Universität Bielefeld/IMW

Working Papers
Institute of Mathematical Economics

Arbeiten aus dem
Institut für Mathematische Wirtschaftsforschung

Nr. 64

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The Effects of Stabilization Policy under Controlled Flexible Exchange Rates

January, 1978

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I. Introduction:

Since the pioneer article of Mundell [5] the effects of fiscal and monetary policies under alternative exchange-rate systems belong to one of the most discussed topics in the economic journals. "It is often argued that under flexible exchange rates and international capital movements, fiscal policy results in a small increase in output and employments, whereas monetary policy tends to result in a strong increase". [12]

While in the most American journals the effects of fiscal and monetary policies on the employment and the real income under alternative exchange-rate systems are analysed under assumption of constant price levels, the problem of imported inflation is mostly discussed in the German journals. [2,6,7,8]

The effects of fiscal and monetary policy in an open economy depends mainly on the interest elasticity of international capital movements [10,12]. If the international capital movements are considered explicitly, there arise many problems, e.g. the real wealth effects of exchange rate adjustment on the net foreign capital (bonds of foreign country, credit to foreign residents, etc.) holded by domestic residents, (since the "real foreign wealth" will be influenced by exchange rate

adjustment if the foreign wealth is quoted (or stated) in foreign currency), the real income effect of exchange rate adjustment on the net income or interest transfer to foreign country, especially if these payments are stated in foreign currency, etc. These real wealth effect and real income effect of exchange rate adjustment are neglected hertofore. As Blinder and Solow [1] pointed out the meaning of the real wealth effect and the real income effect of bonds for the influences of fiscal and monetary policies in a closed economy, the real wealth effect and the real income effect of exchange rate adjustment should be considered explicitly for the effects of stabilization policy in an open economy if international capital movements are treated in the model.

In this paper we shall point out the meaning of the quotation of the net foreign claim or indebtedness and the related interest payments in own currency and in foreign currency. The effects of fiscal and monetary policy are analysed under flexible exchange rates with active transaction policy of the government on the market of foreign exchange. This exchange-rate system is tentatively called as "controlled flexible exchange rates" which characterize the current world exchange-rate system of the most developed market-economy countries.

In this paper the effects of fiscal and monetary policies in an open economy will be analysed. For this purpose we shall expand the model of Blinder and Solow [1] with international economic relations. The model of Blinder and Solow belongs to the common model which is set up by Keynesians and Monetarists for the discussion on the effectivity of fiscal and monetary policy in a closed economy. In our expanded Blinder-Solow model the real wealth effect and the real income effect of exchange rate adjustment as well as the real wealth effect and the real income effect of bonds in the original Blinder-Solow model are considered explicitly.

The misspeeification (or an elementary algebraic error as Sohmen [11] called it) in the most models of monetary international economics under flexible exchange rate will be discussed.

In an open economy the supply of money may be affected by the active transaction policy of the government on the market of foreign exchange, since the foreign reserves of the country will be influenced. Policy to sterilize the effects of change in foreign exchange on the supply of money can be practised. We shall consider the influences of such sterilization policy on the effects of fiscal and monetary policy under controlled flexible exchange rates.

The problem of financing government dificits by money-creation and by new bonds will be treated in a simple dynamic model. The dynamic property of the model is affected by the fact whether capital flows in or out the country considered.

II. The Modell (Blinder-Solow-Model for an Open Economy):

The expanded "Blinder-Solow" model for an open economy can be described by the following functions:

(1) $Y = C(Y+B-T,W)+I(r)+G+ M'(e,Y')-M(e,Y)+Z$

(2) $T = T(Y+B)$

(3) $W = K + \frac{L}{P} + \frac{B}{rP} + \frac{Z}{rP}$

(4) $\frac{L}{P} = L\ (r,\ Y,\ W)$

(5) $H = M' - e\ M + F\ (r,\ r') + Z$

The symbols used in (1) to (5) are explained as following:

- Y = real gross national product (GNP)
- C = real consumption
- B = interest payments of government bonds (It is assumed each bond is a perpetuity paying one currency unit e.g. $ 1 or 1 DM per year.)
- T = tax
- W = real wealth
- I = investment
- r = domestic interest rate
- G = government expenditure
- M' = real export, i.e. real import of foreign country defined in one unit of domestic currency
- M = real import, defined in one unit of foreign currency
- e = exchange rate, defined as price of one unit foreign currency in domestic currency (In the original equilibrium we assume $e=1$)

Z = net foreign interest transfer, for simplicity we assume that each foreign indebtedness is a perpetuity paying one currency unit per year.

K = capital stock

I = the supply of money

$\frac{L}{P}$ = the real cash balance

P = the price level which is assumed to be constant and equal 1 at the original equilibrium

H = the net transaction volume of government on the foreign exchange market. In a free flexible exchange rate system H is equal to zero

F = net international capital movements assumed to be a function of domestic and foreign interest rate (especial of the difference of the domestic and foreign interest rate)

Y+B-T = disposable income

Y', r', M' = GNP, interest rate and real import of foreign country, respectively

The following notation is used in this paper:

$$C_Y = \frac{\partial C}{\partial Y}, \quad C_W = \frac{\partial C}{\partial W}, \quad I_r = \frac{dI}{dr} \quad \text{etc.}$$

(1) is the equilibrium condition for the market of goods in which the consumption function, investment function, export and import function are set in. The variables in parenthesis are the determinating factors for the structural functions respectively.

