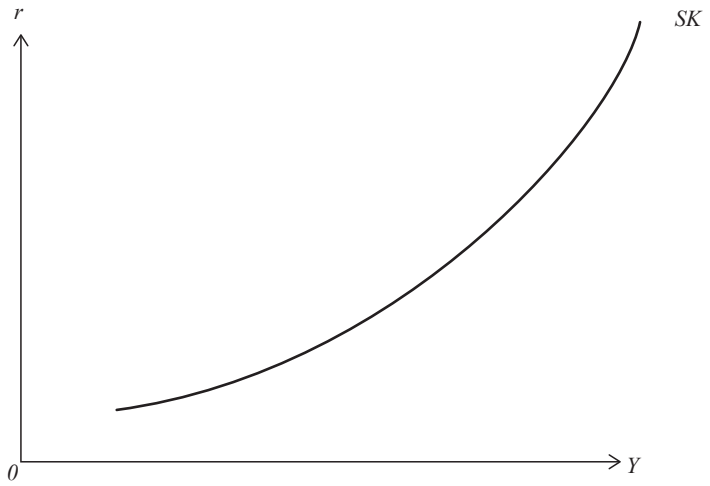

Figure 2

(3) *IS* and *SK* Curves

The slopes of *IS* curve is negative, on the other hand the slope of *SK* curve is positive. The *IS* & *SK* curves are in Figure 3 and the equilibrium point in both market is point *E* in Figure 3.

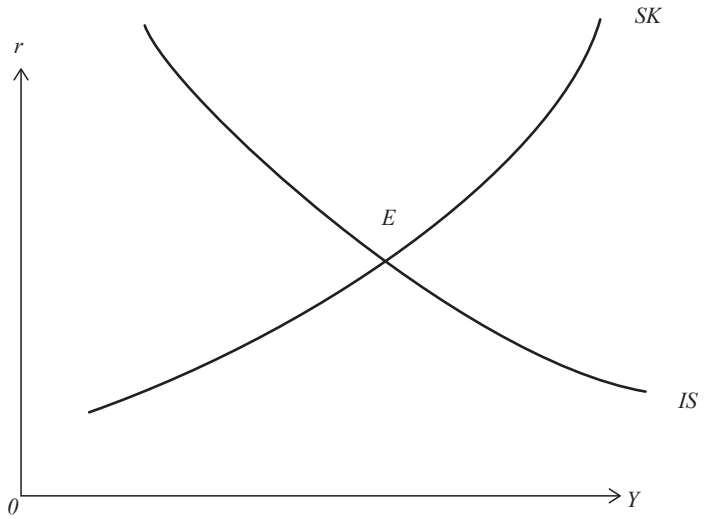

Figure 3

3. Simultaneous Equation of this Economic Model

From equations of (4) and (7), the simultaneous equation of this economic model is as follows,

$$\begin{bmatrix} 1-c_1 & -\dfrac{dI}{dr} \\ \dfrac{\partial K}{\partial Y} & \dfrac{\partial K}{\partial r} \end{bmatrix} \begin{bmatrix} dY \\ dr \end{bmatrix} = \begin{bmatrix} -c_1\,dT + dG \\ \\ +dS - \dfrac{\partial K}{\partial M}\,dM \end{bmatrix} \tag{11}$$

Here, $|A|$ is negative.

$$|A| = \begin{vmatrix} 1-c_1 & -\dfrac{dI}{dr} \\ \dfrac{\partial K}{\partial Y} & \dfrac{\partial K}{\partial r} \end{vmatrix} = (1-c_1)\,\frac{\partial K}{\partial r} + \frac{\partial I}{\partial r}\cdot\frac{\partial K}{\partial Y} < 0. \tag{12}$$

4. Dynamic Stability Analysis

We will analysis the dynamic stability of this model. We assume that the national income Y moves as the same direction of excess demand of the product market, and the interest rate r moves as the same direction of excess demand of the stock market. The dynamic models of the economic model are the following equations. Here t is time.

$$\frac{dY}{dt} = F\Big[c_1\,(Y-T) + C + I\,(r) + G - Y\Big]. \tag{13}$$

$$\frac{dr}{dt} = H\Big[K\,(Y, r, M) - S\Big]. \tag{14}$$

Here, $F\,(0) = 0$, $F' > 0$, and $H\,(0) > 0$, $H' > 0$.

In order to get the global stability, this dynamic economic model must meet the following the Olech Theorem.

