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The International Transmission of
Business Cycles

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I. Introduction:

The international transmission of business cycles was most discussed during the period of Bretton Woods system of fixed exchange rates under the topic of multipliers of international trade. The terminologies such as "beggar-my-neighbour" (8) etc. are much cited. An expansive policy of one country under fixed exchange-rate system has generally positive employment and income effect on the other countries.

The international transmission of business cycles under flexible exchange-rate system was analysed by Laursen and Metzler (4) . In a world of fixed exchange-rate system this celebrated article did not get much attention. Since 1973 the floating exchange rates are practised by the most developed market-economy-countries. The problem of international transmission of business cycles and exchange rate adjustment induces therefore more attention recently.

At the economic summit conference 1977 in London the countries, USA, Federal Republic of Germany and Japan are urged to carry out expansive economic policies to stimulate the economic activity of the world.

Laursen and Metzler pointed out in the celebrated article a negative international transmission effect of business cycles under flexible exchange-rate system, i.e. an expansive policy of home country will influence negatively on the employment and the real output in foreign country (Laursen-Metzler paradox). This main proposition of Laursen and Metzler leans mainly on the hypothesis of terms-of-trade-effect (or Laursen-Metzler-effect) on domestic expenditure. ¹⁾

In a comment White criticizes the terms-of-trade-effect of Laursen and Metzler on domestic consumption demand as "largely incorrect". [11. P.225]

1) "Real income depends upon its output and employment, and under a system of flexible exchange rates a country's output tends to fall when its terms of trade improve and to rise when its terms of trade deteriorate. The effect on real income of the change in terms of trade is thus opposite to the effect of the change in output,...."
(See Laursen and Metzler [4] , P.289)

".... with given money incomes and given domestic prices, an increase in import prices (e.g. due to depreciation) will probably increase total expenditure out of a given income". (See Laursen and Metzler [4] , P.294)

Sohmen [9] proves the Laursen-Metzler effect on the domestic consumption demand under the assumption that the consumers are free of money illusion and that the average propensity to consume is higher than the marginal propensity to consume.

As many other authors Laursen and Metzler made a misspecification in their model due to the assumption of "employment neutrality of a zero trade balance" under flexible exchange-rate system without international capital movements. We shall show even in the case of constant price levels in the trading countries the zero trade balance is not employment neutral under flexible exchange rate.

In an article Kemp [3] considers the "direct cash balance effect" of Mishan [5] in the demand function of money and show the importance of income elasticity of money for the international transmission of business cycles (P.85).

If the income elasticity of money is unity, then the international transmission of business cycles can be ceased.

In this paper we use a simple two-countries macroeconomic model to study the way of international transmission of business cycles under a controlled flexible exchange-rate system. The international capital movements are considered. A controlled flexible exchange-rate system is a flexible

exchange-rate system with active transaction policy of the government on the market of foreign exchange. The current exchange-rate system of the most developed market-economy-countries seems to be characterized by this system.

In our model we neglect both the terms-of-trade-effect on domestic consumption demand and the direct cash balance effect deliberately since we want to show the Laursen-Metzler paradox will arise always if the international capital movements are neglected.

In almost all macroeconomic models for open economies heretofore the effect of exchange-rate adjustment on the net foreign capital and the net interest transfer are neglected even if the international capital movements are considered explicitly. The value in national currency of net foreign claim or indebtedness (net foreign capital) resulted from international capital movements is influenced by a exchange-rate adjustment, if the net foreign capital is denominated in terms of foreign currency. A depreciation of domestic currency will increase the wealth (foreign capital) in domestic currency and vice versa. If the interest payments from the net foreign capital is denominated in the foreign currency, a depreciation of domestic currency will increase the real income in domestic currency, and vice versa. The denomination of net foreign capital as well as interest

payments due to the net foreign capital in terms of domestic or foreign currency is therefore important for the consideration of international transmission of business cycles as well as for the effects of fiscal and monetary policy in an open economy as shown by the author in a recent paper [2] .

In this paper we shall point out the importance of the interest elasticity of international capital movements for the international transmission of business cycles.

In addition to the static macroeconomic two-countries model we make dynamic postulates to study the dynamic properties of different ways of international transmission of business cycles. Only in the case if the home country balance schedule and the foreign country balance schedule have different sort of slope, i.e. one has positive and the other has negative slope, the international transmission of business cycles will be cyclically. In other cases the system approaches equilibrium asymptotically.

