METU Studies in Development 14 (3) 1987, 283 - 290

A SEEMINGLY UNRELATED CURRENCY AREA

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(Received: June 1987; final version received: January 1987)

This paper demonstrates that when a country's currency is used as a common currency among a group of smaller countries, its balance of trade and exchange rate with its primary trading partner will be influenced by the smaller countries' monetary variables.

1) INTRODUCTION

Utilizing a three country model, and assuming that a country's currency is being used without its consent as a common currency among a group of smaller countries, this paper re-examines the monetary approach to the balance of payments as shown in the works by Hahn (1959), Kemp (1962, 1969,1970), Negishi (1968), and later by Dornbusch (1973), Frenkel and Rodriguez (1975) and Mussa (1976). In this model, it is viewed that the first country represents a large country (i.e., U.S.) which wishes to maintain flexible exchange rates with its trading partners. The second country (i.e., Canada) is viewed as representing the primary trading partner of the first country and also wishes to maintain flexible exchange rates. The third country represents a composite of all countries (i.e., Bolivia, Iraq, Egypt) which take the initiative to peg their currencies to the currency of the first country. This forms a common currency area, although it is not an economic union in the sense of Meade (1957), Scitovsky (1958), Mundell (1961), McKinnon (1963) and Kenen (1969) since policies are not coordinated or organized.

The description above attempts to capture the situation of the U.S. dollar. A similar situation also occurs for the French franc. The table

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below displays the number of smaller countries which peg their currencies to a "hard" currency.

Number of countries pegged to:	1975	1979	1980	1981	1982	1983	1984	1985
-U.S. Dollar	54	41	40	38	38	36	33	31
-French franc	13	14	14	14	13	13	13	14
-Other	14	6	4	4	5	5	5	4

Source: International Monetary Fund Annual Reports

Currency areas such as the one described above have historically been overlooked by the literature as playing a role in the trade relationship between countries who are not part of the currency area. The purpose of this paper is to investigate the economic consequences of a seemingly unrelated currency area on the trade relationship between a large country and its primary trading partner. Specifically, the paper examines the ramifications of money supply changes in the composite country on the exchange rate and the balance of trade between the first two countries. The money supply changes in the composite country can occur for a number of reasons. First, they can represent either money supply changes in specific countries or a change in their pegged exchange rates. Second, they can also represent a change in the aggregate money supply in the composite country due to entry and exit of countries in the currency area. Since the table above displays a continued decline in the number of countries pegged to the dollar, the second alternative may be a more relevant interpretation for the U.S. situation.

The results of this paper show that money supply changes in the composite country effectively change the world's supply of the first country's currency in such a way as to break down the homogeneity of the system, and consequently directly influence the exchange rate and the balance of trade between the first and second countries. It is therefore concluded that a seemingly unrelated currency area does in fact have economic consequences on countries who are not part of the currency area.

2) THE MODEL

The model assumes general equilibrium, and is in the tradition of Hahn (1959), Kemp (1962, 1969, 1970), Negishi (1968), Dornbusch (1973) and Krueger (1974). Two of the exchange rates are flexible and

one is fixed. It is assumed that a supra-national exchange authority intervenes in the market to fix the exchange rate, and that exchange arbitrage exists to ensure that the third exchange rate is a combination of the first two.[1] Each country specializes in the production of its own good (national income), and full employment is maintained in each country by flexible prices.[2] Each country has its own money, which is the only marketable asset.[3] Shortrun equilibrium is obtained through a balance of the flow variables ($X_i = X_i1 + X_i2 + X_i3$). Each country finances its foreign expenditures through the selling of its product, which is reflected in its excess demand for money (balance of trade). The analysis begins by examining the model written as a set of excess demand equations.[4]

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1 A fixed exchange rate implies that the currency market is not constrained to be in equilibrium, hence trade balances may be non-zero.