The real consumption is assumed to be depended on the disposable income and the real wealth. The investment is a decreasing function of domestic interest rate. The export is a increasing function of foreign exchange rate and the foreign GNP, while the import is dependent negatively on foreign ex-

change rate and positively on domestic GNP.

The function (2) is tax function. It is assumed that the net foreign interest payments are not taxed by the domestic government. The tax is an increasing function of gross domestic income.

(3) is a definition of real wealth.

(4) describes the equilibrium on the money market. The real cash balance (demand for money) is a function of interest rate, GNP and real wealth with the usual assumptions on the functional relationships with respect to the independent variables respectively.

(5) is the equilibrium condition for the market of foreign exchange. The balance of payments is described by the trade balance ($M' - e\,M$), the balance of international capital movements $F(r,r')$, the balance of active transactions of the government and the balance of international income transfer payments (Z).[1)]

Sohmen [10] pointed out a misspecification in the Laursen-Metzler model and subsequent authors because of neglecting the employment effects of terms-of-trade changes:[2)]

> "Neglecting it means that an elementary algebric error is introduced, no matter how elaborate a model may be in other aspects."

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1) We shall only study the case of interest transfer payments due to the international capital movements. Other forms of income transfers are assumed to be exogenous and equal to zero.

2) Sohmen [11] especially P.525

This misspecification is introduced in many models in such a way that in both functions (1) and (5) $(M' - M)$ is used indifferently by the assumption of constant price levels in home as well as in foreign country under flexible exchange rates. But even under the assumption of constant price levels in both home and foreign country, the real GNP in its own currency and in foreign currency varies due to the exchange rate adjustments. Obviously $M' - M$ is not equal to $(M' - e\,M)$ (with original exchange rate $e=1$), if the exchange rates adjustment realized.

The real wealth effect of change in interest rate, price level and exchange rates can be studied from (5). The net foreign interest transfers paid in domestic and foreign currency can be related by the exchange rate such as:

$$(6) \quad Z = e\,Z'$$

Where Z' is the net foreign interest transfer paid in foreign currency.

If the net foreign interest transfer is arranged to be paid in domestic currency, then Z is constant, i.e. $dZ = 0$. Otherwise if the net foreign interest transfer is arranged to be paid in foreign currency, then Z' is constnat, i.e. $dZ' = 0$.

The real wealth effect of change in interest rate and price level is respectively:

$$(7) \quad \frac{\partial W}{\partial r} = \frac{-(B+Z)}{P\,r^2} < 0$$

$$\frac{\partial W}{\partial P} = -\frac{rL+B+Z}{r\,P^2} < 0$$

If the net foreign interest transfer is arranged to be paid in domestic currency, then influence of exchange rate

adjustment on the real wealth and on the real income can be neglected. If the net foreign interest transfer is arranged to be paid in foreign currency, then the effect of exchange rate adjustment on the real income and the real wealth is respectively:

$$(8)\quad \left|\begin{array}{l} \dfrac{\partial Y}{\partial e} = M'e - M_e + Z' > 0 \\ \\ \dfrac{\partial W}{\partial e} = \dfrac{Z'}{r} > 0 \end{array}\right.$$

The above model (1) to (5) is the Blinder-Solow model extended by international economic relations. In the model the net foreign indebtedness and the net foreign interest transfer are explicitly considered. In this paper we assume:

(a) There exists a single equilibrium for the model (1) to (5)

(b) $U_e - M = M'_e - M_e - M > 0$ (Marshall-Lerner)
This assumption seems to be consistent with the results of empirical research.[1)]

(c) We neglect the capacity effect of the net investment (short-run analysis), and

(d) The price level is assumed to be constant. In the original equilibrium the exchange rate and price level are specified such as e=1 and P=1.

In section 2 through 4 we assume furthermore that the active transaction policy on the market of foreign exchange has no effect on supply of money, i.e. full sterilization of change in foreign reserves on money supply.

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1) Krelle, W. etc.[3]

III. The Effects of Fiscal and Monetary Policy (I):

We consider at first the effects of fiscal and monetary policy under controlled flexible exchage rates for the case that the net foreign capital and net foreign interest transfer are arranged on domestic currency.

We differentiate the functions (1) to (5) total at the equilibrium for the case that Z is given. Solving the equation system we have:[1)]

$$(9)\quad \left|\begin{array}{l} a_{11}dY - a_{12}de = A_1 \\ \\ a_{21}dY + a_{22}de = A_2 \end{array}\right.$$

with

$$a_{11} = 1-C_Y(1-T_Y)+M_Y+ \frac{C_W(B+Z)-r^2I_r}{L_W(B+Z)-r^2L_r} L_Y > 0$$

where $1 > C_Y , T_Y , M_Y , C_W , L_W > 0$;

