The Recommendable Economic Policies to Improve the Trade Conflict between the U.S.A.and Japan

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The Recommendable Economic Policies to Improve the Trade Conflict between the U. S. A. and Japan

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In 1988, the Japanese export was 259.8 billion dollars and the import was 164.7 billion dollars. The excess export was 95.1 billion dollars. On the other hand, the U. S. export was 321.8 billion dollars and the import was 441.6 billion dollars. Then, the U. S. trade deficit was 119.8 billion dollars and the U. S. trade deficit to Japan was 52.1 billion dollars. In 1987, the U. S. trade deficit to Japan was 56.3 billion dollars. Therefore, the U. S. trade deficit to Japan is gradually decreasing, but the percentage to Japan is gradually increasing on the contrary. The U. S. economists claim to improve the U. S.−Japan trade imbalance against Japan. Many economists expected that an increase of yen would improve the U. S. −Japan trade imbalance. But, in spite of increasing of Japanese yen, the U. S. trade deficit to Japan did not decrease contrary to their expectations. Some economists explains that it is because of the J curve effects.

In this paper, we are going to analyze the effects of change of exchange rate and the effects of monetary and fiscal policies on improving of the U. S. −Japan trade imbalance.

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§1. Macroconomic Model under the Floating Exchange Rate

Since February in 1973, the world economy changed from it's fixed exchange rate system to the floating exchange rate system. In the traditional IS−LM framework, the endogenous economic variables are the national income (Y) and the interest rate (r). The exchange rate is an exogenous economic parameter and is given. But, our model is the floating exchange rate economic model and the endogenous economic variables are the national income (Y) and the exchange rate (q). q is measured in unit of foreign currency per domestic currency unit. The interst rate is sometimes regarded as a government control variable. Then, in our model, the interest rate is an exogenous economic parameter and a government political parameter.

(1) Product Market

The equilibrium condition of product market in an open economy is,

$$Y+\frac{1}{q}IM=C+I+G+EX. \qquad \cdots\cdots(1)$$

Y is national income, IM is import, C is private consumption, I is private investment, G is government expenditure and EX is export. Y, C, I, G and EX are measured in units of domestic currency, and IM is measured in units of foreign currency.

The consumption is an increase function of disposable income.

$$C=c(Y-T)+\bar{C} \qquad \cdots\cdots(2)$$

c is marginal propensity to consume ($0<c<1$), T is tax revenue and $\bar{C}$ is basic consumption.

The investment is an decrease function of interest rate.

$$I=I(r) \quad , \quad I'=\frac{dI}{dr}<0. \qquad \cdots\cdots(3)$$

The government expenditure is an independent economic parameter.

$$G=\overline{G}. \qquad \cdots\cdots(4)$$

The export is an decrease function of exchange rate.

$$EX=EX\ (q),\quad EX_q=\frac{dEX}{dq}<0. \qquad \cdots\cdots(5)$$

The import depends on the national income and the exchange rate. An increase of national income increases the import and vice versa. An increase of exchange rate increases the import and vice versa.

$$IM=IM\ (Y,\ q),$$

$$IM_Y=\frac{\partial IM}{\partial Y}>0, \qquad \cdots\cdots(6)$$

$$IM_q=\frac{\partial IM}{\partial q}>0.$$

On the $(Y,\ q)$ coordinates, the equilibrium condition of product market is sketched in figure 1 and is called the ISq curve. The slope of ISq curve is as follows,

$$\frac{\partial q}{\partial Y}=\frac{1-c+\frac{1}{q}IM_Y}{Xq-\frac{1}{q}IM_q+\frac{1}{q^2}IM} \qquad \cdots\cdots(7)$$

The numerator of the equation (7) is positive by the assumptions about the marginal propensity to consume and the marginal propensity to import.