II. The Two-Countries Model:

Our model is a modified version of Blinder-Solow model for two open countries, i.e. countries with international economic relations. For simplification the real wealth effects for domestic consumption and demand for money will be neglected. Our two-countries macroeconomic model can be described by the following structural functions: ¹⁾

A. Home Country:

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

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

$$(3) \quad \frac{\bar{L}}{P} = L(r, Y)$$

$$(4) \quad H = M' - e M + F(r, r') + Z$$

B. Foreign Country:

$$(5) \quad Y' = C'(Y'+B'-T') + I'(r') + M(e, Y) - M'(e, Y') - Z' + G'$$

$$(6) \quad T' = T'(Y'+B')$$

$$(7) \quad \frac{\bar{L}'}{P'} = L'(r', Y')$$

$$(8) \quad H' = \frac{H}{e}$$

$$\text{where} \quad Z' = \frac{Z}{e}$$

1) Blinder, A.S. and Solow, R.M. [1]

Chen, John-ren [2]

where

- Y = real gross national product (GNP)
C = real consumption
B = interest payments of government bonds (each bond is defined as a perpetuity paying on currency unit per year)
T = tax ;
r = interest rate
I = investment
G = government expenditure
M' = real export (equal 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
Z = nett foreign interest transfer
P = Price level
 \bar{L} = nominal money supply
 $\frac{L}{P}$ = real cash balance
H = the nett transaction volume of the government on the market of foreign exchange
F = nett international capital movements
Y+B-T = disposable income

The same symbols are used for the foreign country with a "prime", e.g. Y' = real GNP of foreign country

The following notation is used in this paper:

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

In (1) the consumption function, investment function, export and import function are set in. The variables in parenthesis are the arguments of the function respectively. The function (1) is the equilibrium condition of the goods-market in home country.

The function (2) is the tax function. The function (3) shows the equilibrium of money market in home country. The function (4) is the balance of payments of the home country.

The functions (4) to (7) have the same meaning as the respective function of (1) to (3). The function (8) is an identity.

In an another paper we point out the various meanings, whether the net foreign capital and the net interest transfer are arranged in home or foreign currency. ¹⁾ In this paper we shall assume without loss of generality that the home country has a net foreign claim arranged in currency of home country. The net interest transfer to home country is denominated in the currency of home country. This assumption means that the foreign country has a net indebtedness to the home country denominated in the currency of home country and the foreign country has to transfer interest to home country denominated in the currency of home country.

In model under flexible exchange rates the difference ($M' - M$) is not trade balance but the difference of export volume and import volume, measured in unit of export price and import price in domestic and foreign currency at the initial equilibrium respectively.

1) Chen, John-ren [2]

The trade balance is accordingly equal $(M' - eM)$. Assuming that the exchange rate of initial equilibrium is equal to unity, so is $M' - M = M' - eM$ at the initial equilibrium. But under the flexible exchange rates the difference of M' and M is generally not equal to trade balance.

If international capital movements are neglected the trading country will have a zero trade balance, i.e. $M' = eM$. An exchange-rate adjustment means that the difference of M' and M would not be zero as at the initial equilibrium. If the exchange rate of the country considered depreciated in comparison to that at the initial equilibrium, the $M' - M > 0$; and in case of appreciation $M' - M < 0$. Accordingly using $(M' - M)$ indifferently in function (1) or (5) and (4) causes a misspecification, an elementary algebraic error as Sohmen called it (10), since the exchange-rate adjustment under flexible exchange rates is not "employment neutral".

In this paper we consider the international transmission of business cycles in a short-run analysis, i.e. the capacity effect of investment and the interest effect of net international capital movements are neglected. We assume furthermore:

- (a) There exists an equilibrium for the model (1) to (8)
- (b) $U_e - M = M'_e - e M_e - M > 0$ (Marshall-Lerner)
- (c) The active transaction policy on the market of foreign exchange does not influence the supply of money in the country considered, i.e. full sterilization of change in foreign reserves.
- (d) $P = 1$ and $e = 1$ at the initial equilibrium.

III. International Transmission of Business Cycles:

The model (1) to (8) can be reduced to the following two equations (the partial derivatives are derived at the equilibrium of the model):

(a) the home country balance schedule (G1-Schedule):

$$(9) \quad A_{11}dY + A_{12}dY' = A_{10}$$

(b) the foreign country balance schedule (G2-Schedule):

$$(10) \quad A_{21}dY + A_{22}dY' = A_{20}$$

where

$$A_{11} = 1 - C_Y(1 - T_Y) - I_r l_1 + (F_r l_1 U_e - M M_Y) / E$$

$$A_{12} = (M M_Y' - U_o F_r l_1') / E$$

$$E = U_e - M; \quad l_1 = \frac{-L_Y}{L_r} > 0, \quad l_2 = \frac{1}{L_r} < 0,$$