$I_r < 0 , \quad L_r < 0$

$$a_{12} = M_e' - M_e = U_e > 0$$

where $M_e' > 0 , \quad M_e < 0$

---

1) The solution for dY and de of (9) is:

$$dY = \frac{a_{22}A_1+a_{12}A_2}{a_{11}a_{22}+a_{12}a_{21}} \quad ; \quad de = \frac{a_{11}A_2-a_{21}A_1}{a_{11}a_{22}+a_{12}a_{21}}$$

$$A_1 = \left\{ \frac{C_W(B+Z)-r^2I_r}{r^2L_r-L_W(B+Z)} \cdot \frac{L_W}{r} + C_Y(1-T_Y)+\frac{C_W}{r} \right\} dB + dG + dZ$$

$$+\left\{ \frac{C_W(B+Z)-r^2I_r}{r^2L_r-L_W(B+Z)} \cdot L_W + C_W \right\} dK + M'Y\, dY'$$

$$+\left\{ \frac{C_W(B+Z)-r^2I_r}{r^2L_r-L_W(B+Z)} (L_W - 1) + C_W \right\} dL$$

$$a_{21} = - M_Y + \frac{r^2 F_r L_Y}{L_W(B+Z)-r^2L_r}$$

where $F_r > 0$

$$a_{22} = M'e - M_e - M > 0$$

$$A_2 = \frac{1}{r^2L_r-L_W(B+Z)} \left\{ r^2L_rL_W dK + r^2F_r(L_W-1)\, dL \right.$$

$$\left. + rF_rL_W dB \right\} + dH - dZ - M_Y' dY' + F_r dr'$$

$$a_{11}a_{12} + a_{12}a_{21} = a_{22}\left[1-C_Y(1-T_Y)\right] + M\, M_Y$$

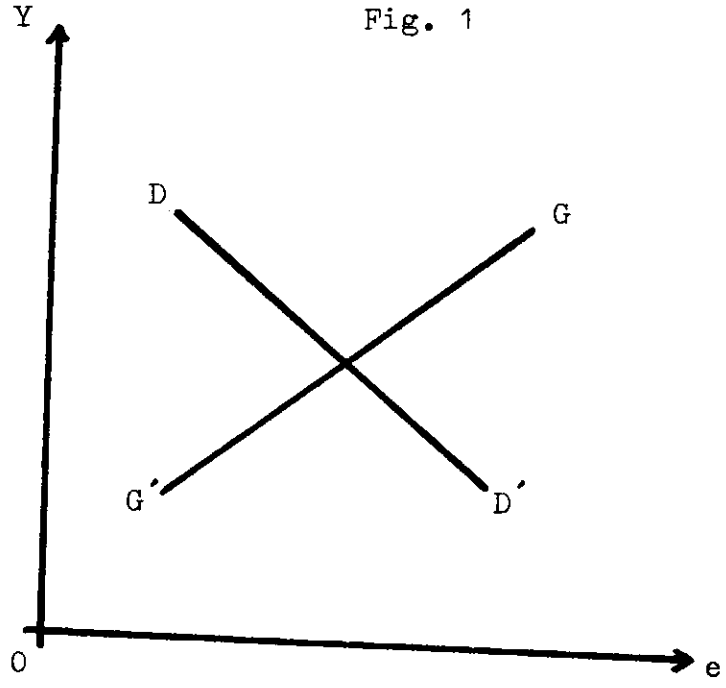
$$- \frac{a_{22}\left[C_W(B+Z)-r^2I_r\right]+r^2U_eF_r}{r^2L_r - L_W(B+Z)} L_Y > 0$$

The first equation of (9) is analogeous as "the internal balance schedule" (GG') and the second equation as "the

foreign balance schedule" (DD´) in the model of Mundell[4]

The slope of the foreign balance schedule depends on the partial derivative F_r i.e., the partial effect of change in interest rate on international capital movements, or the interest elasticity of international capital movements. The higher the interest elasticity of international capital movements the flatter the slope of the foreign balance schedule. The foreign balance schedule runs parallel to Oe if the interest elasticity of international capital movements is infinite.

Fig. 1



The effects of fiscal and monetary policy can be studied now with comparative static analyses:

(10)

$$\frac{\partial Y}{\partial G} = \frac{a_{22}}{a_{11}a_{22} + a_{12}a_{21}} > 0$$

$$\frac{\partial Y}{\partial L} = \frac{a_{22}\left[\frac{C_W(B+Z)-r^2I_r}{r^2L_r-L_W(B+Z)}(L_W-1)+C_W\right]-U_e\frac{r^2F_r(1-L_W)}{r^2L_r-L_W(B+Z)}}{a_{11}a_{22} + a_{12}a_{21}} \gtrless 0$$

(11)

$$\frac{\partial e}{\partial G} = \frac{-a_{21}}{a_{11}a_{22} + a_{12}a_{21}} \gtrless 0$$

$$\frac{\partial e}{\partial L} = \left\{\left[F_r - C_Y(1-T_Y)\,F_r + (F_r - I_r)M_Y\right]r^2(1-L_W) + C_W\left[(B+Z-L_r)M_Y - r^2F_rL_Y\right]\right\} \Big/ (a_{11}a_{22}+a_{12}a_{21}) \cdot \left[L_W(B+Z)-r^2L_r\right]$$