The elasticity of export and import to exchange rate are μ and ε, and μ is negative and ε is positive.

$$\mu=\frac{q}{EX}EX_q<0, \qquad \cdots\cdots(8)$$

$$\varepsilon=\frac{q}{IM}IM_q>0.$$

δ is the ratio of import and export.

$$\delta=\frac{\frac{1}{q}IM}{EX}>0. \qquad \cdots\cdots(9)$$

The "Marshall−Lerner Condition" is,

$$\varepsilon-\mu>1, \qquad \cdots\cdots(10)$$

and in the case of imbalance of trade, the modified Marshall−Lerner condition is,

$$\varepsilon-\frac{1}{\delta}\mu>1. \qquad \cdots\cdots(11)$$

Under the modified Marshall−Lerner condition, the denominator of the equation (7) is negative, then the slope of IS_q curve is negative.

$$\left.\frac{dq}{dY}\right|_{IS_q}=\frac{1-c+\frac{1}{q}IM_Y}{\frac{IM}{q^2}\left(\frac{1}{\delta}\mu-\varepsilon+1\right)}<0. \qquad \cdots\cdots(12)$$

Next, we consider the effects of the parameter changes on the IS_q curve.

$$\frac{\partial Y}{\partial G}=\frac{1}{1-c+\frac{1}{q}IM_Y}>0. \qquad \cdots\cdots(13)$$

The equation (13) is the government investment multiplier and an increse of government expenditure shifts the IS_q curve to the right.

$$\frac{\partial Y}{\partial r}=\frac{I'}{1-c+\frac{1}{q}IM_Y}<0. \qquad \cdots\cdots(14)$$

An increase of interest rate shifts the IS_q curve to the left.

$$\frac{\partial Y}{\partial T}=\frac{-c}{1-c+\frac{1}{q}IM_Y}<0. \qquad \cdots\cdots(15)$$

The equation (15) is the tax multiplier and an increase of tax shifts the IS_q curve to the left. The investment multiplier is bigger than the tax multiplier.

(2) International Trade

The purpose of this paper is to analyze the trade imbalance problem. The trade balance equation is,

$$EX(q)=\frac{1}{q}IM(Y,\ q). \qquad \cdots\cdots(16)$$

On the $(Y,\ q)$ coordinates, the trade balance equation is sketched in figure 1 and is called the BT curve.

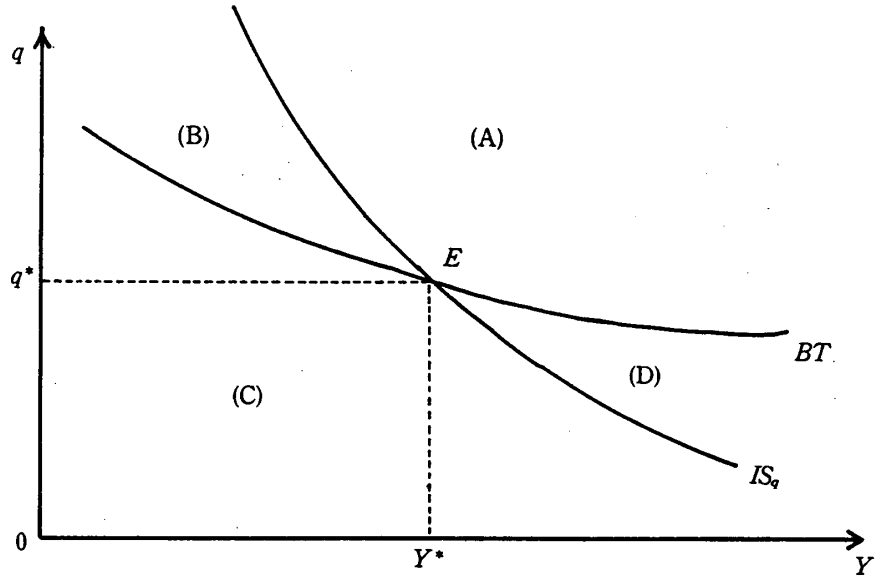
The slope of BT curve is,

$$\left.\frac{dq}{dY}\right|_{BT}=\frac{\frac{1}{q}IM_Y}{\frac{IM}{q^2}\left(\frac{1}{\delta}\mu-\varepsilon+1\right)}<0. \qquad \cdots\cdots(17)$$

Under the modified Marshall−Lerner condition, the slope of BT curve is negative. Since the following inequality is hold,

$$1-c+\frac{1}{q}IM_Y>\frac{1}{q}IM_Y, \qquad \cdots\cdots(18)$$

then, the slope of IS_q curve is steeper than that of BT curve.