$$l_1' = \frac{-L_Y'}{L_r} > 0, \quad \text{and} \quad l_2' = \frac{1}{L_r} < 0$$

$$A_{21} = [M_Y(M - U - Z) - F_r l_1 (U_e - U - Z)] / E$$

$$A_{22} = 1 - C_Y'(1 - T_Y') - I_r' l_1' + [F_r l_1' (U_e - U - Z) - M_Y' (M - U - Z)] / E$$

$$A_{10} = dG + dZ + I_r l_2 dL + U_e (dH - dZ + l_2' F_r dL' - l_2 F_r dL) / E$$

$$A_{20} = dG' + I_r' l_2' dL' - (U_e - U - Z) (dH - dZ + l_2' F_r dL' - l_2 F_r dL) / E$$

$$U = M' - M, \quad M-U-Z = M - M' + (M-Z)$$

$$U_e - U - Z > M - U - Z$$

The equation system (9) and (10) can be solved for

$$(11) \quad dY = \frac{A_{22} A_{10} - A_{12} A_{20}}{D}$$

$$(12) \quad dY' = \frac{A_{11} A_{20} - A_{21} A_{10}}{D}$$

$$\text{where} \quad D = A_{11} A_{22} - A_{12} A_{21}$$

An expansive fiscal policy in home country will shift the home country balance schedule upwards while an expansive monetary policy in home country will shift the home country balance schedule upwards and the foreign country balance schedule downwards.¹⁾

An expansion fiscal policy in foreign country can be characterized by a rightward-shift of the foreign country balance schedule, while an expansive monetary policy in foreign country will shift the foreign country balance schedule rightwards and the home country balance schedule downwards.²⁾

The effects of an expansive fiscal and monetary policy in home country on the real output (employment) of the foreign country or **analogical** the effects of an expansive fiscal and monetary policy in foreign country on the real output (employment) of

1) Since $\frac{\partial A_{10}}{\partial G} > 0$, $\frac{\partial A_{20}}{\partial G} = 0$, $\frac{\partial A_{10}}{\partial L} > 0$, $\frac{\partial A_{20}}{\partial L} = \frac{(U_e - U - Z) l_2' F_r}{E} < 0$

$$\frac{\partial A_{10}}{\partial G'} = 0, \quad \frac{\partial A_{20}}{\partial G'} > 0; \quad \frac{\partial A_{10}}{\partial L'} = \frac{U_e l_2' F_r}{E} < 0$$

$$-\frac{\partial A_{20}}{\partial L'} = I_r' l_2' - \frac{(U_e - U - Z) l_2' F_r}{E} > 0$$

the home country are given as following:

$$(13) \quad \frac{\partial Y}{\partial G} = \frac{A_{22}}{D}$$

$$(14) \quad \frac{\partial Y'}{\partial G} = -\frac{A_{21}}{D}$$

$$(15) \quad \frac{\partial Y}{\partial L} = \frac{A_{22}(I_r l_2 - U_e l_2 F_r E^{-1}) - A_{12}(U_e - U - Z) l_2 F_r E^{-1}}{D}$$

$$(16) \quad \frac{\partial Y'}{\partial L} = \frac{A_{11}(U_e - U - Z) l_2 F_r E^{-1} - A_{21}(I_r l_2 - U_e l_2 F_r E^{-1})}{D}$$

$$(17) \quad \frac{\partial Y}{\partial G'} = \frac{-A_{12}}{D}$$

$$(18) \quad \frac{\partial Y'}{\partial G'} = -\frac{A_{11}}{D}$$

$$(19) \quad \frac{\partial Y'}{\partial L'} = \frac{A_{11} \{ I_r' l_2' - (U_e - U - Z) l_2' F_r E^{-1} \} - A_{21} U_e l_2' F_r E^{-1}}{D}$$

$$(20) \quad \frac{\partial Y}{\partial L'} = \frac{A_{22} U_e l_2' F_r E^{-1} - A_{12} \{ I_r' l_2' - (U_e - U - Z) l_2' F_r E^{-1} \}}{D}$$

$$(21) \quad \frac{\partial Y}{\partial H} = \frac{A_{22} U_e + A_{12}(U_e - U - Z)}{D E}$$

$$(22) \quad \frac{\partial Y'}{\partial H} = \frac{-A_{11}(U_e - U - Z) - A_{21} U_e}{D E}$$

$$(23) \quad \frac{\partial Y}{\partial Z} = \frac{-M A_{22} - A_{12}(U_e - U - Z)}{D E}$$

$$(24) \quad \frac{\partial Y'}{\partial Z} = \frac{A_{11}(U_e - U - Z) + M A_{21}}{D E}$$