(12)

$$\frac{\partial r}{\partial G} = \frac{-r^2a_{22}\,L_Y}{\left[r^2L_r-L_W(B+Z)\right](a_{11}a_{22}+a_{12}a_{21})} > 0$$

$$\frac{\partial r}{\partial L} = \left\{-r^2L_Y(L_W-1)\left[a_{22}C_W(B+Z)-(a_{22}I_r-U_eF_r)r^2\right] + C_W\left[r^2L_r-L_W(B+Z)\right]\right\} \Big/ (a_{11}a_{22}+a_{12}a_{21}) + \frac{(1-L_W)\,r^2}{\left[r^2L_r-L_W(B+Z)\right]} < 0$$

$$(13)\quad \begin{cases} \dfrac{\partial Y}{\partial H} = \dfrac{U_e}{a_{11}a_{22}+a_{12}a_{21}} > 0 \\[2ex] \dfrac{\partial e}{\partial H} = \dfrac{a_{11}}{a_{11}a_{22}+a_{12}a_{21}} > 0 \\[2ex] \dfrac{\partial r}{\partial H} = \dfrac{-r^2 L_Y U_e}{\left[r^2 L_r - L_W(B+Z)\right]^2 (a_{11}a_{22}+a_{12}a_{21})} < 0 \end{cases}$$

$$(14)\quad \begin{cases} \dfrac{\partial Y}{\partial Z} = \dfrac{-M}{a_{11}a_{22}+a_{12}a_{21}} < 0 \\[2ex] \dfrac{\partial e}{\partial Z} = \dfrac{-a_{11}-a_{21}}{a_{11}a_{22}+a_{12}a_{21}} < 0 \\[2ex] \dfrac{\partial r}{\partial Z} = \dfrac{-Mr^2 L_Y}{\left[L_W(B+Z)-r^2 L_r\right](a_{11}a_{22}+a_{12}a_{21})} < 0 \end{cases}$$

A comparison between the impact of a change in government expenditure and the quantity of money on the real output, interest rate and exchange rate shows that the different way of influence of fiscal and monetary policy. Under controlled flexible exchange rates an increase in quantity of money has a depreciation effect on the country's exchange rate because of increasing domestic demand on the one hand and capital export on the other hand, since the interest rate become lower in home country. An expansive fiscal policy induces a depreciation effect because of stimulating domestic demand but an appreciation effect because of capital import, since an expansive fiscal policy has a positive impact on the domestic interest rate. The net effect of an expansive fiscal policy on the country's exchange rate depends on the marginal propensity to import of

the country and the interest elasticity of international capital movements. The higher the marginal propensity to import the greater is the depreciation effect, and the higher the interest elasticity of international capital movements the higher will be the apreciation effect.

An active transaction policy of the government on the market of foreign exchange for a depreciation of the country's exchange rate has stimulating effect on the real output and negative effect on the interest rate.

Now it is interesting to study the effect of fiscal and monetary policy for the two limiting cases: (a) if the international capital movements are completely unelastic to the change in interest rate and (b) if the international capital movements are infinitely elastic to the change in interest rate:

(A) The limiting case : zero interest elasticity of international capital movements:

$$(15)\quad \begin{cases} \dfrac{\partial Y}{\partial G} = \dfrac{M_e' - M_e - M}{A_o} > 0 \\[2ex] \dfrac{\partial Y}{\partial L} = \dfrac{a_{22}\left[\dfrac{C_W(B+Z)-r^2 I_r}{r^2 L_r - L_W(B+Z)}(L_W-1)+C_W\right]}{A_o} > 0 \end{cases}$$

$$(16)\quad \begin{cases} \dfrac{\partial e}{\partial G} = \dfrac{M_Y}{A_o} > 0 \\[2ex] \dfrac{\partial e}{\partial L} = \dfrac{M_Y\left[\dfrac{C_W(B+Z)-r^2 I_r}{r^2 L_r - L_W(B+Z)}(L_W-1)+C_W\right]}{A_o} > 0 \end{cases}$$

$$\frac{\partial r}{\partial G} = \frac{r^2 a_{22} L_Y}{\left[L_W(B+Z) - r^2 L_r\right] A_o} > 0$$

$$(17)\quad \frac{\partial r}{\partial L} = \left\{-a_{22} r^2 L_Y \left[\frac{C_W(B+Z) - r^2 I_r}{L_W(B+Z) - r^2 L_r}(1-L_W) + C_W\right]\right\} \Big/ \left[L_r r^2 - L_W(B+Z)\right] A_{1o} + \frac{(1-L_W)\, r^2}{L_r r^2 - L_W(B+Z)} < 0$$

where

$$A_o = a_{22}\left[1 - C_Y(1-T_Y)\right] + M\, M_Y + \frac{a_{22}\left[C_W(B+Z) - r^2 I_r\right] L_Y}{L_W(B+Z) - r^2 L_r} > 0$$

$$(18)\quad \frac{\partial Y}{\partial H} > 0 \qquad \text{and} \qquad \frac{\partial e}{\partial H} > 0$$

$$(19)\quad \frac{\partial Y}{\partial Z} < 0$$

(B) The limiting case : infinite interest elasticity of international capital movements:

$$(20)\quad \frac{\partial Y}{\partial G} = 0$$

$$\frac{\partial Y}{\partial L} = \frac{1-L_W}{L_Y} > 0$$

$$\frac{\partial e}{\partial G} = \frac{1}{U_e} > 0$$

$$(21)\quad \frac{\partial e}{\partial L} = \frac{(1-L_W)\left[1 - C_Y(1-T_Y) + M_Y + 2\,\dfrac{C_W(B+Z) - r^2 I_r}{L_W(B+Z) - r^2 L_r}\right] + L_Y C_W}{U_e\, L_Y} > 0$$

$$(22)\quad \left|\begin{array}{l} \dfrac{\partial r}{\partial G} = 0 \\[2ex] \dfrac{\partial r}{\partial L} = -\dfrac{1}{L_Y} < 0 \end{array}\right.$$

$$(23)\quad \left|\begin{array}{l} \dfrac{\partial Y}{\partial H} = 0 \\[2ex] \dfrac{\partial e}{\partial H} = 0 \end{array}\right.$$

$$(24)\quad \frac{\partial Y}{\partial Z} = 0$$

The "internal balance schedule" and "the foreign balance schedule" for the limiting case of infinite interest elasticity of international capital movements can be drawn in Fig. 2. In this case the foreign balance schedule runs parallel to Oe.