(Figure 1)

In figure 1, the upper area of BT curve is an area of trade deficit and the upper area of IS_q curve is an area of excess supply of products. Four areas of figure 1 are summaried in table 1.

area	A	B	C	D
product market	excess supply	excess demand	excess demand	excess supply
trade balance	excess import	excess import	excess export	excess export

(table 1)

§2. Dynamic Stability

(I) Local Stability

In this section, we are going to study the stability condition. First, the local stability problem will be analyzed. It is assumed that the national income is in proportion to an excess demand for goods and serrices and the exchange rate is in proportion to an excess export.

$$\frac{dY}{dt}=\alpha\ \{c\ (Y-T)+\bar{C}+I\ (\gamma)+\bar{G}+EX\ (q)-Y-\frac{1}{q}IM\ (Y,\ q)\}\ , \qquad \cdots\cdots(19)$$

$$\frac{dq}{dt}=\beta\ \{EX\ (q)-\frac{1}{q}IM\ (Y,\ q)\}\ . \qquad \cdots\cdots(20)$$

Here, t is time, and α and β are positive proportional constant parameters. According to Taylor's expansion of the differential system (19) and (20) in the neighborhood of the equilibrium value$(Y^*,\ q^*)$, the linear approximation of these differential equations are,

$$\frac{dY}{dt}=\alpha\left(c-1-\frac{1}{q}IM_Y\right)(Y-Y^*)+\alpha\left(EX_q-\frac{1}{q}IM_q+\frac{IM}{q^2}\right)(q-q^*), \qquad \cdots\cdots(21)$$

$$\frac{dq}{dt}=-\beta\frac{1}{q}IM_Y(Y-Y^*)+\beta\left(EX_q-\frac{1}{q}IM_q+\frac{IM}{q^2}\right)(q-q^*). \qquad \cdots\cdots(22)$$

The characteristic equation of the above simultaneous differential equations is as follows,

$$\lambda^2-\{\alpha(c-1-\frac{1}{q}IM_Y)+\beta(EX_q-\frac{1}{q}IM_q+\frac{1}{q^2}IM)\}\lambda$$
$$+\alpha\beta(EX_q-\frac{1}{q}IM_q+\frac{1}{q^2}IM)(c-1)=0. \quad \cdots\cdots(23)$$

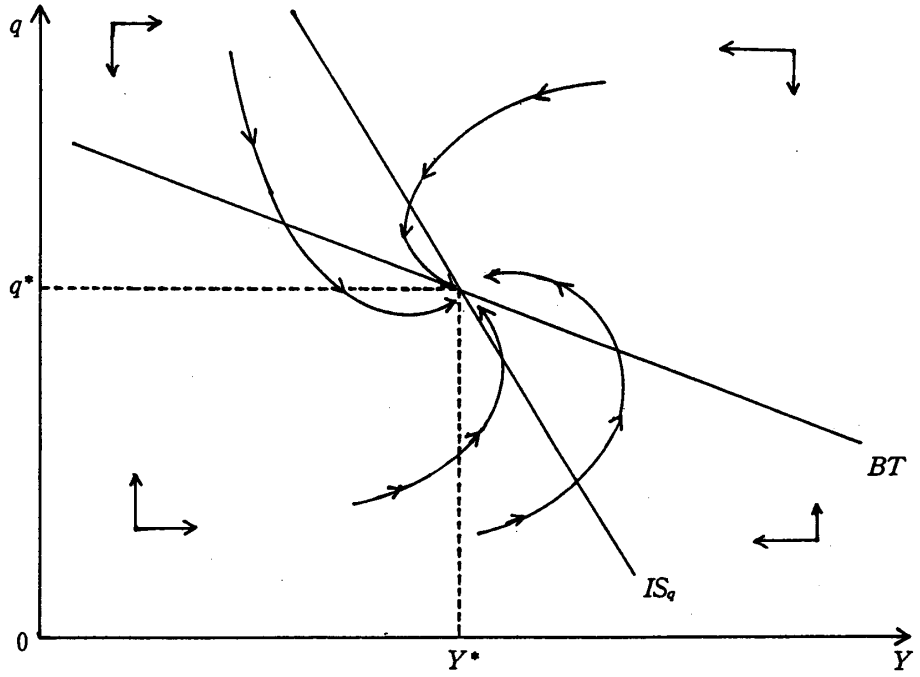
λ is a characteristic root. If λ_1 and λ_2 are the solutions of the characteristic equation (23), then the sum is negative and the product is positive.