(a) $F_Y + H_r < 0.$ (15)

(b) $\begin{vmatrix} F_Y & F_r \\ H_Y & H_r \end{vmatrix} > 0.$ (16)

(c) $F_Y \cdot H_r \neq 0$, or $F_r \cdot H_Y \neq 0.$ (17)

(Proof)

$$\text{(a)}\quad F_Y + H_r = F'(c_1 - 1) + H'\frac{\partial K}{\partial r} < 0. \tag{18}$$

$$\text{(b)}\quad \begin{vmatrix} F_Y & F_r \\ H_Y & H_r \end{vmatrix} = F_Y \cdot H_r - F_r \cdot H_Y$$
$$= F'(c_1 - 1) \cdot H'\frac{\partial K}{\partial r} - F'\frac{\partial I}{\partial r} \cdot H'\frac{\partial K}{\partial Y} > 0. \tag{19}$$

$$\text{(c)}\quad F_Y \cdot H_r = F'(c_1 - 1) \cdot H'\frac{\partial K}{\partial r} > 0 \neq 0,$$
$$F_r \cdot H_Y = F'\frac{\partial I}{\partial r} \cdot H'\frac{\partial K}{\partial Y} < 0 \neq 0. \tag{20}$$

Therefore, our dynamic economic model meets the Olech Theorem, therefore this dynamic *IS-SK* model is globally stable. The equilibrium point *E* in Figure 4 is the globally stable point.

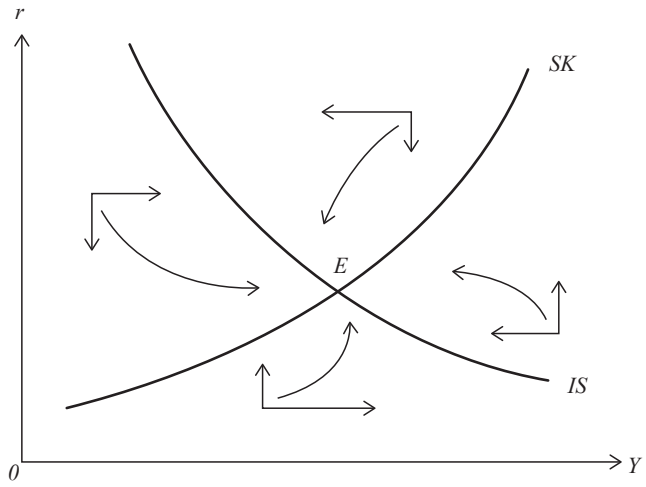

Figure 4

5. Economic Policies

(1) Fiscal Policy

In this section, we analyze about the fiscal policy. From the equation (11), we get the

following results by Cramer's Rule.

$$\frac{\partial Y}{\partial G} = \frac{\begin{vmatrix} 1 & -\frac{dI}{dr} \\ 0 & \frac{\partial K}{\partial r} \end{vmatrix}}{|A|} = \frac{\frac{\partial K}{\partial r}}{|A|} > 0. \tag{21}$$

$$\frac{\partial r}{\partial G} = \frac{\begin{vmatrix} 1-c_1 & 1 \\ \frac{\partial K}{\partial Y} & 0 \end{vmatrix}}{|A|} = \frac{-\frac{\partial K}{\partial Y}}{|A|} > 0. \tag{22}$$

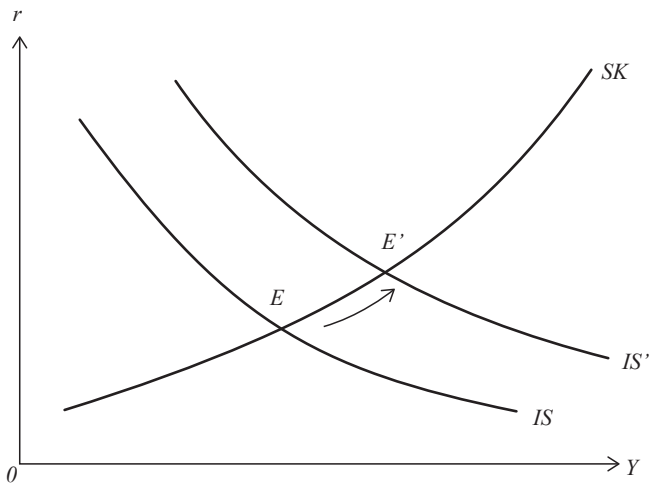

Figure 5

An increase of public expenditure increases the national income and the interest rate. Therefore, the public policy is effective.