In the following analysis we proceed from: 1)

$$(25) \quad \begin{aligned} D &= A_{11} A_{22} - A_{12} A_{21} > 0 \\ A_{11} &> 0 \quad \text{and} \quad A_{22} > 0 \end{aligned}$$

The sign of A_{12} and A_{21} depends on the interest elasticity of international capital movements. A_{12} and A_{21} are both positive if the international capital movements have zero interest elasticity, since

$$(26) \quad A_{12} \begin{matrix} > \\ < \end{matrix} 0, \quad \text{if} \quad \frac{r M M'_Y}{F U_e l'_1} \begin{matrix} > \\ < \end{matrix} \frac{r F_r}{F} = \xi_{F/r}$$

$$(27) \quad A_{21} \begin{matrix} > \\ < \end{matrix} 0, \quad \text{if} \quad \frac{r M_Y(M-U-Z)}{F l_1 (U_e - U - Z)} \begin{matrix} > \\ < \end{matrix} \frac{r F_r}{F} = \xi_{F/r}$$

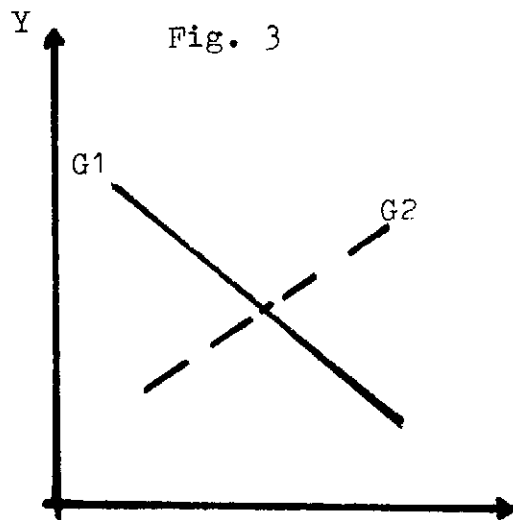
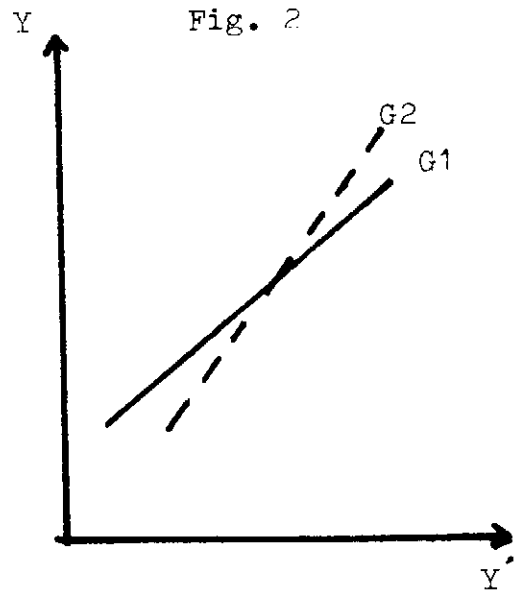
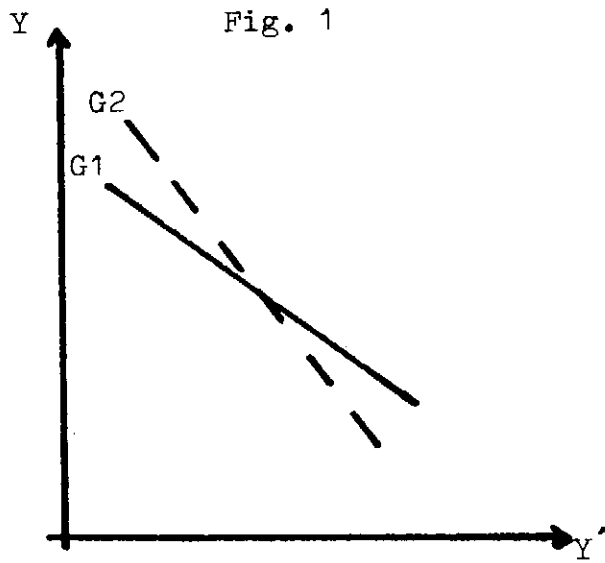
The way of international transmission of business cycles can be classified by the following three cases:

case A: Both the home country balance schedule and the foreign country balance schedule have negative slope, i.e. if $A_{12} > 0$ and $A_{21} > 0$ (See Fig. 1)

case B: Both the home country balance schedule and the foreign country balance schedule have positive slope, i.e. if $A_{12} < 0$ and $A_{21} < 0$ (See Fig. 2)

case C: The slope of the home country balance schedule and of the foreign country balance schedule has different sign. (See Fig. 3)

1) These are sufficient conditions for Stability of the model. See Section 5



Explanations for Fig. 1, Fig. 2 and Fig. 3:

