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A non-linear currency substitution model of hysteresis in debt and competitiveness

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Abstract

The model has four assets: domestic and foreign money and bonds. It is a two country macro model, with debt defined in terms of the net asset holdings of the domestic country. Asset flows between the domestic and foreign country are driven by the interaction between the current and capital account. Both the assets and goods markets are non-linear: the non-linearities in international debt create the possibility of multiple debt and competitiveness equilibria. The paper shows that domestic and foreign monetary policy, as well as trade shocks, can not only lead to irreversibility of international debt, but also of international competitiveness. This allows us to shed some light on the causes leading to 'debt traps' faced by newly industrialised and less developed countries, the so called 'Dutch disease' in countries with new resource discoveries, and the persistent effects on trade and competitiveness with capital controls and project linked lending.

1. Introduction

Most contemporary models of exchange rate dynamics make the theoretical assumption of *perfect capital mobility*, ruling out, for example, capital controls or transaction costs, that would otherwise limit the free flow of capital across national boundaries. This assumption implies that the exchange rate adjusts instantaneously to ensure that there is always equilibrium between the demand for and supply of national assets (there is *stock* equilibrium). However, models of exchange rates do differ significantly in both the range of assets considered and the degree of asset substitutability.

In *pure monetary models*, the exchange rate is principally determined in the domestic money market. This is possible because these models assume that domestic and foreign non-money assets are perfect substitutes, but domestic and foreign money are not substitutable. *Perfect asset substitutability* is the condition that investors are indifferent to the composition of their bond portfolio providing the expected rates of return are identical when expressed in a common currency. Models of this type include Mussa (1976), who assumes continuous purchasing power parity (PPP), Dornbusch (1976), who allows short run deviations from PPP arising from the sluggish adjustment of goods prices, and Buiter and Miller (1981), who enhanced the Dornbusch model by allowing for a non-zero rate of core inflation.

Currency substitution models relax the assumption that domestic and foreign monies are not substitutable, but maintain the assumption of perfect substitutability of non-money assets. The model by Rodriguez (1980) is a particularly elegant example of this type of model. It is a one-country model. The asset menu facing domestic residents comprises domestic currency and a non-interest bearing foreign asset: foreign money. Current account adjustment is 'sticky'. The only way of accommodating a current account surplus is by accumulating foreign assets, the stock of which is fixed in the short run. Therefore, any current account surplus must be immediately offset by an instantaneous appreciation (fall in the real exchange rate). In the long run, residents' accumulation of foreign assets, through a wealth effect, will restore balance of payments balance. Thus the model allows the exchange rate to have an effect on foreign asset accumulation and hence on the trade balance (beside the usual effects of the trade balance on the exchange rate). Furthermore, the model ensures that, through wealth effects, current account imbalances are matched by changes in asset stocks. Hence, there is *stock-flow consistency*.

The *portfolio balance model* is a much more radical departure, for, whilst it retains the assumption that domestic and foreign monies are not substitutes, domestic and foreign non-money assets are regarded as imperfect substitutes. Domestic agents may hold in their portfolios domestic money (which is not traded and does not bear interest), and domestic and foreign bonds (both of which are traded and bear interest). More fundamentally, imperfect asset substitutability implies that agents are not risk neutral. From the point of view of domestic residents, holding the foreign bond is 'riskier' than holding the domestic bond, since exchange rate changes may alter its real return, so the foreign bond must bear a higher rate of return in order to compensate investors for the exchange rate risk. Thus, uncovered interest rate parity does not hold in these models. Branson (1977) was the seminal portfolio balance model.

In recent years, a number of hybrid models have been developed that seek to combine the best features of these different approaches. Zervoyianni (1988) develops a one-country extended currency substitution model, where residents may hold in their portfolios domestic and foreign bonds in addition to domestic and foreign money to analyse the effect of unanticipated monetary policy when the rates of return on interest-bearing assets are endogenously determined as part of a complete financial equilibrium and where short run deviations from purchasing power parity are permitted. This is further extended in Zervoyianni (1992) to a two-country model.

Artis and Gazioğlu (1991, 1996) use a two country, two asset currency substitution model, which is extended by Gazioğlu (1996) to include domestic and foreign bonds in the portfolio, to simulate the effect of various real and monetary shocks to the domestic and foreign country. In these models the real exchange rate is determined interactively by both the current and capital account, and consider the effects of government budget constraints and various inflation mechanisms.

All of these approaches are, however, limited by their log-linear specification. Roberts and McCausland (1999) make a first attempt at introducing non-linearities through wealth effects in a trade account model. However, in their model, the exchange rate is fixed, so there is only a single dynamic, and they concern themselves only with the effects of trade shocks.

The model in this paper is an extension of the currency substitution approaches of Artis and Gazioğlu (1991, 1996), Karacaoğlu and Ursprung (1988) and Zervoyianni (1988, 1992), by introducing non-linear trade dynamics in a model with both domestic and foreign money and bonds in the asset portfolio. In this paper, however, we have imperfect substitutability between domestic and foreign money but perfect substitution between domestic and foreign bonds. Furthermore, we explicitly introduce excess demand inflation dynamics, and show that a rise in the foreign money stock increases domestic debt and induces a domestic appreciation. Favourable trade shocks result in a rise in domestic international debt, and a fall in domestic competitiveness. Positive shocks to domestic consumption increase domestic international debt and reduce domestic competitiveness. This result is different from that usually expected, and this is due to the effects of currency substitution and the presence of non-linearities. Moreover, these previous small macro models were primarily concerned with the short run volatility of exchange rate fluctuations, whereas here we focus on the long run real exchange rate dynamics in response to various shocks.

Finally, we show that, domestic and foreign monetary policy, as well as trade shocks, can not only lead to irreversibility of international debt, but also of international competitiveness —a result that has recently received some prominence in the international trade literature (see, for example, Baldwin, 1988, Dixit, 1989, Baldwin and Krugman, 1989; Krugman, 1991, Baldwin and Lyons, 1994). The non-linear models found in the literature tend to be incomplete in the sense that they analyse only a small subset of the possible markets; models containing more complete treatments of all markets tend to be linear. This paper is seminal in the sense that it presents a non-linear model with a more complete treatment of all relevant markets and in which there is hysteresis and irreversibility so that initial conditions determine the final equilibrium outcome. In this paper we show how large reflationary policies adopted during periods of post war reconstruction may lead to irreversible changes in the countries' international debt position and competitiveness. We also show a possible mechanism whereby newly industrialised and less developed countries may get stuck in the so called 'debt trap'. The irreversibility implies that they may not be able to overcome any historical disadvantage they face. In other words, initial, history-determined conditions are important in determining the eventual outcome. Furthermore, the incentive they have to attempt to escape the 'debt-trap' by increasing their own money supply not only implies persistent debt, but also hyperinflationary pressure.