2 The assumption of full employment implies that output is fixed. This does not substantially restrict the qualitative results of the model. If output were flexible, the excess demand equations would still be written in terms of prices, where a change in price would represent a change in both supply and demand. Therefore the qualitative results produced here are similar in nature to those produced by a standard two sector variable output model.

3 The works by Hahn (1969), Kemp (1976). and Lapan and Enders (1978) do not include other financial assets. The lack of other financial assets does not substantially alter the qualitative results of the paper. Kyle (1976), employing a one country Walrasian model with bonds and money, points out that the system is still operated by changes in the real value of assets (i.e., the wealth effect).

4 To aid in the interpretation of the results, it is helpful to view the set of excess demand equations as having been derived from the following constrained maximization problem. It is assumed that a representative agent in each country tries to maximize his own utility:

$$Ui = Ui(X1i, X2i, X3i, P1, eP2, qP3, Mi) \quad (I)$$

where the utility functions are assumed to be quasi-concave, twice continuously differentiable, have finite derivatives, and are homogeneous of degree zero in the monetary variables. This equation states that agent i gains utility from the consumption of the three commodities (X1i, X2i, X3i) and from money services (which are justified due to transactions costs).

The maximization of each representative agent's utility is constrained by his respective budget:

$$PiXi + Mi^{\circ} \geq P1X1i + eP2X2i + qP3X3i + Mi \quad (II)$$

This states that for the first country the value of consumption of the three commodities ($P1X11 + eP2\,X21 + qP3X31$) and the end of the period holdings of money (M1) must be equal to or less than the value of their productilon income (P1X1) and the initial holdings (endowment) of money ($M1^{\circ}$), all of which are measured in terms of the first currency.

In a competitive world, taking prices and the exchange rate as parameters, consumers maximize equation (I) subject to equation (II). The maximization procedure yields demand equations for both money and goods that depend upon money income, money prices and the stock of money, However, since money income depends upon money prices, the demand equations may be written solely in terms of money prices and the stock of money.

$$X1 = X11(P1,eP2,qP3,M1) + X12(P1,eP2,qP3,eM2) + X13(P1,eP2,qP3,qM3) \quad (1)$$

$$X2 = X21(P1,eP2,qP3,M1) + X22(P1,eP2,qP3,eM2) + X23(P1,eP2,qP3,qM3) \quad (2)$$

$$X3 = X31(P1,eP2,qP3,M1) + X32(P1,eP2,qP3,eM2) + X33(P1,eP2,qP3,qM3) \quad (3)$$

$$eM2 = M22(P1,eP2,qP3,eM2) \quad (4)$$

$$M1 = M11(P1,eP2,qP3,M1) \quad (5)$$

$$qM3 = M33(P1,eP2,qP3,qM3) \quad (6)$$

The notation can be summarized by the following:

xi = country i's output of its own good.

xij = country j's demand of country i's good.

Mi = country i's supply of its own money.

Mii = country i's demand of its own money.

Pi = price of country i's good valued in its own currency.

e = flexible exchange rate, value of the second country's currency in terms of the first country's currency.

q = fixed exchange rate, value of the third country's currency in terms of the first country's currency.

Commodity demands are assumed to depend on money prices, money income and the stock of money. However, since money income depends upon money prices, the demand equations may be written solely in terms of money prices and the stock of money. The demand equations for goods are homogeneous of degree zero in their arguments, and the demand equations for money are homogeneous of degree one in their arguments. The combination of exchange arbitrage and Walras' Law allows us to ignore the money equations for the first and third currencies. In addition, the following four assumptions are used: (i) all commodities are (weak) gross substitutes ($Xi_{Pj} = \partial Xij / \partial Pj \geq 0$), (ii) commodities are gross substitutes for money ($Mi_{Pj} = \partial Mii / \partial Pj \geq 0$),[5] (iii) marginal propensities to consume are positive ($Xi_{Mj} = \partial Xij / \partial Mj > 0$), and (iv) marginal propensities to hoard currency are positive ($Mi_{Mi} = \partial Mii / \partial Mi > 0$).