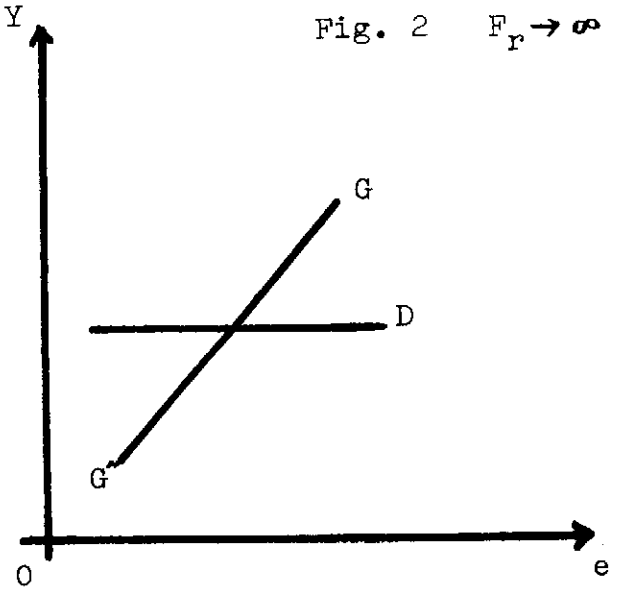


Fig. 2 $F_r \to \infty$

An expansive fiscal policy will shift the internal balance schedule rightwards and induce a depreciation effect on the exchange rate without any influence on the real GNP. An expansive monetary policy (increasing quantity of money) will shift the internal balance schedule rightwards and the foreign balance schedule upwards and therefore increase the real GNP and depreciate the exchange rate.

In inquiring the effect of fiscal and monetary policy for the two limiting cases we realize the following propositions:

First, $\lim_{F_r \to o} \frac{\partial Y}{\partial G} \geqq \frac{\partial Y}{\partial G} \geqq \lim_{F_r \to \infty} \frac{\partial Y}{\partial G}$

Second, $\lim_{F_r \to \infty} \frac{\partial Y}{\partial L} \geqq \frac{\partial Y}{\partial L} \geqq \lim_{F_r \to o} \frac{\partial Y}{\partial L}$

Since

$$\frac{\partial}{\partial F_r}\left(\frac{\partial Y}{\partial G}\right) = \frac{a_{22}\left[r^2 L_r - L_W(B+Z)U_e r^2 L_Y\right]}{(a_{11}a_{22} + a_{12}a_{21})^2} < 0$$

and

$$\frac{\partial}{\partial F_r}\left(\frac{\partial Y}{\partial L}\right) = \frac{-U_e r^2(1-L_W)}{(a_{11}a_{22}+a_{12}a_{21})\left[r^2 L_r - L_W(B+Z)\right]}$$

$$- \frac{\dfrac{r^2 U_e L_Y}{L_W(B+Z)-r^2 L_r}}{(a_{11}a_{22}+a_{12}a_{21})}\left\{a_{22}\left\{\frac{C_W(B+Z)-r^2 I_r}{L_W(B+Z)-r^2 L_r}\right.\right.$$

$$\left.\left.(1-L_W)+C_W\right\}+U_e\frac{r^2 F_r(1-L_W)}{L_W(B+Z)-r^2 L_r}\right\} > 0$$

IV. The Effects of Fiscal and Monetary Policy (II):

We shall now consider the effects of fiscal and monetary policy for the case that the foreign capital and the foreign interest transfer are arranged on the foreign currency. The internal balance schedule and the foreign balance schedule for this case are as follows:

$$(25)\quad \left|\begin{array}{l} \bar{a}_{11}\, dY - \bar{a}_{12}\, de = \bar{A}_1 \\ \bar{a}_{21}\, dY + \bar{a}_{22}\, de = \bar{A}_2 \end{array}\right.$$

$$\bar{a}_{11} = a_{11}\,, \qquad \bar{a}_{21} = a_{21}$$

$$\bar{a}_{12} = a_{12} + Z + \frac{C_W(B+Z) - r^2 I_r}{L_W(B+Z) - r^2 L_r} \;>\; 0$$

$$\bar{a}_{22} = a_{22} + \left[1 + \frac{rF_r + L_W(B+Z) - r^2 L_r}{L_W(B+Z) - r^2 L_r}\right] Z \;>\; 0$$

$$\bar{A}_1 = A_1 - dZ$$

$$\bar{A}_2 = A_2 + dZ$$

where $e=1$ for the original equilibrium is used.