The paper also extends the established literature on resource discovery effects and the associated 'Dutch disease' by considering the net wealth accumulation aspects of trade account imbalances. Indeed, oil rich countries that become major debtors may in fact also be locked in to a debt trap. We also consider the effects of project linked lending.

2. The model

2.1. Wealth identities

Real domestic interest-bearing assets in domestic currency denomination, D, real domestic money, M, real foreign interest-bearing assets in foreign currency denomination, F, and real foreign money, L, are each held by both domestic, indexed d, and foreign residents, indexed f. The prices of the interest-bearing assets are assumed to be fixed, on account that they are government bonds with an infinite time scale (the bond is infinitely lived in that it pays interest each period in perpetuity but never pays back the principal).

$$D \equiv D_d + D_f \tag{1a}$$

$$F \equiv F_d + F_f \tag{1b}$$

$$M \equiv M_d + M_f \tag{2a}$$

$$L \equiv L_d + L_f \tag{2b}$$

We define real domestic personal wealth in domestic currency denomination and real foreign personal wealth in foreign currency denomination as follows

$$W_d \equiv D_d + M_d + CF_d + CL_d \tag{3a}$$

$$W_f \equiv D_f / C + M_f / C + F_f + L_f \tag{3b}$$

The real exchange rate, C, or 'domestic competitiveness', is defined as the domestic real price of foreign currency. Net international debt of the domestic country in foreign currency terms is comprised of domestic assets held by foreign residents minus foreign assets held by domestic residents

$$H \equiv \hat{H} + N \equiv \left(\frac{D_f}{C} - F_d \right) + \left(\frac{M_f}{C} - L_d \right) \tag{4}$$

Using identities (1a)-(4) allows us to define real domestic and foreign personal wealth as

$$W_d \equiv D + M - CH \tag{5a}$$

$$W_f \equiv H + F + L \tag{5b}$$

where $-(F + L) \leq H \leq (D + M)/C$.

2.2. Goods market

The reduced form domestic aggregate demand equation is given by

$$Y_d = E + T + \left(r_d - \dot{p}_d \right)^{-k} \tag{6}$$

where Y_d is domestic aggregate demand, E is domestic consumption of domestic goods, T is the domestic trade balance, and the last term represents domestic physical capital investment, which depends negatively on the real interest rate (which is the domestic nominal interest rate minus the domestic rate of inflation). The trade balance in foreign currency terms, T, is specified as exports minus imports

$$T = A\left(W_f / C\right)^{\phi} C^{\alpha} - B\left(W_d\right)^{\theta} C^{-\beta}$$

$$T = A\left(H + F + L\right)^{\phi} C^{\alpha - 1} - B\left(D + M - CH\right)^{\theta} C^{-\beta} \qquad (7)$$

where $0 < \phi, \theta < 1, \alpha > 1, \beta > 0$. Exports and imports are determined on the demand side by wealth and by the exchange rate in Cobb-Douglas functional forms. A and B are parameters, F and Q are the wealth elasticities, and A and B are the exchange rate elasticities. The wealth elasticities are assumed to be very small. Similarly domestic consumption, E, is specified also as being a function of domestic wealth and domestic competitiveness (see Branson, 1977)

$$E = Q\left(W_d\right)^{\iota} C^{\omega}$$

$$E = Q\left(D + M - CH\right)^{\iota} C^{\omega} \qquad (8)$$

where Q is a positive constant, I is the wealth elasticity of domestic consumption and W is the real exchange rate elasticity of domestic consumption.

2.3 Money Market

Equilibrium in the domestic and foreign money markets are given by

$$M = r_d^{-u_d} Y_d^{v_d} \qquad (9a)$$

$$L = r_f^{-u_f} Y_f^{v_f} \qquad (9b)$$

where u_d ,u_f, v_d, $v_f > 0$, r, r_f, are the domestic and foreign nominal interest rates respectively, and Y_d, Y_f are the real domestic and foreign output.

2.4. Asset dynamics

The international budget constraint from Roberts and McCausland (1999) is given as

$$\dot{H} = -T + \left[R_d \frac{D_f}{C} - R_f F_d \right] \qquad (10)$$

where R_d and R_f are the domestic and foreign *real* interest rates respectively. A current account deficit must be financed through foreign residents accumulating domestic assets and/or domestic residents decumulating foreign assets. The current account is defined in foreign currency terms as the trade account, T, plus the debt-servicing component, $\left[R_d \frac{D_f}{C} - R_f F_d\right]$. Replacing the left hand side of (10) with the total differentiation of (4) gives

$$\frac{1}{C}\frac{dM_f}{dt} - \frac{dI_d}{dt} + \frac{1}{C}\frac{dD_f}{dt} - \frac{dF_d}{dt} - \left(\frac{\dot{C}}{C}\right)\left(\frac{D_f}{C} + \frac{M_f}{C}\right) = -T + \left[R_d \frac{D_f}{C} - R_f F_d\right] \quad (11)$$

The last term on the right hand side is zero since, from the uncovered interest parity condition, which is derived later in equation (16), $\frac{\dot{C}}{C} = R_d - R_f$, and given our assumption of perfect bond substitution, $R_d = R_f \Rightarrow \frac{\dot{C}}{C} = 0$. Using the definition of H given in (4), and assuming that domestic and foreign real interest rates are equalised $R_d = R_f = R$ due to perfect capital mobility, yields the first dynamic equation

$$\dot{H} = -T + R\hat{H} = -T + R(H - N) \quad (12)$$

2.5. Price dynamics

Price adjustment in each country is proportional to excess demand. Since total world output is fixed, excess foreign demand is equal to excess domestic supply, so we may write the foreign price adjustment equation also in terms of domestic output.

$$\dot{p}_d = G_d\left(Y_d - \overline{Y}_d\right) \quad (13a)$$

$$\dot{p}_f = G_f\left(Y_f - \overline{Y}_f\right) = G_f\left(\overline{Y}_d - Y_d\right) \quad (13b)$$

Assuming that total world output is fixed, $Y_d + Y_f = V$, then from (9a) and assuming for convenience[1] that $u_d = u_f = v_d = v_f = 1$,

$$Mr_d = V - Lr_f \quad (14)$$

and assuming again that in equilibrium $r_d = r_f = r$,

$$r = V(L + M)^{-1} \quad (15)$$

and thus, (12) becomes

[1] This minor assumption allows a tractable analytical solution to be obtained.

$$\dot{H} = -T + (H - N)V(L + M)^{-1} \tag{16}$$

2.6. Exchange rate dynamics

We assume that capital is perfectly mobile and uncovered interest rate parity condition holds together with the perfect foresight approximation to rational expectations, thus giving the second dynamic equation

$$\dot{C} = \frac{1 + r_d - \dot{p}_d}{1 + r_f - \dot{p}_f} = \frac{1 + R_d}{1 + R_f} \tag{17}$$

We may therefore write $R_d = R_d\,(C, H; L, M, A, Q)$ from the solution to the implicit function (A27), and $R_f = R_f\,(C, H; L, M, A, Q)$ from equation (A30) shown in Appendix C.