$$\lambda_1+\lambda_2=\alpha(c-1-\frac{1}{q}IM_Y)+\beta(EX_q-\frac{1}{q}IM_q+\frac{1}{q^2}IM)<0, \quad \cdots\cdots(24)$$

$$\lambda_1\lambda_2=\alpha\beta(EX_q-\frac{1}{q}IM_q+\frac{1}{q^2}IM)(c-1)>0. \quad \cdots\cdots(25)$$

(Case 1)

In case 1, it is assumed that the characteristic roots are two complex conjugate numbers. From the equations (24) and (25), it is evident that the real number parts of two roots are both negative. Therefore, the system is locally stable.

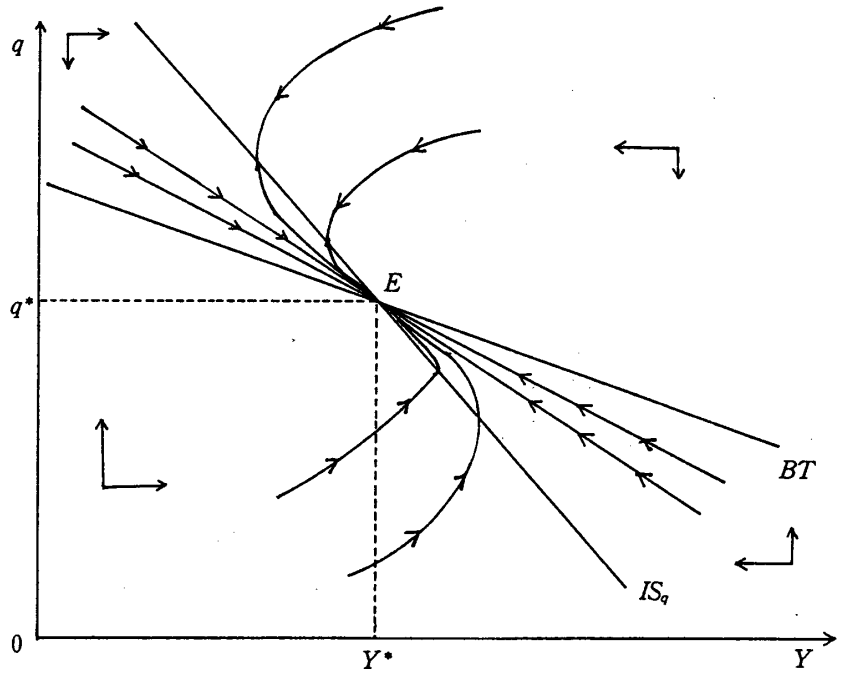


(Figure 2)

In the upper area of the *ISq* curve, the national income decreases because of the excess supply of goods and services. On the contrary, in the lower area of the *ISq* curve, the national income increases. In the upper area of the *BT* curve, the exchange rate decreases because of the excess export. In the lower area of the *BT* curve, the exchange rate increases.

(Case 2)

In case 2, it is assumed that the characteristic roots are real and distinct. From the equations (24) and (25), it is evident that these two roots are negative. Therefore, the system is locally stable, too.



(Figure 3)

If the adjustment parameter of product market (α) is bigger than that of foreign exchange market (β), then the phase diagram is sketched in figure 3.