In comparison between the equation system (9) and (25) we find that both the internal and the foreign balance schedule in (25) are steeper than that in (9), if the country considered has net foreign claims, i.e. $Z > 0$; and that both the internal and the foreign balance

schedule in (25) are flatter than that in (9), since $\bar{a}_{12} > a_{12}$ and $a_{22} > \bar{a}_{22}$, if $Z > 0$; and $\bar{a}_{12} < a_{12}$ and $\bar{a}_{22} < a_{22}$, if $Z < 0$. This means that for the country with net foreign claim the stabilization policies will influence the real output more strongly and the exchange rate more weakly if her residents hold foreign bonds and receive net interest payments in foreign currency than if the foreigners borrow from her residents and would pay back in her currency. But if the country considered has net foreign indebtedness the stabilization policies will influence the real output more strongly and the exchange rate more weakly if her residents borrow in foreign country and will pay back in foreign currency than if foreigners bought bonds from her residents.

The first case can be shown as follows:

$$
(26)\quad
\begin{cases}
\left.\frac{\partial Y}{\partial G}\right|_{Z = \text{given}} < \left.\frac{\partial Y}{\partial G}\right|_{Z' = \text{given}} & \text{and} \\
\left.\frac{\partial Y}{\partial L}\right|_{Z = \text{given}} < \left.\frac{\partial Y}{\partial L}\right|_{Z' = \text{given}} & \\
\left.\frac{\partial e}{\partial G}\right|_{Z = \text{given}} > \left.\frac{\partial e}{\partial G}\right|_{Z' = \text{given}} & \text{and} \\
\left|\frac{\partial e}{\partial L}\right|_{Z = \text{given}} > \left|\frac{\partial e}{\partial L}\right|_{Z' = \text{given}} & \text{for} \quad Z > 0
\end{cases}
$$

analogous for the second case:

$$
(27)\quad
\begin{cases}
\left.\frac{\partial Y}{\partial G}\right|_{Z = \text{given}} > \left.\frac{\partial Y}{\partial G}\right|_{Z' = \text{given}} & \text{and} \\
\left.\frac{\partial Y}{\partial L}\right|_{Z = \text{given}} > \left.\frac{\partial Y}{\partial L}\right|_{Z' = \text{given}} & \\
\left.\frac{\partial e}{\partial G}\right|_{Z = \text{given}} < \left.\frac{\partial e}{\partial G}\right|_{Z' = \text{given}} & \text{and} \\
\left|\frac{\partial e}{\partial L}\right|_{Z = \text{given}} < \left|\frac{\partial e}{\partial L}\right|_{Z' = \text{given}} & \text{for} \quad Z < 0
\end{cases}
$$

V. The Effect of Active Transaction Policy on the Market of Foreign Exchange:

Heretofore the effects of active transaction policy are studied under the assumption that the change in foreign reserves due to the active transaction of the government on the market of foreign exchange is fully sterilized for the domestic money market. In this case the effect of active transaction policy on the real output, the exchange rate and the interest rate are quite clear cut as shown in section III.

In this section a more general assumption on the sterilization policy of the active transaction policy for the domestic money market will be introduced with the following functions:

$$(28)\quad \left|\begin{array}{l} \frac{L}{P} = L\ (Y,\ r,\ W) \\ L = \bar{L} + b\ H \qquad \text{with} \quad 1 \geq b \geq 0 \end{array}\right.$$

b can be called as the ratio of sterilization.

The model of section II is modified accordingly. The effects of the active transaction policy can be summerized as following:

$$(29)\quad \frac{\partial Y}{\partial H} = \left\{U_e + ba_{22}\left[\frac{C_W(B+Z) - r^2 I_r}{L_W(B+Z) - r^2 L_W}(1-L_W) + C_W\right] + bU_e \frac{r^2 F_r (1-L_W)}{L_W(B+Z)}\right\} / (a_{11}a_{22} + a_{12}a_{21}) > 0$$

$$\text{or}\quad \frac{\partial Y}{\partial H} = \frac{U_e}{a_{11}a_{22} + a_{12}a_{21}} + \frac{\partial Y}{\partial L} b > 0$$

$$(30)\quad \frac{\partial e}{\partial H} = \frac{a_{11}}{a_{11}a_{22}+a_{12}a_{21}} + b\frac{\partial e}{\partial L}$$

$$(31)\quad \frac{\partial r}{\partial H} = \frac{-r^2 L_Y U_e}{\left[r^2 L_r - L_W(B+Z)\right]^2 (a_{11}a_{22}+a_{12}a_{22})} + b\frac{\partial r}{\partial L} < 0$$

In comparison to (13) in section III the effects of active transaction policy are strengthened under the generalized assumption of sterilization (i.e. $1 \geq b \geq 0$). It is easy to see, that the higher will be the effects of active transaction policy the lower the sterilization ratio of change in foreign exchange reserves, since

$$(32)\quad \left|\begin{array}{l} \frac{d}{db}\left(\frac{\partial Y}{\partial H}\right) > 0 \\ \frac{d}{db}\left(\frac{\partial e}{\partial H}\right) > 0 \\ \frac{d}{db}\left(\frac{\partial r}{\partial H}\right) > 0 \end{array}\right.$$

Furthermore, with a sterilization ratio greater than zero the active transaction policy is always effective, even if the interest elasticity of international capital movements is infinite, for

$$(33)\quad \left|\begin{array}{l} \lim\limits_{F_r} \frac{\partial Y}{\partial H} = \frac{b\left[L_W(B+Z)-r^2 L_r\right](1-L_W)}{L_Y L_W (B+Z)} > 0 \\ \lim\limits_{F_r} \frac{\partial e}{\partial H} = \left\{ b(1-L_W)\left[1-C_Y(1-T_Y)+M_Y+2\frac{C_W(B+Z)-r^2 I_r}{L_W(B+Z)-r^2 L_r}\right] \right. \\ \qquad\qquad \left. +L_Y C_W \right\} \Big/ U_e L_Y > 0 \\ \lim\limits_{F_r} \frac{\partial r}{\partial H} = -\frac{b}{L_Y} < 0 \end{array}\right.$$