2.7. System dynamics

The entire dynamics of the system may be represented by equations (16) and (17), which, evaluated at the steady state, may be written in implicit function form as

$$\dot{H} = \dot{H}(C, H; L, M, A, Q) = 0 \tag{18}$$

$$\dot{C} = \dot{C}(C, H; L, M, A, Q) = 0 \tag{19}$$

Appendix A details the algebra of the dynamic system given by (18) and (19) and the techniques used to obtain the signs for the effects of foreign and domestic money stock changes, L, M, and shocks to A, Q on equilibrium domestic competitiveness and debt, $\widetilde{C}, \widetilde{H}$.

3. Policy analysis

We may represent the system described by (18) and (19), by the $\dot{H} = 0$ and $\dot{C} = 0$ loci shown in Figure 1. The explanation of their shapes is described in Appendix B. Above (below) the $\dot{H} = 0$ locus domestic international debt will be falling (rising), and above (below) the $\dot{C} = 0$ locus, competitiveness will be rising (falling). We may therefore draw in the direction of motion arrows as indicated, and determine that the stable saddle path to a local equilibrium will be positively sloped and approach equilibrium from above the $\dot{C} = 0$ locus. We assume throughout the following analysis that the wealth effects on exports and imports are small, and hence the conditions in (21), (21a) and (23) are as reported.

3.1. Monetary policy ('small' changes): Currency substitution

Let us first consider the effect of a rise in the foreign money supply, *L*. A rise in the money stock causes a fall in the foreign interest rate of the respective country. This triggers a capital inflow to the domestic country and consequently a domestic balance of payments surplus. Restoration of balance requires a fall in the real exchange rate. The capital inflow and falling level of competitiveness due to the appreciation of the real exchange rate implies a worsening of the domestic trade account and hence a rise in international debt. We confirm in Appendix A that the increase in the foreign money supply (a rise in *L*) reduces domestic competitiveness and increases domestic debt as reported in equations (20) and (21)[2]

$$\partial\tilde{C}/\partial L = |\mathbf{J}_{CL}|/|\mathbf{J}| < 0 \tag{20}$$

$$\partial\tilde{H}/\partial L = |\mathbf{J}_{HL}|/|\mathbf{J}| > 0\,* \tag{21}$$

Graphically, the rise in *L* shifts both loci downwards, as explained in Appendix B. The net result is a fall in domestic competitiveness (a fall in *C*), and, if we have low interest sensitivity of foreign money demand (implying the fall in the $\dot{C} = 0$ locus is large relative to the $\dot{H} = 0$ locus), a rise in domestic indebtedness (a rise in *H*).

If the domestic economy was initially at the credit equilibrium H_{CR}^{0}, a 'small' rise in the foreign money stock (*L*) shifts in the $\dot{H} = 0$ and $\dot{C} = 0$ loci from $(\dot{H} = 0)_0$ to $(\dot{H} = 0)_1$ and from $(\dot{C} = 0)_0$ to $(\dot{C} = 0)_1$ respectively, reducing the domestic country's credit position from H_{CR}^{0} to H_{CR}^{1}, and causing a fall in domestic competitiveness. In return, this, of course, implies that the foreign country reduces its debt and increases its competitiveness (due to the symmetry between countries). In the short run, given the slope of the saddle path, there must be an overshooting of domestic competitiveness. This is because a rise in the foreign money stock reduces the foreign interest rate, and from (17), a foreign interest rate below the domestic interest rate generates the expectation of a depreciation. Thus, initially there will be a larger appreciation than is required in the long run (an immediate fall in competitiveness from the

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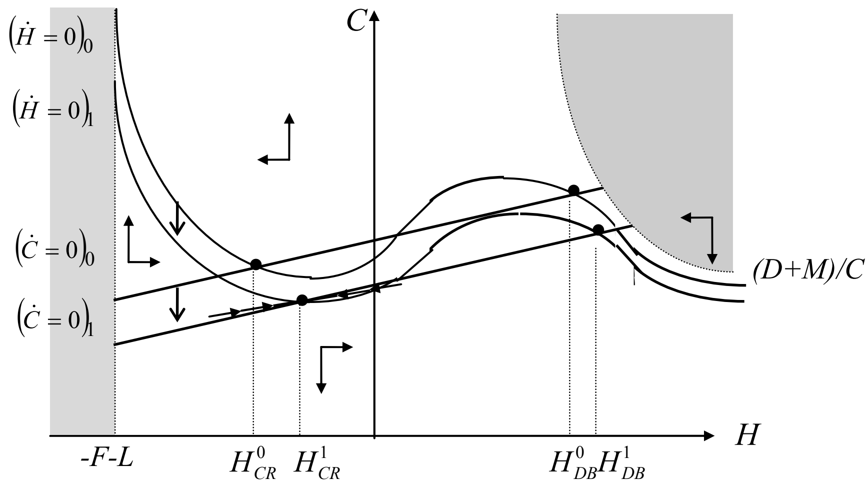
2 And conversely that an increase in the domestic money supply (a rise in *M*) raises domestic competitiveness and reduces domestic debt as reported in the following equations

$$\partial\tilde{C}/\partial M = |\mathbf{J}_{CM}|/|\mathbf{J}| > 0 \tag{20a}$$

$$\partial\tilde{H}/\partial M = |\mathbf{J}_{HM}|/|\mathbf{J}| < 0\,* \tag{21a}$$

initial equilibrium onto the saddle path), followed by a gradual depreciation along the saddle path to long run equilibrium. A policy reversal (a reduction in the foreign money supply to its initial level) restores the original equilibrium, H_{CR}^{0}. In the long run the higher domestic than foreign interest rate, through the consequent capital inflow and balance of payments surplus, generates a fall in domestic competitiveness (in order to restore balance of payments balance). The capital inflow and fall in competitiveness also imply a deterioration of the domestic trade balance, which result, from (12), in a worsening of the domestic international debt position.

Figure 1



On the other hand, suppose that the domestic economy was initially at the debt equilibrium H_{DB}^{0}, a 'small' rise in the foreign money stock shifts in the $\dot{H}=0$ and $\dot{C}=0$ loci from $(\dot{H}=0)_0$ to $(\dot{H}=0)_1$ and $(\dot{C}=0)_0$ to $(\dot{C}=0)_1$ respectively, increasing the domestic country's debt position to H_{DB}^{1}, again causing a fall in domestic competitiveness. This, again, implies that the foreign country increases both its credit position and level of competitiveness. A policy reversal again restores the initial equilibrium. Thus, providing the policy change is not 'too' large, the effects are symmetric between the credit and debt positions, and, importantly, policy reversal restores the initial state. This 'small' changes case yields results concurrent with those obtained from linear models, since policy reversal restores the initial equilibrium. The next section shows that this may not be the case when policy changes are 'large'.