(2) Global Stability

Next, we will analyze the global stability of the equilibrium value. It is assumed that the national income is an increase function of the excess demand for goods and services and the exchange rate is an increase function of the excess export.

$$\frac{dY}{dt}=f\ \{c(Y-T)+\bar{C}+I(r)+G+EX(q)-Y-\frac{1}{q}IM(Y,\ q)\},\cdots(26)$$

$$\frac{dq}{dt}=g\ \{EX(q)-\frac{1}{q}IM(Y,q)\}\ .\qquad\cdots(27)$$

Here, $f(0)=0$, $g(0)=0$, $f'(\cdot)>0$, $g'(\cdot)>0$.

In order to be stable, the above simultaneous differential equations must satisfy the following Olech Theorem's conditions.

$$(\mathrm{i})\quad \frac{\partial f}{\partial Y}+\frac{\partial g}{\partial q}<0,\qquad\cdots(28)$$

$$(\mathrm{ii})\quad \begin{vmatrix} \frac{\partial f}{\partial Y} & \frac{\partial f}{\partial q} \\ \frac{\partial g}{\partial Y} & \frac{\partial g}{\partial q} \end{vmatrix}>0,\qquad\cdots(29)$$

$$(\mathrm{iii})\quad \frac{\partial f}{\partial Y}\cdot\frac{\partial g}{\partial q}\gtrless 0,\qquad\cdots(30)$$

$$(\mathrm{iv})\quad \frac{\partial f}{\partial q}\cdot\frac{\partial g}{\partial Y}\gtrless 0.\qquad\cdots(31)$$

All the conditions of (i), (ii), (iii) and (iv) are satisfied under the modified Marshall−Lerner condition.

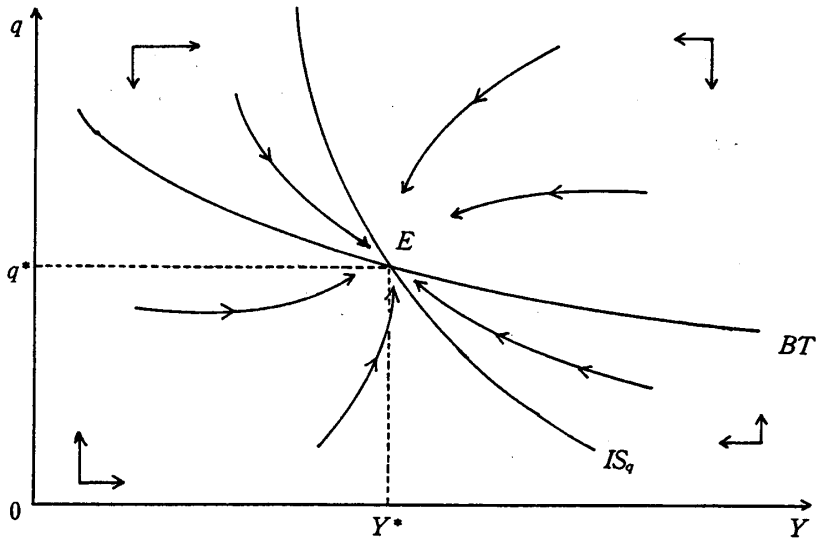
$$(\mathrm{i})\quad \frac{\partial f}{\partial Y}+\frac{\partial g}{\partial q}=f'\cdot(c-1-\frac{1}{q}IM_Y)+g'\cdot\frac{IM}{q^2}(\frac{1}{\delta}\mu-\varepsilon+1)<0,\qquad\cdots(32)$$

$$(\mathrm{ii})\quad \begin{vmatrix} \frac{\partial f}{\partial Y} & \frac{\partial f}{\partial q} \\ \frac{\partial g}{\partial Y} & \frac{\partial g}{\partial q} \end{vmatrix}=f'\cdot g'\cdot\frac{IM}{q^2}(c-1)(\frac{1}{\delta}\mu-\varepsilon+1)>0,\qquad\cdots(33)$$

$$(\mathrm{iii})\quad \frac{\partial f}{\partial Y}\cdot\frac{\partial g}{\partial q}=f'\cdot g'\cdot\frac{IM}{q^2}(c-1-\frac{1}{q}IM_Y)(\frac{1}{\delta}\mu-\varepsilon+1)>0,\qquad\cdots(34)$$

$$\text{(iv)}\quad \frac{\partial f}{\partial q}\cdot\frac{\partial g}{\partial q}=-f'\cdot g'\cdot\frac{IM}{q^3}IM_Y\left(\frac{1}{\delta}\mu-\varepsilon+1\right)>0. \qquad \cdots\cdots(35)$$

Therefore, the equilibrium values of the simultaneous differential equations are globally stable.