VI. Financing government dificits by money-creation or by new bonds:

We modify our model (1) to (5) with the following two differential equations which describe the ways of financing government dificits and change in net foreign interest transfer result of international capital movements:

$$(34)\quad \left|\begin{array}{l} \dot{L} + \dot{B} = G + B - T\,(Y + B) \\ \dot{Z} = r \cdot F\,(r, r') \end{array}\right.$$

Notation: $\dot{L} = \frac{dL}{dt}$, $\dot{B} = \frac{dB}{dt}$, etc.

In this section we want to study the stability of the model (1) to (5) and (34), especially, for the case if the government deficits are financed by money creation and the case if these deficits are financed by new bonds. Other than the case studied by Blinder and Solow [1] in an open economy with international capital movements the net foreign interest transfer varies according to whether capital flows in or out the country considered.

To study the stability of the model it will be usefull to consider the static equilibrum equations as defining Y, r and F as functions of G, L, B, Z, K, Y', and H : [1)]

$$(35)\quad \left|\begin{array}{l} Y = Q\,(G, L, B, Z, K, H, Y') \\ r = R\,(G, L, B, Z, K, H, Y') \\ F = S\,(G, L, B, Z, K, H, Y') \end{array}\right.$$

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1) Compare the solution of the model in Section III

In Section II and III we have derived the partial derivatives of these functions at the equilibrium, e.g. [1)]

$$Q_G = \frac{\partial Y}{\partial G} = \frac{a_{22}}{a_{11}a_{22}+a_{12}a_{21}} > 0$$

$$Q_L > 0$$

etc.

A. Financing Deficits by Money-Creation:

If the deficits are financed solely by money-creation, then the function (34) can be modified as:

$$(36) \quad \left| \begin{array}{l} \dot{L} = G + B - T\,(\,Y + B\,) \\ \dot{Z} = r\,F\,(\,r,\,r'\,) \end{array} \right.$$

The stability of the model (1) to (5) and (36) can be studied by the following homogemevus differential equations of the firstxapproximations:

$$(37) \quad \begin{bmatrix} \dot{l} \\ \dot{z} \end{bmatrix} = \begin{bmatrix} -T_Y Q_L & -T_Y Q_E \\ FR_L + rS_L & FR_Z + rS_Z \end{bmatrix} \cdot \begin{bmatrix} l \\ z \end{bmatrix}$$

where $\dot{l} = \dot{L} - \bar{L}$

$\dot{z} = \dot{Z} - \bar{Z}$

$FR_L + rS_L = (F + rF_r)\,R_L$

$FR_Z + rS_Z = (F + rF_r)\,R_Z$

1) See Section II and III

The model (1) to (5) and (36) is stable, if the following conditions are fulfilled: [1]

$$(38)\quad \left|\begin{array}{l} \text{Trace} = -T_Y Q_L + (F+rF_r)\, R_Z < 0 \\ \\ \text{Det} = -T_Y(F+rF_r)\,(Q_L R_Z - Q_Z R_L) > 0 \end{array}\right.$$

Therefore, for capital importing country the model is always stable, if the deficits are financed by money-creation; and for capital exporting coumtry the model is stable if the deficits are financed by money-creation and if the international capital movements are "sufficiently" interest elastic, i.e. if $\frac{r}{F} F_r > 1$

(B) Financing Deficits by New Bonds:

The equations of (36) should be modified as following, if the deficits are financed by new bonds:

$$(39)\quad \left|\begin{array}{l} \dot{B} = G + B - T\,(\,Y + B\,) \\ \\ \dot{Z} = r\,F\,(\,r,\, r'\,) \end{array}\right.$$

Analogous to (37) the stability of the model (1) to (5) and (39) can be studied by the following homogeous (first approximation) differential equations:

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1) $R_Z = \dfrac{-r^2 L_Y M}{\left[L_W(B+Z) - r^2 L_r\right](a_{11}a_{22}+a_{12}a_{21})} < 0$;

$S_Z = \dfrac{\partial F}{\partial r} \cdot \dfrac{\partial r}{\partial Z} < 0 \qquad S_L = \dfrac{\partial F}{\partial r} \cdot \dfrac{\partial r}{\partial L} = F_r R_L < 0$

$$(40)\quad \begin{bmatrix} \dot{b} \\ \dot{z} \end{bmatrix} = \begin{bmatrix} r\left[1-T_Y(1+Q_B)\right] & -rT_YQ_Z \\ (F+rF_r)R_B & (F+rF_r)R_Z \end{bmatrix} \begin{bmatrix} \dot{b} \\ \dot{z} \end{bmatrix}$$

$$(41)\quad \begin{cases} \text{Trace} = r\left[1-T_Y(1+Q_B)\right]+(F+rF_r)R_Z \\ \text{Det} = (F+rF_r)r\left[R_Z-T_Y(R_Z+Q_BR_Z-Q_ZR_B)\right]-T_YR_Z(1+Q_B) \end{cases}$$

The model is stable, if the Trace is negative and the Det is positive.