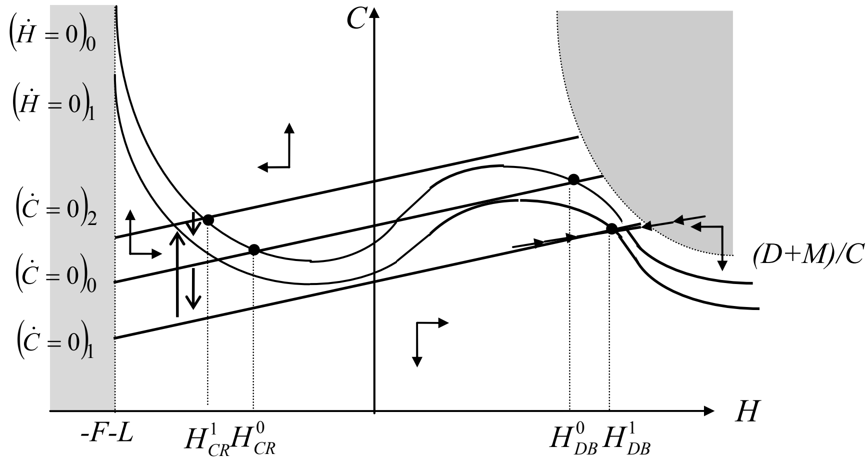
The use of the terms 'small' and 'large' must be considered with respect to the size of the economy and the composition of its trade. A small country with non-diversified exports and trading with a single buyer may be very vulnerable to shocks to its export markets compared with a larger country with well diversified export market and trading with a large number of buyers of its exports. This vulnerability is further enhanced when the export good accounts for a large share of the country's exports. The implication is that less developed or newly industrialised countries relying on the export of a single commodity to a single large country will regard what may be considered as 'small' shocks from the point of view of the large country as 'large' shocks from their own perspective, and hence our analysis of non-reversibility and the debt trap is particularly applicable to these small countries.

3.2. Policy conflict and hysteresis (with 'large' changes in monetary policy)

Suppose there is a 'large' foreign money expansion, starting from a position of domestic international credit. This is illustrated in Figure 2 by the shift of the $\dot{H}=0$ locus from $(\dot{H}=0)_0$ to $(\dot{H}=0)_1$ and the $\dot{C}=0$ locus from $(\dot{C}=0)_0$ to $(\dot{C}=0)_1$. This causes the domestic country to switch from an initial credit equilibrium H^0_{CR}, to the international debt equilibrium H^1_{DB}. Again, there will be overshooting of domestic competitiveness. A policy reversal, a fall in the foreign money stock to its initial level, then shifts the system from international debt equilibrium H^1_{DB} to H^0_{DB}, which is also an international debt equilibrium. The initial credit position is not restored, since the debt equilibrium is now the local attractor. This is hysteresis in international debt. Correspondingly there is also hysteresis in the real exchange rate: there is a permanently *higher* level of domestic competitiveness. This may represent the situation of countries with overvalued currencies and increasing debt.

Clearly, if the domestic government wishes to return to a position of credit, it would be forced to respond by raising its own money supply by a sufficient amount so that the $\dot{C}=0$ locus moves upwards to a degree, say to $(\dot{C}=0)_2$, such that it does not intersect with the right hand maximum of the $\dot{H}=0$ locus (that is, to such an extent that the high debt equilibrium is lost).

Figure 2



The analysis conducted above has interesting implications for policy interdependence in the sense that there may be a conflicting desire for monetary policy between the domestic and foreign countries. Providing the foreign country's shock (a rise in the foreign money supply, *L*) is 'small', a reversal of the policy by the foreign country (an equal fall in the foreign money supply, *L*), or an offsetting domestic monetary policy (an offsetting rise in the domestic money supply, *M*), will bring the system back to the initial equilibrium. However, if the foreign country's shock is 'large', a policy reversal will not restore the initial equilibrium. This may represent the situation faced by the US adopting a large monetary expansion to finance the government deficit after the Vietnam war. This exported inflation to the rest of the world (Artis and Gazioğlu, 1991, 1996).

Furthermore, the response of the domestic country would be to increase its own money supply in an attempt to return back to the initial equilibrium. Our model shows that it may not be possible in these circumstances for the initial equilibrium to be restored, and hence the domestic country may get stuck in a 'debt-trap', or is forced to adopt very large monetary expansion in order to 'escape' (to move to a credit equilibrium). This is the usual path newly industrialising or less developed countries go through in the hope of getting out of the 'debt-trap'. Indeed, the incentive for the domestic country to increase its money supply in response to the foreign money supply rise, not only implies persistent debt, but also hyper-inflationary pressure.

3.3 The 'resource discovery effect': Trade shocks and hysteresis

A positive domestic trade shock may be represented by a rise in the parameter A relative to B in equation (7). From (22) and (23) (see Appendix A for their derivation) this gives an overall fall in domestic competitiveness and decrease in domestic international debt.

$$\partial\widetilde{C}/\partial A = |\mathbf{J}_{CA}|/|\mathbf{J}| < 0 \tag{22}$$

$$\partial\widetilde{H}/\partial A = |\mathbf{J}_{HA}|/|\mathbf{J}| < 0\,* \tag{23}$$

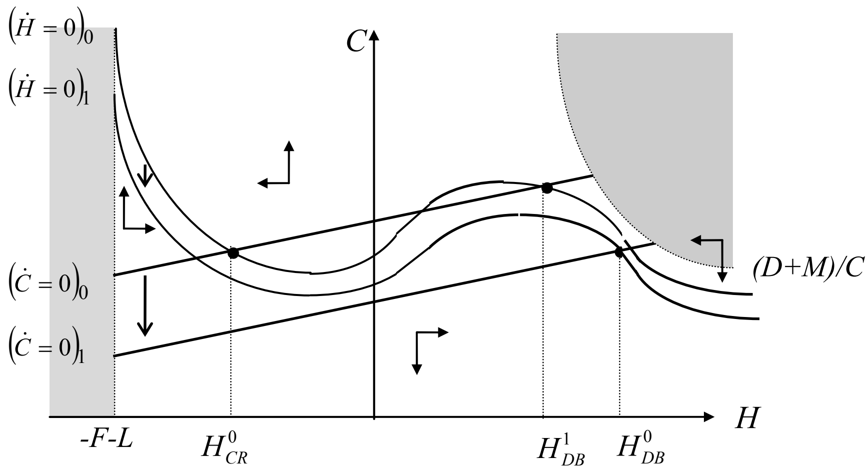
A rise in A (or, equivalently, a fall in B) increases demand for domestic exports (decreases demand for imports) which causes an increase in demand for domestic currency (fall in demand for foreign currency). These changes in money demand cause the domestic interest rate to exceed the foreign interest rate, triggering a capital inflow and consequent balance of payments surplus. To restore balance of payments balance requires a fall in domestic competitiveness (that is, an appreciation). Capital inflow and real exchange rate appreciation deteriorate t he trade account and hence increase international debt. This is shown on Figure 3. Suppose that the domestic economy was initially at the credit equilibrium H^0_{CR}, and there is a 'large' positive trade shock (a large rise in A) which shifts in the $\dot{H} = 0$ and $\dot{C} = 0$ loci from $(\dot{H} = 0)_0$ to $(\dot{H} = 0)_1$ and $(\dot{C} = 0)_0$ to $(\dot{C} = 0)_1$ respectively. This has the effect of shifting the domestic country from a position of domestic credit, H^0_{CR}, to a position of domestic debt, H^0_{DB}, and is associated with a fall in domestic competitiveness. A removal of the trade shock (a fall in A back to its initial level which shifts in the $\dot{H} = 0$ and $\dot{C} = 0$ loci from $(\dot{H} = 0)_1$ to $(\dot{H} = 0)_0$ and $(\dot{C} = 0)_1$ to $(\dot{C} = 0)_0$ respectively) shifts the domestic economy to a new equilibrium, H^1_{DB}, which is still a position of international debit, albeit with a higher level of domestic competitiveness. A fall in exports (or rise in imports) causes there to be a fall in demand for domestic currency (or rise in demand for foreign currency), resulting in the foreign interest rate being higher than the domestic interest rate. This generates a capital outflow and domestic balance of payments deficit, which requires a depreciation to restore balance. The capital outflow and rising level of domestic competitiveness implies there is an improvement in the trade account, which, from (16), results in a decrease in domestic international debt, from H^0_{DB} to H^1_{DB}.