5 The assumption that commodities are gross substitutes for money demonstrates the motivation to maximize real balances.

3) RESULTS

Equations (1) — (4) produce a four equation system for P1, P2, P3, and e. The following propositions are deduced by the differentiation of the four equation system with respect to the money stocks in compliance with the homogeneity conditions. The variables are written in terms of percentage changes (denoted by $\hat{}$).

EXCHANGE RATE

Proposition 1: The direction of change of the exchange rate is dependent upon the relative rate of change between each of the three currencies, and the pegged exchange rate. Furthermore, a proportionate change in either the first currency, the third currency or the pegged exchange rate will cause a less than proportionate change in the exchange rate.

$$\hat{e} = \Gamma\hat{M}1 - \hat{M}2 + (1-\Gamma)\hat{M}3 + (1-\Gamma)\hat{q} \tag{7}$$

where:

$$1 > \Gamma = \frac{M2_{P1}P1\Phi_1 + M2_{eP2}eP2\Omega_1 + M2_{qP3}qP3\Psi_1}{(1-M2_{eM2})eM2 - M2_{P1}P1\Phi_2 - M2_{eP2}eP2\Omega_2 - M2_{qP3}qP3\Psi_2} > 0$$

Proof: Using the differentiated form of equations (1)-(3) and their homogeneity conditions to solve for $\hat{P}1$, $\hat{P}2$ and $\hat{P}3$ yields:

$$\hat{P}1 = \Phi_1\hat{M}1 + \Phi_2\hat{M}2 + \Phi^{\varepsilon}\hat{M}3 + \Phi_2\hat{e} + \Phi_3\hat{q} \tag{8}$$

$$\hat{P}2 = \Omega_1\hat{M}1 + \Omega_2\hat{M}2 + \Omega_3\hat{M}3 + (\Omega_2-1)\hat{e} + \Omega_3\hat{q} \tag{9}$$

$$\hat{P}3 = \Psi_1\hat{M}1 + \Psi_2\hat{M}2 + \Psi_3\hat{M}3 + \Psi_2\hat{e} + (\Psi_3-1)\hat{q} \tag{10}$$

where: $\Phi_1 + \Phi_2 + \Phi_3 = 1,\ 0 < \Phi_i < 1$

$\Omega_1 + \Omega_2 + \Omega_3 = 1,\ 0 < \Omega_i < 1$

$\Psi_1 + \Psi_2 + \Psi_3 = 1,\ 0 < \Psi_i < 1$

Then substituting equations (8)–(10) into the differentiated form of equation (4) and again using the homogeneity conditions yields the reduced form equation for $\hat{e}$.

The exchange rate (e) measures the value of the second country's currency (M2) in terms of the first country's currency (M1). In a standard two-country model, a proportionate increase in the domestic money supply, or an equi-proportionate decrease in the foreign money supply,

causes an equi-proportionate increase in the exchange rate. In this model, due to the pegged exchange rate (q), the second country's currency becomes a perfect substitute for the first country's currency, therefore the world's supply of the first country's currency is the sum of M1 and qM3. Therefore, the exchange rate (e) now measures the value of the second country's currency in terms of the world's supply of the first currency (M1 + qM3). Consequently, changes in M1, q and, M3 will cause a less than proportionate change in the world's supply of the first currency and therefore cause a less than proportionate change in the exchange rate (e).