Therefore, for capital importing country the model is stable if the deficits are financed by new bonds and if $Q_B > 0$, i.e. if the additional bonds have a positive net impact on GNP; [1] and for capital exporting country which finances the deficits by new bonds the model is stable, if the additional bonds have a positive net impact on GNP, i.e. $Q_B > 0$, and if the international capital movements are "sufficiently" interest elastic, i.e. if $\frac{r}{F} F_r > 1$

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1) "Is the net effect of the additional bonds on GNP (i.e. Q_B) positive or negative?". This constitutes one of the main issues separating monetarists from Keynesians.
"If the parameters of the system are such that the net wealth effect of a new bond issue is contractionary, the monetarists will be vindicated; but the more important consequence is that the System will then be unstable."
(Blinder & Solow [1], P.328)

VII. Summary:

In a simple common macroeconomic model of Blinder-Solow expanded with international economic relations for an open economy the effects of fiscal and monetary policies on real output, exchange rate, interest rate, etc. are studied under controlled flexible exchange-rate system which characterizes the recent exchange-rate system of the most developed market-economy countries. International capital movements are considered. The terms of trade effect (Laursen-Metzler effect) and the direct cash balance effect are neglected deliberately. But the real wealth effect of bonds, the effects of exchange-rate adjustment on the real net foreign wealth and on the real income of the international interest transfer are considered explicitly. We point out the meaning, whether the net foreign capital (claim or indebtedness) and the international interest transfer are quoted in currency of home or foreign country, for the effects of fiscal and monetary policy in an open economy.

In this paper we analyse the effects of stabilization policy under constant price level. The effects of exchange-rate adjustment on the real net foreign capital and on the real net international interest transfer can be neglected if the net real foreign capital and the net interest transfer are quoted in the own currency.

If the country considered has net foreign claims, then the effects of fiscal and monetary policies on the real income is more strongly and on the exchange rate is more weakly, if the net foreign claims and the net interest transfer receivable from the net foreign claims are quoted in the

foreign than in the own currency. If the country considered has net foreign indebtedness, then the effects of fiscal and monetary policies on the real income is more strongly and on the exchange rate is more weakly, if the net foreign indebtedness and the net interest transfer are quoted in the own than in the foreign currency.

The effects of fiscal policy are weaker, the higher the interest elasticity of international capital movements. The effects of monetary policy are weaker, the lower the interest elasticity of international capital movements.

The effects of active transaction policy are stronger the lower the sterilization ratio of change in foreign reserves to the money supply. The active transaction policy does not matter, if the change in foreign reserves is fully sterilized and the interest elasticity of international capital movements is infinite.

The way of financing government deficits, i.e. whether the deficits are financed by money-creation or by new bonds, is important to the effects of fiscal and monetary policy. For capital importing country the model is always stable, if the dificits are financed by money-creation. For capital exporting country the model is stable, if the deficits are financed by money-creation and the interest elasticity of international capital movements is higher than unity.

For capital importing country, the model is stable, for financing deficits by new bonds, if the additional bonds have a positive net impact on GNP. For capital exporting country the model is stable for financing deficits by new bonds, if the additional bonds have a positive net impact on GNP and if the interest elasticity of international capital movements is higher than unity.

References:

1. Blinder, A.S. & Solow, R.M.
Does Fiscal Policy Matter?
in: Journal of Public Economics, 1973

2. Herberg, H.
Internationaler Preiszusammenhang bei festen und flexiblen Wechselkursen
in: Zeitschrift für Wirtschafts- und Sozialwissenschaften, 1976

3. Krelle, W., Beckerhoff, D. Langer, H.G. and Fuß, H.
Ein Prognosesystem für die wirtschaftliche Entwicklung der Bundesrepublik Deutschland, Meisenheim am Glan, 1969

4. Mundell, R.A.
The Monetary Dynamics of International Adjustment under Fixed and Fixed Exchange Rates
in: Quarterly Journal of Economics, 1960

5. Mundell, R.A.
Capital Mobility and Stabilization Policy under Fixed and Flexible Exchange Rates
in: Canadian Journal of Economics and Political Science, 1963

6. Neumann, M.
Internationaler Preiszusammenhang bei festen und flexiblen Wechselkursen
in: Zeitschrift für Wirtschafts- und Sozialwissenschaften, 1974

7. Rose, K. & Bender, D.
Flexible Wechselkurse und Inflationsimport
in: Jahrbücher für Nationalökonomie und Statistik, 1972

8. Siebert, H.
Inflationsimport bei flexiblen Wechselkursen
in: Jahrbücher für Nationalökonomie und Statistik, 1976

9. Sohmen, E.
Fiscal and Monetary Policies under Alternative Exchange Rate Systems
in: Quarterly Journal of Economics, 1967

10. Sohmen, E. & Schneeweiss, H.
Fiscal and Monetary Policies under Alternative Exchange Rate Systems - A Correction
in: Quarterly Journal of Economics, 1969

11. Sohmen, E.
Exchange Rates, Terms of Trade and Employment: Pitfalls in Macroeconomic Models of Open Economy
in: Kyklos, 1974

12. Takayama, A.
The Effect of Fiscal and Monetary Policies under Flexible and Fixed Exchange Rates
in: Canadian Journal of Economics, 1969