An example of the effect of resource discovery has been extensively explored in the literature in the 1980s with respect to oil discovery, for example Eastwood and Venables (1982), Corden and Neary (1982) and

Buiter and Purvis (1982). Eastwood and Venables (1982) explored the adverse effects of an exchange rate that appreciates as an initial response to an oil discovery due to there being a time lag between when exploration and construction spending takes place and when revenue comes on stream. Moreover, the trade account deficit generated reflects in part an increase in total demand due to the permanent income effect of the oil discovery, and in part the fall in competitiveness of domestic goods relative to foreign goods due to the real appreciation. This so called 'Dutch Disease' was used to explain the de-industrialisation process following oil discovery in the UK in the 1970s by Corden and Neary (1982).

An implication of this analysis is the issue of whether it is worth having a policy to prevent the real appreciation in order to protect the real goods sector. Corden (1981a, 1981b) and Corden and Neary (1982) suggest a combination of monetary and fiscal policies. However, the limitations of these models in explaining the behaviour of oil rich countries must include their lack of consideration of the net wealth accumulation aspects of trade account imbalances (Buiter and Purvis, 1982). This criticism of the previous literature is overcome in this model due to the inter-linking of the current and capital account effects. Our analysis further suggests that oil rich countries that became major debtors may in fact be locked in a so-called 'debt trap'.

Figure 3



3.4 Capital controls, demand shocks and hysteresis

The effect of a positive shock to domestic consumption of domestic goods[3], represented by a rise in Q in (8), say due a shift in domestic preferences towards domestic goods, is to shift the $\dot{C}=0$ locus downwards (see Appendix B). The $\dot{H}=0$ locus does not shift in response to the parameter Q. We show the effect of a relatively large rise in Q in Figure 4. The overall effect, from (24) and (25) (derived in Appendix A) is to increase domestic international debt and decrease domestic competitiveness as shown in equations (24) and (25) where the tilda above a variable denotes its equilibrium value:

$$\partial\tilde{C}/\partial Q = \left|\mathbf{J}_{CQ}\right| / \left|\mathbf{J}\right| < 0 \tag{24}$$

$$\partial\tilde{H}/\partial Q = \left|\mathbf{J}_{HQ}\right| / \left|\mathbf{J}\right| > 0 \tag{25}$$

Intuitively, the shift in preferences towards domestic consumption of domestic goods is increasing domestic demand for domestic money (and possibly, through a substitution effect, decreasing domestic demand for foreign money) which cause the domestic interest rate to exceed the foreign interest rate, generating a capital inflow and balance of payments surplus. Restoration of balance of payments equilibrium requires an appreciation of the real exchange rate. The capital inflow and falling level of domestic competitiveness implies that the trade account, T, is worsening. From (16), a fall in T implies there will be a rise in debt, H. Thus, a worsening of the trade account increases domestic international debt.

It is important to stress that, in the absence of currency substitution effects, our intuition would lead us to believe that such a stimulation to the domestic economy would lead to a rise in domestic competitiveness. This result is overturned when there is currency substitution, since we have to explicitly consider the implications of the change in the relative demands of national monies.

We also note, finally, that hysteresis effects are generated in this scenario also. The rise in Q illustrated in Figure is large enough to cause the domestic economy to switch from a position of international credit to debt. A restoration of Q to its initial state will be insufficient to return the domestic country to a position of international credit. The effect of post war reconstruction in the developed world may also be captured in this

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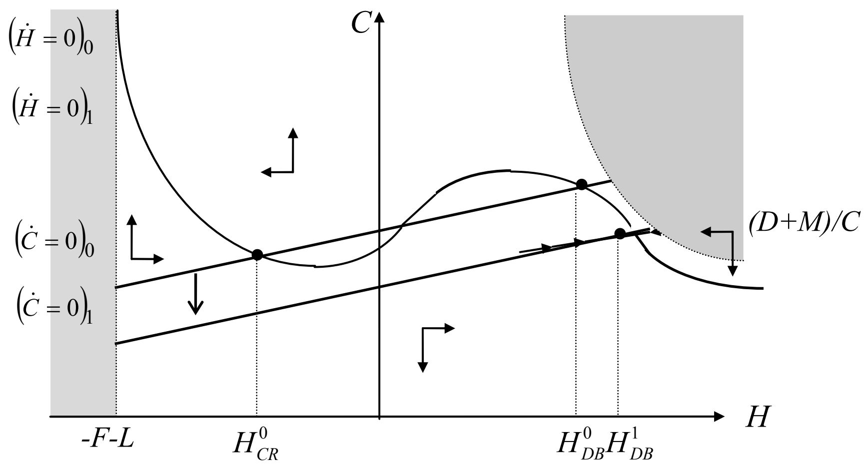
3 The effect of a shift in domestic preferences towards foreign goods results in an increase in imports, discussed in section 3.3.

model in as far as it increases domestic demand for domestic goods, and tended to be accompanied by increasing levels of debt.

Figure 4



The importance of capital flows leading to this counter intuitive result may in part explain the avocation of capital controls in many countries until the 1970s. Even increasing the demand for domestically produced goods can lead to a high debt equilibrium, which is non-reversible to a credit equilibrium, if currency substitution is allowed. Within a framework of free trade and free capital mobility, therefore, it is not unexpected that high debt equilibria persist in newly industrialised and less developed countries.