(2) Monetary Policy

In this section, we analyze about the monetary policy. From the equation (11), we get the following results by Cramer's Rule.

$$\frac{\partial Y}{\partial M} = \frac{\begin{vmatrix} 0 & -\frac{dI}{dr} \\ -\frac{\partial K}{\partial M} & \frac{\partial K}{\partial r} \end{vmatrix}}{|A|} = \frac{-\frac{dI}{dr} \cdot \frac{\partial K}{\partial M}}{|A|} < 0. \tag{23}$$

$$\frac{\partial r}{\partial M} = \frac{\begin{vmatrix} 1-c_1 & 0 \\ 0 & -\dfrac{\partial K}{\partial M} \end{vmatrix}}{|A|} = \frac{-(1-c_1)\dfrac{\partial K}{\partial M}}{|A|} > 0. \tag{24}$$

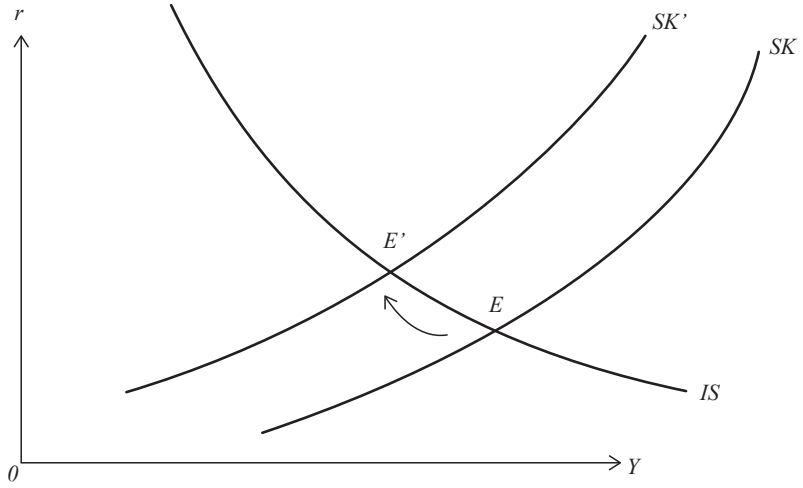

Figure 6

An increase of money supply decreases a national income, but increases an interest rate. Therefore, the monetary policy is ineffective.

(3) Tax Policy

Next, we analyze the effects of an increasing tax. The government increases tax in order to increase tax revenue. From the equation (11), we get the following results by Cramer's Rule.

$$\frac{\partial Y}{\partial T} = \frac{\begin{vmatrix} -c_1 & -\dfrac{dI}{dr} \\ 0 & \dfrac{\partial K}{\partial r} \end{vmatrix}}{|A|} = \frac{-c_1 \cdot \dfrac{\partial K}{\partial r}}{|A|} < 0. \tag{25}$$

$$\frac{\partial r}{\partial T} = \frac{\begin{vmatrix} 1-c_1 & -c_1 \\ \dfrac{\partial K}{\partial Y} & 0 \end{vmatrix}}{|A|} = \frac{c_1 \cdot \dfrac{\partial K}{\partial Y}}{|A|} < 0. \tag{26}$$

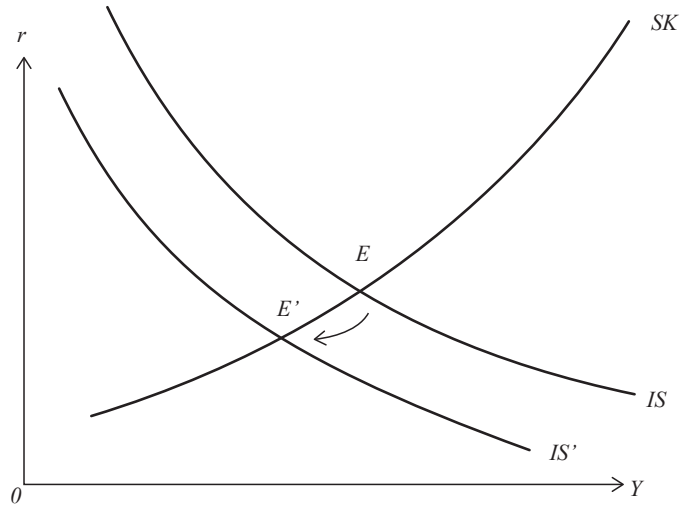

Figure 7

An increase of tax revenue decreases the national income and the interest rate. Therefore, an economic policy of an reduction of a tax decreases a national income and an interest rate.