G1 ——— : the home country balance schedule

G2 - - - - : the foreign country balance schedule

We can see easily that the case A comes into being, if

$$(28) \quad \xi_{F/r} = \frac{r}{F} F_r < \min \left\{ \frac{r M M'_Y}{F U_e l'_1}, \frac{r M_Y(M-U-Z)}{F l_1(U_e-U-Z)} \right\}$$

and the case B arises, if

$$(29) \quad \xi_{F/r} > \max \left\{ \frac{r M M'_Y}{F U_e l'_1}, \frac{r M_Y(M-U-Z)}{F l_1(U_e-U-Z)} \right\}$$

$$(30) \quad \text{If } \min \left\{ \frac{r M M'_Y}{F U_e l'_1}, \frac{r M_Y(M-U-Z)}{F l_1(U_e-U-Z)} \right\} < \xi_{F/r} <$$

$$\max \left\{ \frac{r M M'_Y}{F U_e l'_1}, \frac{r M_Y(M-U-Z)}{F l_1(U_e-U-Z)} \right\}$$

then the case C will come into being.

If the international capital movements are sufficiently unelastic to interest rate, then the international transmission of business cycles can be described as in the Fig. 1. In this case an expansive policy of home country influence contractionarily on the GNP of foreign country, and vice versa. This is the case of the so called Laursen-Metzler Paradox. Neglecting international capital movement the Laursen-Metzler Paradox seems to be always the case. In the model of Laursen and Metzler the international capital movements are not considered and the balance of trade is always equal to zero because of flexible exchange rates. We see now the Laursen-Metzler Paradox can also arise if the international capital movements react sufficiently weakly to the change in interest rate, while the balance of trade needs not to be zero. In this case both home country balance schedule and foreign country balance schedule has negative slope. In Fig. 1 we assume the foreign country balance

schedule has higher slope than the home country balance schedule. As shown above that the zero interest elasticity of the international capital movements is sufficient but not necessary for the Laursen-Metzler Paradox in our model.

If the international capital movements respond "enough" strongly to the change in interest rate, then both the home country balance schedule and the foreign country balance schedule have positive slope as shown in Fig. 2. In this case an expansive policy of the home country will influence positively on the GNP of the foreign country, and vice versa. In Fig. 2 the slope of the home country balance schedule is shown to be flatter than that of the foreign country balance schedule.

If the interest elasticity of international capital movements is not high enough so that both the home country balance schedule and the foreign country balance schedule have positive slope as shown in Fig. 2 and yet not sufficiently low so that both G_1 and G_2 have negative slope as shown in Fig. 1, then the international transmission of business cycles can be described as in Fig. 3. In this case an expansive policy of home country (a shift of G_1 schedule onwards in Fig. 3) has an positive effect on the GNP of foreign country, but an expansive policy of the foreign country will influence negatively the GNP of home country. ¹⁾

1) In Fig. 3 we show an example of the case B with

$$\frac{r M_Y (M-U-Z)}{F l_1 (U_e - U-Z)} < \left\{ \frac{F}{r} < \frac{r M M'_Y}{F U_e l'_1} \right.$$

If the interest elasticity of international capital movements is "infinitely" high, then both G_1 and G_2 schedule have the same positive slope. In this case the equilibrium of the model is not unique.

The above analysis points out the central signification of the reaction of the international capital movements on change of interest rate. For a positive international transmission of business cycles the international capital movements should not to be controlled or restricted by the government.

IV. Two Limiting Cases of the International Transmission of Business Cycles:

It seems to be interesting to study the properties of our model for two limiting cases: (a) if the interest elasticity of international capital movements is zero and (b) if the interest elasticity of international capital movements is infinite.

A. The Limiting Case: Zero Interest Elasticity of International Capital Movements ($\lim F_r \rightarrow 0$)

$$(31) \quad \frac{\partial Y}{\partial G} = \frac{\tilde{A}_{22}}{A_{00}} > 0$$

$$(32) \quad \frac{\partial Y'}{\partial G} = \frac{-M_Y(M-U-Z)}{E A_{00}} < 0$$

$$(33) \quad \frac{\partial Y}{\partial L} = \frac{\tilde{A}_{22} I_r l_2}{A_{00}} > 0$$

$$(34) \quad \frac{\partial Y'}{\partial L} = \frac{-\tilde{A}_{21} I_r l_2}{A_{00}} < 0$$

$$(35) \quad \frac{\partial Y}{\partial G'} = \frac{-M M_Y}{A_{00}} < 0$$

$$(36) \quad \frac{\partial Y'}{\partial G'} = \frac{\tilde{A}_{11}}{A_{00}} > 0$$