(Figure 4)

§3. Comparative Statistic Analysis

In this section we are going to research the comparative statistic analysis, that is, the effects of parameter changes on the equilibrium national income and the equilibrium exchange rate.

(i) Fiscal Policy

From the equations (1) and (16),

$$\begin{pmatrix} 1-c+\frac{1}{q}IM_Y & -EX_q+\frac{1}{q}IM_q-\frac{1}{q^2}IM \\ \frac{1}{q}IM_Y & -EX_q+\frac{1}{q}IM_q-\frac{1}{q^2}IM \end{pmatrix}\begin{pmatrix} dY \\ dq \end{pmatrix}=\begin{pmatrix} -cdT+I'dr+dG \\ 0 \end{pmatrix}. \qquad \cdots\cdots(36)$$

$$\Delta=\begin{vmatrix} 1-c+\frac{1}{q}IM_r & -EX_q+\frac{1}{q}IM_q-\frac{1}{q^2}IM \\ \frac{1}{q}IM_Y & -EX_q+\frac{1}{q}IM_q-\frac{1}{q^2}IM \end{vmatrix}>0. \quad \cdots\cdots(37)$$

Under the condition of stability, Δ is positive.

$$\frac{\partial Y}{\partial G}=\frac{-\frac{1}{q^2}IM\left(\frac{1}{\delta}\mu-\varepsilon+1\right)}{\Delta}>0, \quad \cdots\cdots(38)$$

$$\frac{\partial q}{\partial G}=\frac{-\frac{1}{q}IM_Y}{\Delta}<0. \quad \cdots\cdots(39)$$

When the government takes the expanding fiscal policy, the national income increases and the exchange rate decreases.

(ii) Tax Policy

$$\frac{\partial Y}{\partial T}=\frac{c\cdot\frac{1}{q^2}IM\left(\frac{1}{\delta}\mu-\varepsilon+1\right)}{\Delta}<0, \quad \cdots\cdots(40)$$

$$\frac{\partial q}{\partial T}=\frac{c\cdot\frac{1}{q}IM_Y}{\Delta}>0. \quad \cdots\cdots(41)$$

An increase of tax increases the national income and decreases the exchange rate, and vice versa.

(iii) Monetary Policy

$$\frac{\partial Y}{\partial r}=\frac{-\frac{1}{q^2}IM\cdot I'\cdot\left(\frac{1}{\delta}\mu-\varepsilon+1\right)}{\Delta}<0, \quad \cdots\cdots(42)$$

$$\frac{\partial q}{\partial r}=\frac{-I'\cdot\frac{1}{q}IM_Y}{\Delta}>0. \qquad \cdots\cdots(43)$$

An increase of the interest rate decreases the national income and increases the exchange rate, and vice versa.

§4. Concluding Remarks

In spite of decreasing the U. S. trade deficit to Japan, it is not seemed that the trade conflict between the U. S. A. and Japan is going to the direction of being suppressed. From our open-macro economic model, we are able to propose the following recommendablle policies to improve the trade imbalance between the U. S. and Japan.

(1) The equilibrium national income and the equilibrium exchange rate are globally stable.
(2) An increase of exchange rate is effective to decrease the Japanese excess export to the U. S. A.
(3) An increase of government expenditure increases the national income and decreases the exchange rate.
(4) An increase of tax decreases the national income and increases the exchange rate.
(5) An increase of the intrest rate decreases the national income and increases the exchange rate.

In conclusion, an increase of exchange rate is effective to improve the Japanese excess export and therefore, the fiscal and monetary policies which increase the exchange rate are effective to improve the trade conflict between the U. S. A. and Japan.

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