6. Balanced Budget Multiplier

Many elementary macroeconomic textbooks mention that the balanced budget ($\Delta G = \Delta T$) multiplier is 1. But this article proves that the balanced budget multiplier is positive, but not 1. From the equation (11), we get the following results by Cramer's Rule.

$$\frac{\partial Y}{\partial G} = \frac{\begin{vmatrix} 1 - c_1 & -\frac{dI}{dr} \\ 0 & \frac{\partial K}{\partial r} \end{vmatrix}}{|A|} = \frac{(1 - c_1) \cdot \frac{\partial K}{\partial r}}{|A|} > 0 \neq 1. \tag{27}$$

$$\frac{\partial r}{\partial G} = \frac{\begin{vmatrix} 1 - c_1 & 1 - c_1 \\ \frac{\partial K}{\partial Y} & 0 \end{vmatrix}}{|A|} = \frac{-(1 - c_1) \cdot \frac{\partial K}{\partial Y}}{|A|} > 0 \neq 1. \tag{28}$$

7. The case of increasing of Stock Certificate

Many companies want to issue stock certificates to get money. In this section, we analyze the effects of the case of increasing of stock certificates. From the equation (11), we get the following results by Cramer's Rule.

$$\frac{\partial Y}{\partial S} = \frac{\begin{vmatrix} 0 & -\frac{dI}{dr} \\ 1 & \frac{\partial K}{\partial r} \end{vmatrix}}{|A|} = \frac{\frac{dI}{dr}}{|A|} > 0. \tag{29}$$

$$\frac{\partial r}{\partial S} = \frac{\begin{vmatrix} 1-c_1 & 0 \\ \frac{\partial K}{\partial Y} & 1 \end{vmatrix}}{|A|} = \frac{1-c_1}{|A|} < 0. \tag{30}$$

An increasing of stock certificates increases the national income and decreases the interest rate. Therefore, an increasing of stock certificates is effective for the national income.

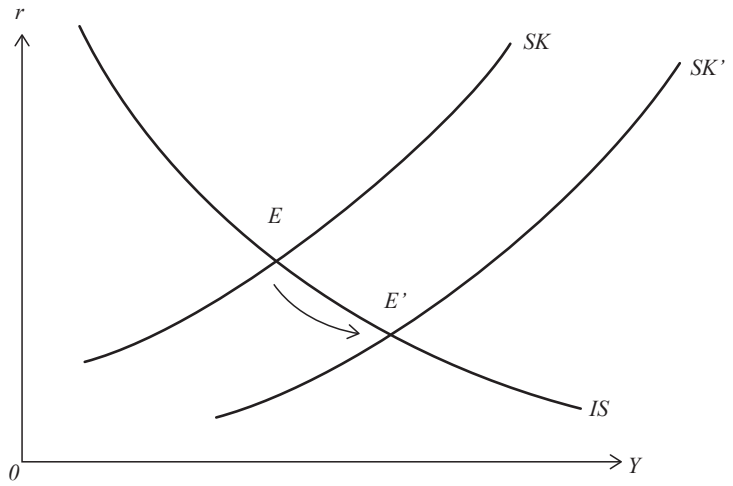

Figure 8

8. Concluding Remarks

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References

1. Barro, R., and X. I. Sala-i-Martin, Economic Growth, The MIT Press; 2nd edition, 2003.
2. Blanchard, O., and Fischer, S., Lectures on Macroeconomics, The MIT Press, 1989.
3. Ljungqvist, L., and T.J. Sargent, Recursive Macroeconomic Theory, The MIT Press; 3rd edition, 2012.
4. Miyamoto K., “Re-consideration of Keynesian Multiplier Theory” Journal of Accountancy, economics and Law, No.1, pp.1-11, March 2007.
5. Miyamoto, K., “Exchange Rate and Economic Policies in Floating Exchange Rate System,” Journal of Accountancy, economics and Law, No.10. pp.1-9, March 2016.
6. Miyamoto, K., “Economic Policies in Accumulated Budget Deficit,” Journal of Accountancy, economics and Law, No.12. pp.1-14, March 2018.
7. Miyamoto, K., “Macroeconomic Policies under the Fixed Low interest rate,” Journal of Accountancy, economics and Law, No.14. pp.1-12, March, 2020.

8. Miyamoto, K., “Effects of the Economy of Trading Country on the Japanese Economy in the World Pandemic,” Journal of Accountancy, economics and Law, No. 15. pp. 17-30, March, 2021.
9. Olsson, O., Essentials of Advanced Macroeconomic Theory, London, Routledge, 2012.
10. Romer, D., Advanced Macroeconomics, McGraw-Hill Education; 4th edition, 2011.
11. Sargent, T. J., Dynamic Macroeconomic Theory, Harvard University Press, 5th edition, 1987.
12. Stokey, L., R. E. Lucas Jr., and E. C. Prescott, Recursive Methods in Economic Dynamics, Harvard University Press; First edition, 1989.