$$(37) \quad \frac{\partial Y'}{\partial L'} = \frac{\tilde{A}_{11} I_r' l_2'}{A_{00}} > 0$$

$$(38) \quad \frac{\partial Y}{\partial L'} = \frac{-\tilde{A}_{12} I_r' l_2'}{A_{00}} < 0$$

where

$$A_{00} = \tilde{A}_{11} \tilde{A}_{22} - \tilde{A}_{12} \tilde{A}_{21} > 0$$

$$\tilde{A}_{11} = 1 - C_Y(1-T_Y) - I_r l_1 - M M_Y E^{-1}$$

$$\tilde{A}_{22} = 1 - C'_Y(1-T'_Y) - I'_r l'_1 - M'_Y(M-U-Z) E^{-1}$$

$$\tilde{A}_{12} = M M'_Y E^{-1} > 0$$

$$\tilde{A}_{21} = M'_Y(M-U-Z) E^{-1} > 0$$

B. The Limiting Case: Infinite Interest Elasticity of International Capital Movements ($\lim F_r \rightarrow \infty$)

$$(39) \quad \frac{\partial Y}{\partial G} = \frac{l'_1(U_e - U - Z)}{A_{01}} > 0$$

$$(40) \quad \frac{\partial Y'}{\partial G} = \frac{l_1(U_e - U - Z)}{A_{01}} > 0$$

$$(41) \quad \frac{\partial Y}{\partial L} = - (I_r l_2 l'_1 + l_1) U_e l_2 (U_e - U - Z) / A_{01} (U_e - M) > 0$$

$$(42) \quad \frac{\partial Y'}{\partial L} = \frac{-2 l_1 l_2 U_e (U_e - U - Z)}{E A_{01}} > 0$$

$$(43) \quad \frac{\partial Y}{\partial G'} = \frac{U_e l'_1}{A_{01}} > 0$$

$$(44) \quad \frac{\partial Y'}{\partial G'} = \frac{l_1 U_e}{A_{01}} > 0$$

$$(45) \quad \frac{\partial Y}{\partial L'} = \frac{-(U+Z) U_e l'_2}{E A_{01}} > 0$$

$$(46) \quad \frac{\partial Y'}{\partial L'} = \frac{-2 l_1 U_e l'_2 (U_e - U - Z)}{E A_{01}} > 0$$

where $A_{01} = l_1 U_e \tilde{A}_{22} + l'_1 (U_e - U - Z) \tilde{A}_{11} > 0$

V. Dynamic Properties of the International Transmission of Business Cycles:

The dynamic postulates to the model (1) to (8) can be approximated by the following equations:

$$(47) \quad \dot{Y} = -k_1 X(Y, Y')$$

which states the home country GNP rises and falls in proportion to the expansive gap for goods and services of home country; and

$$(48) \quad \dot{Y}' = -k_2 X'(Y, Y')$$

which states the foreign country GNP rises and falls in proportion to the expansive gap for goods and services of foreign country.

Expanding equations (47) and (48) in a Taylor series, and retaining only linear terms, we obtain:

$$(49) \quad \dot{Y} = -k_1 A_{11} (Y - \bar{Y}) - k_1 A_{12} (Y' - \bar{Y}')$$

$$(50) \quad \dot{Y}' = -k_2 A_{21} (Y - \bar{Y}) - k_2 A_{22} (Y' - \bar{Y}')$$

where the results of comparative static analyses in section 3 are made use.

The system of differential equations (49) and (50) has the characteristic equation

$$(51) \quad \begin{vmatrix} -k_1 A_{11} - \lambda & -k_1 A_{12} \\ -k_2 A_{21} & -k_2 A_{22} - \lambda \end{vmatrix} \\ = \lambda^2 + (k_1 A_{11} + k_2 A_{22}) \lambda + k_1 k_2 (A_{11} A_{22} - A_{12} A_{21})$$

with latent roots

$$(52) \quad \lambda_{1/2} = \frac{-(k_1 A_{11} + k_2 A_{22}) \pm \sqrt{(k_1 A_{11} - k_2 A_{22})^2 + 4k_1 k_2 A_{12} A_{21}}}{2}$$

We study now the dynamic property of the three cases of international transmission of business cycles:

Case 1: Both G1 and G2 schedule have negative slope, (i.e. if $A_{11} > 0$, $A_{12} > 0$, $A_{21} > 0$ and $A_{22} > 0$):
 in this case both latent roots of (52) λ_1 and λ_2 are real. The model is stable, if