3.5. Project linked lending

In this section we consider the interesting case of the effects of devaluation when $\alpha < 1$. From (7) this implies that $\partial T / \partial C < 0$. In other words, although the Marshall-Lerner condition holds ($\alpha + \beta > 1$), a devaluation actually worsens the domestic trade balance. This may reflect the case of a developing country with a low real exchange rate elasticity of exports (due to inelastic demand for or supply of exports). A project linked lending by the foreign (developed) country to the domestic (developing) country may be captured by a rise in D_f, which, from (4), increases domestic net international debt. This shifts the $\dot{H}=0$ locus upwards resulting in a real depreciation (rise in the real exchange rate), which normally would improve the trade balance, but in this case the trade balance actually deteriorates. This is often the observed result of such a situation. Furthermore, if the scale of lending is such that the shift of the $\dot{H} = 0$ locus results in the loss of an initial credit equilibrium, the developing country may find itself switched to a debt equilibrium, from which it cannot escape, even after the project has expired.

4. Concluding comments

The non-linear currency substitution model presented in this paper extended various models in the literature, namely Artis and Gazioğlu (1991, 1996), Gazioğlu (1996), Zervoyianni (1988, 1992) and Roberts and McCausland (1999). All of these were linear models, with the exception of Roberts and McCausland (1999), whose non-linear model focused exclusively on debt dynamics. The other linear approaches, however, included more complete descriptions of the international assets markets, together with consideration of aggregate demand, inflation and competitiveness (the real exchange rate). They were, however, on the whole only concerned with the effects of various shocks on foreign exchange fluctuations. The present paper integrates these two approaches by introducing non-linearities into a small macro model with exchange rate dynamics (in addition to trade and debt dynamics).

In this paper, we developed an extended non-linear model which integrates a complete asset and goods market description in order to investigate the dynamics of debt and competitiveness (the real exchange rate). We focused on four policy implications of the model, with the common theme that the existence of multiple equilibria may lead to non-reversibility and hysteresis in both debt and competitiveness. First, we show how an aggregate demand shock gives rise to persistence of an international debt position even when the shock has been removed. Second, we give an alternative mechanism that might explain how a trade shock may give rise to the so called ‘Dutch disease’ and associated persistent debt. Third, there may be monetary policy conflict between countries in this model. A large country may, through expanding its own money stock, force a smaller country into a position of net international debt. The small country may react to this by increasing its own money supply thinking that it can restore its former credit position, without realising that it is stuck in a so called ‘debt-trap’. A consequence of repeated attempts by the small country to escape from this situation may be spiralling inflation, as we have witnessed in the newly industrialising and less developed countries. Finally, the effects of project linked lending can also be explained by the model presented in this paper.

Appendix A

Using (18) and (19) and defining the Jacobian matrix **J** as

$$\mathbf{J} = \begin{bmatrix} \partial\dot{H}/\partial C & \partial\dot{H}/\partial H \\ \partial\dot{C}/\partial C & \partial\dot{C}/\partial H \end{bmatrix} \tag{A1}$$

we may obtain signs for the effects of foreign and domestic money stock changes, L, M, and shocks to A, J on equilibrium domestic competitiveness and debt, $\widetilde{C}, \widetilde{H}$. These are given in the text by equations (20) through (25) and repeated below for convenience.

$$\partial\widetilde{C}/\partial L = |\mathrm{J}_{CL}|/|\mathrm{J}| < 0$$

$$\partial\widetilde{C}/\partial M = |\mathrm{J}_{CM}|/|\mathrm{J}| > 0$$

$$\partial\widetilde{H}/\partial L = |\mathrm{J}_{HL}|/|\mathrm{J}| > 0*$$

$$\partial\widetilde{H}/\partial M = |\mathrm{J}_{HM}|/|\mathrm{J}| < 0*$$

$$\partial\widetilde{C}/\partial A = |\mathrm{J}_{CA}|/|\mathrm{J}| < 0$$

$$\partial\widetilde{H}/\partial A = |\mathrm{J}_{HA}|/|\mathrm{J}| > 0*$$

$$\partial\widetilde{C}/\partial Q = |\mathrm{J}_{CQ}|/|\mathrm{J}| < 0$$

$$\partial\widetilde{H}/\partial Q = |\mathrm{J}_{HQ}|/|\mathrm{J}| > 0$$

We establish the signs reported in (20) through (25) in the following way. First, to evaluate |**J**| we need to determine the signs of its components. Let us first consider $\dot{H}$. From (16)

$$\partial\dot{H}/\partial C = -\partial T/\partial C < 0 \tag{A2}$$

from the Marshall-Lerner condition. Roberts and McCausland (1999) show that[4], over the range corresponding to stable equilibria,

$$\partial\dot{H}/\partial H < 0 \tag{A3}$$

We also need to know the response of $\dot{H}$ to the policy variables L,M in order to evaluate the auxiliary Jacobeans:

---

4 Assuming wealth effects are small but significant, and interest rates are 'low'. It is easy to extend the 'low' interest rate condition presented in the Roberts and McCausland (1998) two asset case to the four asset model considered here, without qualitatively altering its properties, giving:

$$r < \frac{B(D+M+CF+CL)^{\theta} C^{-\beta}}{F+L+N}, \frac{A((D+M)/C+F+L)^{\phi} C^{\alpha}}{D+M-NC}$$

$$\partial\dot{H}/\partial L = -\phi A(H+F+L)^{\phi-1}C^{\alpha-1} - (H-N)V(L+M)^{-2} < 0 \qquad \text{(A4)}$$

Conversely

$$\partial\dot{H}/\partial M = \theta B(D+M-CH)^{\theta-1}C^{-\beta} - (H-N)V(L+M)^{-2} > 0 \qquad \text{(A5)}$$

where we assume that the latter term, derived from the interest income effect from holding foreign assets, is insufficient in strength to outweigh the positive first term.