BALANCE OF TRADE

With the aid of Walras' Law and the world's budget constraint, the investigation of a country's balance of trade may be focused on either its excess supply of commodities or its excess demand of money. By concentrating on the excess demand of money, and assuming that each balance of trade (Bi) is initially zero, the substitution of the money demand equations shown above will yield:

$$B1 = M11\,(P1, eP2, qP3, M1) - M1 \tag{11}$$

$$B2 = M22\,(P1, eP2, qP3, eM2) - eM2 \tag{12}$$

$$B3 = M33\,(P1, eP2, qP3, qM3) - qM3 \tag{13}$$

Proposition 2 : The direction of change of the balance of trade of each country is influenced by the relative rate of change between the first country's currency, the third country's currency and the pegged exchange rate.

$$dB1 = \tau\,(\widehat{M}3 - \widehat{M}1 + \hat{q}), \text{ where } \tau > 0. \tag{14}$$

$$dB2 = \eta\,(\widehat{M}1 - \widehat{M}3 - \hat{q}), \text{ where } \eta \text{ is ambiguous in sign.} \tag{15}$$

$$dB3 = \mu\,(\widehat{M}1 - \widehat{M}3 - \hat{q}), \text{ where } \mu > 0. \tag{16}$$

where:

$$\tau = M1_{p_1}P1\,(1 - \Phi_1 - \Phi_2\Gamma) + M1_{ep_2}eP2(1 - \Omega_1 - \Omega_2\Gamma) + M1_{qp_3}qP3\,(1 - \Psi_1 - \Psi_2\Gamma) > 0$$

$$\eta = M2_{p_1}P1(\Phi_1 - (1 - \Phi_2)\Gamma) + M2_{ep_2}eP2(\Omega_1 - (1 - \Omega_2)\Gamma) + M2_{qp_3}qP3\,(\Psi_1 - (1 - \Psi_2)\Gamma)$$

$$\mu = M3_{p_1}P1(\Phi_1 + \Phi_2\Gamma) + M3_{ep_2}eP2(\Omega_1 + \Omega_2\Gamma) + M3_{qp_3}qP3(\Psi_1 + \Psi_2\Gamma) > 0$$

Proof: Substituting equation (7) into equations (8)–(10) for ê provides the reduced form equations for $\hat{P}1$, $\hat{P}2$, and $\hat{P}3$. Then substituting the reduced form equations for ê, $\hat{P}1$, $\hat{P}2$, and $\hat{P}3$ into the differentiate form of equations (11)–(13) yields the reduced form equations for dBi.

In a standard two country model, changes in monetary variables do not influence a country's balance of trade. In this model, as a result of the exchange rate (e) not adjusting proportionately to changes in M1, q and, M3, the balance of trade of each country is influenced by monetary variables of the first and third countries. For example, an increase in q or M3 will stimulate the third country's demand for imports from the first and second countries. The increase in M3 increases the world's money supply of the first currency, causing its value to depreciate with respect to the second currency. This stimulates the second country's demand for imports from the first country. As a result, the third country has an overall balance of trade deficit, the first country has an overall balance of trade surplus, and the second country has an ambiguous change in its overall balance of trade.

4) CONCLUDING REMARKS

This investigation highlights the inability of a flexible exchange rate to fully offset foreign monetary shocks to a home country. Specifically it was shown that the second country, which is not part of the currency area, is directly influenced by the monetary actions of the composite country (which is seemingly unrelated). The results also stress the importance of correctly measuring the relevant money supply in conducting empirical work investigating the determination of exchange rates. In addition, an application of the results of this investigation suggest that the decline in the number of countries pegged to the U.S. dollar (as shown above) may have contributed to the appreciation of the U.S. dollar with respect to the Canadian dollar and the corresponding U.S. balance of trade deficit with Canada.[6]

6 This is based on a casual observation rather than a formal empirical investigation. An empirical investigation is required in order to make conclusive statements. However, this is consistent with the results obtained in the above propositions for a decrease in M3.

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ÖZET

Bu yazı bir ülke parasının bir grup küçük ülkenin ortak parası olarak kullanılması halinde, ülkenin ticaret yaptığı en büyük ülkeyle dış ticaret dengesinin ve döviz kurunun görece daha küçük ülkenin parasal değişkenlerinden etkilendiğini göstermektedir.