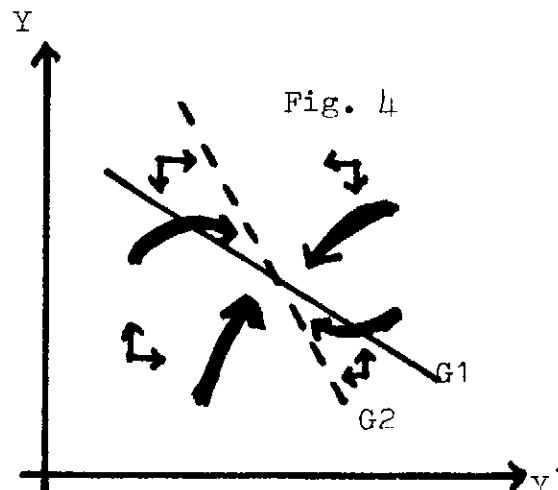
$$(53) \quad -(k_1 A_{11} + k_2 A_{22}) < 0 \quad \text{and}$$

$$(54) \quad A_{11} A_{22} - A_{12} A_{21} > 0$$

or

$$\frac{A_{22}}{A_{21}} > \frac{A_{12}}{A_{11}}$$

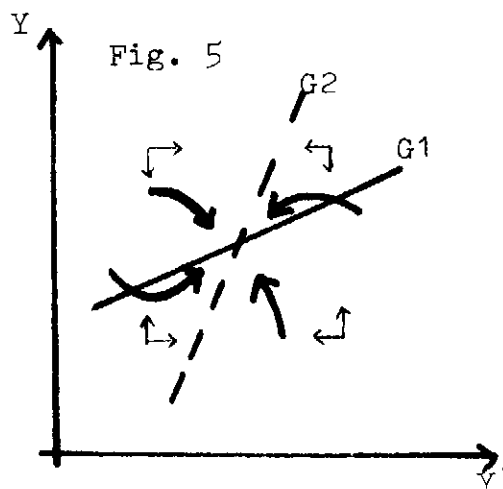
The system approaches equilibrium asymptotically.



Case 2: Both G1 and G2 have positive slope:

(i.e. if $A_{11} > 0$, $A_{22} > 0$, $A_{12} < 0$ and $A_{21} < 0$)

In this case both latent roots of (52) λ_1 and λ_2 are real. The model is stable, if both conditions of (53) and (54) are fulfilled. The system approaches equilibrium asymptotically. (Fig. 5)



Case 3: G1 - schedule has negative and G2 - schedule has positive

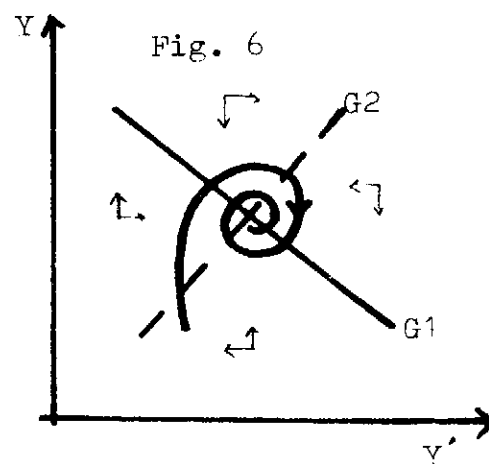
slope : (i.e. if $A_{11} > 0$, $A_{22} > 0$, $A_{12} > 0$ and $A_{21} < 0$).

In this case the system approaches equilibrium cyclically, if

(55)

$$(k_1 A_{11} - k_2 A_{22})^2 < -4k_1 k_2 A_{12} A_{21}$$

This case is showed by Fig. 6



The arrows in Fig. 4, Fig. 5 and Fig. 6 show the direction of adjustment of the real output in home country and in the foreign country. The thick arrows show the way of the adjustment. In Fig. 4 and Fig. 5 the system approaches equilibrium asymptotically. Only in Fig. 6 the system can approach equilibrium cyclically.

VI. Summary:

Since 1973 the floating exchange-rate system is practised in the most developed market-economy-countries. Since there the international transmission of business cycles under flexible exchange-rates induces much attention.

With the hypothesis of "terms-of-trade-effect" on the domestic consumption demand Laursen and Metzler point out under the flexible exchange rates without international capital movements an expansive policy of home country has a negative effect on the employment and real output in foreign country.

Assumming "direct cash balance effect" Kemp shows the meaning of the income elasticity of money demand for the international transmission of business cycles under flexible exchange rates.

In this paper we neglect both the "terms-of-trade-effect" on the domestic consumption demand and the "direct cash balance effect" and consider the "real income effect" of exchange-rate adjustment explicitly. We point out in a previous paper (2) the meaning of the "real income effect" for the effectivity of fiscal and monetary policy under controlled flexible exchange-rate system which characterizes the current exchange-rate system of the most developed market-economy countries.