We further need to determine the response of $\dot{H}$ to the shock variables *A, Q* in order to evaluate the auxiliary Jacobeans:

$$\partial\dot{H}/\partial A = -(H+F+L)^{\phi}C^{\alpha-1} < 0 \qquad \text{(A6)}$$

$$\partial\dot{H}/\partial Q = 0 \qquad \text{(A7)}$$

Considering now $\dot{C}$, from (17)

$$\partial\dot{C}/\partial C = (1+R_f)^{-2}\left[(1+R_f)(\partial \overset{+}{R_d}/\partial C) - (1+R_d)(\partial \overset{-}{R_f}/\partial C)\right] > 0 \qquad \text{(A8)}$$

$$\partial\dot{C}/\partial H = (1+R_f)^{-2}\left[(1+R_f)(\partial \overset{-}{R_d}/\partial H) - (1+R_d)(\partial \overset{+}{R_f}/\partial H)\right] < 0 \qquad \text{(A9)}$$

$$\partial\dot{C}/\partial A = (1+R_f)^{-2}\left[(1+R_f)(\partial \overset{+}{R_d}/\partial A) - (1+R_d)(\partial \overset{-}{R_f}/\partial A)\right] > 0 \qquad \text{(A10)}$$

$$\partial\dot{C}/\partial Q = (1+R_f)^{-2}\left[(1+R_f)(\partial \overset{+}{R_d}/\partial Q) - (1+R_d)(\partial \overset{-}{R_f}/\partial Q)\right] > 0 \qquad \text{(A11)}$$

$$\partial\dot{C}/\partial L = (1+R_f)^{-2}\left[(1+R_f)(\partial \overset{+}{R_d}/\partial L) - (1+R_d)(\partial \overset{-}{R_f}/\partial L)\right] > 0 \qquad \text{(A12)}$$

$$\partial\dot{C}/\partial M = (1+R_f)^{-2}\left[(1+R_f)(\partial \overset{-}{R_d}/\partial M) - (1+R_d)(\partial \overset{+}{R_f}/\partial M)\right] < 0 \qquad \text{(A13)}$$

The signs are easily confirmed, either by computing directly from (C3) and (C6), see Appendix C, or, we prefer, by economic intuition. In (A8), a rise in competitiveness increases domestic exports, decreases domestic imports, and, through a substitution effect, increases domestic consumption. These serve to increase demand for domestic money and reduce demand for foreign money, forcing the domestic interest rate to exceed the foreign interest rate. From the uncovered interest parity condition (UIP), this generates the expectation of a real depreciation. In (A9) a rise in domestic international debt improves the domestic trade balance and reduces domestic consumption of domestic goods. These both reduce domestic income and hence domestic money demand falls. The domestic interest rate therefore falls short of the foreign interest rate causing, through UIP, the expectation of a domestic real appreciation. In (A10), a rise in the exogenous component of exports, *A*, increases the demand for domestic money, raising the domestic interest rate above the foreign interest rate, which again through UIP generates the expectation of a depreciation. A rise in the exogenous component of domestic consumption, *Q*, in (A11) increases domestic demand, generating in turn a rise in the demand for domestic money, and thus increasing the domestic interest rate over and above the level of the foreign interest rate, causing the expectation of a rise in the real exchange rate through UIP. In (A12) and (A13) a rise in the foreign money supply, *L*, or a fall in the domestic money supply, *M*, will directly decrease the foreign interest rate and increase the domestic interest rate. This interest rate differential results, through UIP, in the expectation of a real depreciation.

Thus we may summarise our final results as

$$|\mathbf{J}| = \begin{vmatrix} \partial\dot{H}/\partial C & \partial\dot{H}/\partial H \\ \partial\dot{C}/\partial C & \partial\dot{C}/\partial H \end{vmatrix} = \overset{-}{\left(\partial\dot{H}/\partial C\right)}\overset{-}{\left(\partial\dot{C}/\partial H\right)} - \overset{-}{\left(\partial\dot{H}/\partial H\right)}\overset{+}{\left(\partial\dot{C}/\partial C\right)} > 0 \tag{A14}$$

$$|\mathbf{J}_{CL}| = \begin{vmatrix} -\partial\dot{H}/\partial L & \partial\dot{H}/\partial H \\ -\partial\dot{C}/\partial L & \partial\dot{C}/\partial H \end{vmatrix} = -\overset{-}{\left(\partial\dot{H}/\partial L\right)}\overset{-}{\left(\partial\dot{C}/\partial H\right)} + \overset{-}{\left(\partial\dot{H}/\partial H\right)}\overset{+}{\left(\partial\dot{C}/\partial L\right)} < 0 \tag{A15}$$

$$|\mathbf{J}_{CM}| = \begin{vmatrix} -\partial\dot{H}/\partial M & \partial\dot{H}/\partial H \\ -\partial\dot{C}/\partial M & \partial\dot{C}/\partial H \end{vmatrix} = -\overset{+}{\left(\partial\dot{H}/\partial M\right)}\overset{-}{\left(\partial\dot{C}/\partial H\right)} + \overset{-}{\left(\partial\dot{H}/\partial H\right)}\overset{-}{\left(\partial\dot{C}/\partial M\right)} > 0 \tag{A16}$$

$$|\mathbf{J}_{HL}| = \begin{vmatrix} \partial\dot{H}/\partial C & -\partial\dot{H}/\partial L \\ \partial\dot{C}/\partial C & -\partial\dot{C}/\partial L \end{vmatrix} = -\overset{-}{\left(\partial\dot{H}/\partial C\right)}\overset{+}{\left(\partial\dot{C}/\partial L\right)} + \overset{-}{\left(\partial\dot{H}/\partial L\right)}\overset{+}{\left(\partial\dot{C}/\partial C\right)} > 0\,* \tag{A17}$$

$$|\mathbf{J}_{HM}| = \begin{vmatrix} \partial\dot{H}/\partial C & -\partial\dot{H}/\partial M \\ \partial\dot{C}/\partial C & -\partial\dot{C}/\partial M \end{vmatrix} = -\overset{-}{\left(\partial\dot{H}/\partial C\right)}\overset{-}{\left(\partial\dot{C}/\partial M\right)} + \overset{+}{\left(\partial\dot{H}/\partial M\right)}\overset{+}{\left(\partial\dot{C}/\partial C\right)} < 0\,* \tag{A18}$$

$$|\mathbf{J}_{CA}| = \begin{vmatrix} -\partial\dot{H}/\partial A & \partial\dot{H}/\partial H \\ -\partial\dot{C}/\partial A & \partial\dot{C}/\partial H \end{vmatrix} = -\overset{-}{\left(\partial\dot{H}/\partial A\right)}\overset{-}{\left(\partial\dot{C}/\partial H\right)} + \overset{-}{\left(\partial\dot{H}/\partial H\right)}\overset{+}{\left(\partial\dot{C}/\partial A\right)} < 0 \tag{A19}$$

$$|\mathbf{J}_{HA}| = \begin{vmatrix} \partial\dot{H}/\partial C & -\partial\dot{H}/\partial A \\ \partial\dot{C}/\partial C & -\partial\dot{C}/\partial A \end{vmatrix} = -\overset{-}{\left(\partial\dot{H}/\partial C\right)}\overset{+}{\left(\partial\dot{C}/\partial A\right)} + \overset{-}{\left(\partial\dot{H}/\partial A\right)}\overset{+}{\left(\partial\dot{C}/\partial C\right)} > 0\,* \tag{A20}$$

$$|\mathbf{J}_{CQ}| = \begin{vmatrix} -\partial\dot{H}/\partial Q & \partial\dot{H}/\partial H \\ -\partial\dot{C}/\partial Q & \partial\dot{C}/\partial H \end{vmatrix} = -\overset{0}{\left(\partial\dot{H}/\partial Q\right)}\overset{-}{\left(\partial\dot{C}/\partial H\right)} + \overset{-}{\left(\partial\dot{H}/\partial H\right)}\overset{+}{\left(\partial\dot{C}/\partial Q\right)} < 0 \tag{A21}$$

$$|\mathbf{J}_{HQ}| = \begin{vmatrix} \partial\dot{H}/\partial C & -\partial\dot{H}/\partial Q \\ \partial\dot{C}/\partial C & -\partial\dot{C}/\partial Q \end{vmatrix} = -\overset{-}{\left(\partial\dot{H}/\partial C\right)}\overset{+}{\left(\partial\dot{C}/\partial Q\right)} + \overset{0}{\left(\partial\dot{H}/\partial Q\right)}\overset{+}{\left(\partial\dot{C}/\partial C\right)} > 0 \tag{A22}$$