In this paper we study the international transmission of business cycles under a controlled flexible exchange-rate system in which the active transaction policy on the market of foreign exchange for the purpose of influencing exchange rate in certain direction.

To study the international transmission of business cycles under controlled flexible exchange rates we set up a two-countries macroeconomic model, a modified common model of Blinder-Solow (1). The quotation of the net foreign capital and the net interest transfer is explicitly discussed. The effect of exchange-rate adjustment on the real wealth of net foreign capital and on the real income of net interest transfer depends on whether the net foreign capital and the net interest transfer are denominated in terms of domestic or foreign currency. If the net foreign capital and the interest transfer are denominated in terms of its own currency the effect of exchange-rate adjustment on the net real foreign capital and on the net interest transfer can be neglected.

In this paper we point out the meaning of the international capital movements for the international transmission of business cycles under a controlled flexible exchange-rate system. The Laursen-Metzler Paradox of international transmission of business cycles under controlled flexible exchange rates will arise if the international capital movements are not considered. In this case trade balance is necessarily zero if non active transaction policy on the market of foreign exchange is carried out. In this paper we show that the Laursen-Metzler Paradox will also arise, if the interest elasticity of the international capital movements is sufficiently low.

Under flexible exchange rates the difference between the real export and real import is not equal to the balance of trade if exchange-rate adjustment realized. An appreciation of the countr's exchange rate decrease ceteris paribus the difference

of real export and import and hence induces an negative employment effect or negative real output effect. Otherwise a depreciation would have a positive employment or real output effect *ceteris paribus*.

The way of international transmission of business cycles can be classified in three different cases:

- (a) The Laursen-Metzler case: in this case both the home country balance schedule and the foreign country balance schedule have negative slope. An expansive policy of home country would influence the employment and the real output of foreign country, and vice versa.
- (b) The case where the home country balance schedule has negative slope and the foreign country balance schedule has positive slope: In this case the effect of an expansive policy in home country on the real output of the foreign country is negative, while the effect of an expansive policy of foreign country on the real output of home country is positive.
- (c) The case both the home country balance schedule and the foreign country schedule have positive slope: This is the normal effect which is expected under the fixed exchange rates.

The dynamic properties of international transmission of business cycles are studied with two dynamic postulates to the static model, namely (a) the home country real GNP rises and falls in proportion to the expansive gap for goods and services of the home country, and (b) the foreign country real GNP rises and falls in proportion to the expansive gap for goods and services of the foreign country. The dynamic properties of the model are:

- (a) For the Laursen-Metzler case the model is stable if the foreign country balance schedule has steeper than the home country balance schedule. The system approaches equilibrium asymptotically.
- (b) The case both schedules have positive slope: the model is stable if the foreign country balance schedule is steeper than the home country balance schedule. The system approaches equilibrium asymptotically.
- (c) The case if the home country balance schedule has negative and the foreign country balance schedule has positive slope. The system is stable and approaches equilibrium cyclically.

References:

1. Blinder, A.S. and Solow, R.M.
Does Fiscal Policy Matter?
in: Journal of Public Economics, 1973
2. Chen, John-ren
The Effects of Stabilization Policy under Controlled
Flexible Exchange Rates
Discussion Paper Nr. 64, Institute for Mathematical
Economics, University of Bielefeld, 1977
3. Kemp, M.C.
Relative Prices and Aggregate Expenditure
in: Economica, 1964
4. Laursen, L. and Metzler, L.A.
Flexible Exchange Rates and the Theory of Employment
in: Review of Economics and Statistics, 1950
5. Mishan, E.J.
A Fallacy in the Interpretation of the Cash Ballance
Effect
in: Economica, 1958
6. Mundell, R.A.
The Monetary Dynamics of International Adjustment under
Fixed and Flexible Exchange Rates
in: Quarterly Journal of Economics, 1960
7. Mundell, R.A.
The Appropriate Use of Monetary and Fiscal Policy for
Internal and External Stability
in: International Monetary Fund Staff Papers, 1962

8. Robinson, J.
Beggar-My-Neighbour Remedies for Employment
in: American Economic Association: Readings in the
Theory of International Trade, Philadelphia, 1950
9. Sohmen, E.
Wechselkurs und Währungsordnung
Tübingen, 1973
10. Sohmen, E.
Exchange Rates, Terms of Trade and Employment:
Pitfalls in Macroeconomic Models of Open Economy
in: Kyklos, 1974
11. White, W.
The Employment-Insulating Advantages of Flexible
Exchange Rates: A Comment on Professors Laursen and
Metzler
in: Review of Economics and Statistics, 1954