In (20), (20a), (22), (24) and (25) the signs are unambiguous. The signs reported for (21), (21a) and (23) above require $|\mathbf{J}_{HL}| > 0$, $|\mathbf{J}_{HM}| < 0$

and $|\mathbf{J}_{HA}| > 0$ respectively, which, from (A16), (A17) and (A19), in turn require

$$|\mathbf{J}_{HL}| > 0 \text{ if } \left(\overset{-}{\partial\dot{H}/\partial L}\right)\left(\overset{+}{\partial\dot{C}/\partial C}\right) < \left(\overset{-}{\partial\dot{H}/\partial C}\right)\left(\overset{+}{\partial\dot{C}/\partial L}\right) \quad \text{(A23)}$$

$$|\mathbf{J}_{HM}| < 0 \text{ if } \left(\overset{+}{\partial\dot{H}/\partial M}\right)\left(\overset{+}{\partial\dot{C}/\partial C}\right) < \left(\overset{-}{\partial\dot{H}/\partial C}\right)\left(\overset{-}{\partial\dot{C}/\partial M}\right) \quad \text{(A24)}$$

$$|\mathbf{J}_{HA}| > 0 \text{ if } \left(\overset{-}{\partial\dot{H}/\partial A}\right)\left(\overset{+}{\partial\dot{C}/\partial C}\right) < \left(\overset{-}{\partial\dot{H}/\partial C}\right)\left(\overset{+}{\partial\dot{C}/\partial A}\right) \quad \text{(A25)}$$

Of the four terms in (A23) and (A24), there is one that is instrumental in attaining the required conditions: $\partial\dot{H}/\partial L$ and $\partial\dot{H}/\partial M$ respectively, which must be relatively small. Similarly, in (A25), it is $\partial\dot{H}/\partial A$ that is the key term deciding the sign, which must be relatively small to obtain the sign given above.

Why are the other terms not instrumental in this regard? For a start $\partial\dot{C}/\partial L$, $\partial\dot{C}/\partial M$, and $\partial\dot{C}/\partial A$, see (A12), (A13) and (A10) respectively, reflect the uncovered interest parity effect that, a rise in the foreign money supply, fall in domestic money supply, or a rise in domestic exports through the indirect effect in increasing the demand for domestic money, causes the domestic interest rate to exceed the foreign interest rate which generates the expectation of a domestic real depreciation. The remaining two terms, $\partial\dot{H}/\partial C$ and $\partial\dot{C}/\partial C$, from (A2) and (A8), emerge through the Marshall-Lerner and extended Marshall-Lerner conditions that a rise in competitiveness improves both the trade balance and domestic consumption (through a substitution effect). This generates a rise in demand for domestic money and fall in demand for foreign money, raising the domestic interest rate above the foreign interest rate, generating the expectation of a rise in competitiveness from the UIP condition. Since these two effects occur on both sides of (A23), (A24) and (A25), the conditions shown cannot be achieved by relative strength or weakness of this effect.

A relatively small $\partial\dot{H}/\partial L$, $\partial\dot{H}/\partial M$ and $\partial\dot{H}/\partial A$ occurs, from (A4), (A5) and (A6) when the wealth effects on exports, imports, and exports respectively are small. This is the assumption we make from now on.

Appendix B

First, consider the $\dot{H} = 0$ locus. For an explanation of the shape of the $\dot{H} = 0$ locus the reader is referred to Roberts and McCausland (1999). We may write

$$\partial L/\partial H = -\left(\overset{-}{\partial \dot{H}}/\partial H\right)\Big/\left(\overset{-}{\partial \dot{H}}/\partial L\right) < 0 \tag{B1}$$

We have established that the first term is negative in the relevant region corresponding to stable equilibria - see Roberts and McCausland (1999) for more detail - and from (A4) that the second term is negative, thus the whole expression in (B1) is negative. Thus a rise in L shifts the entire $\dot{H} = 0$ locus downwards.

Next, consider the $\dot{C} = 0$ locus. We may write

$$\partial C/\partial H = -\left(\overset{-}{\partial \dot{C}}/\partial H\right)\Big/\left(\overset{+}{\partial \dot{C}}/\partial C\right) > 0 \tag{B2}$$

thus the $\dot{C} = 0$ locus is upwards sloping. Similarly

$$\partial L/\partial H = -\left(\overset{-}{\partial \dot{C}}/\partial H\right)\Big/\left(\overset{+}{\partial \dot{C}}/\partial L\right) > 0 \tag{B3}$$

From (A9) we know that the first term is negative, and from (A12), the second term is positive. Thus the whole expression in (B3) is positive. A rise in L therefore shifts the $\dot{C} = 0$ locus downwards. A small latter term (as a result of high interest sensitivity of money demand) implies a relatively large shift in the $\dot{C} = 0$ locus.

Replacing L with M in (B1) and (B3) allows us to determine that, since (A5) and (A13) have opposite signs to (A4) and (A12), a rise in M have the opposite effects on the $\dot{H} = 0$ and $\dot{C} = 0$ loci to the rise in L.

Furthermore, replacing L with A in (B1) and (B3), since (A6) and (A10) have the same signs as (A4) and (A12), a rise in A have the same effects on the $\dot{H} = 0$ and $\dot{C} = 0$ loci to the rise in L.

Finally, replacing L with Q in (B1) and (B3), since (A7) is zero, a change in Q will have no effect on the $\dot{H} = 0$ locus, and, since (A11) has the same sign as (A12), a rise in Q will shift the $\dot{C} = 0$ locus downwards.

Appendix C

From (9a), $M = \left(R_d + \dot{p}_d\right)^{-1} Y_d$ and using (13a) yields a solution for Y_d of the form

$$Y_d = \frac{M\left(R_d - G_d \overline{Y}_d\right)}{1 - MG_d} \tag{C1}$$

Then, from (6)

$$Y_d R_d^k = \left(E + T\right) R_d^k + 1 \tag{C2}$$

which upon substitution of (A2) into (A3) gives a solution for R_d in terms of the implicit function *I*

$$I = 1 + R_d^k\left(E + T\right) + R_d^k M\left(G_d \overline{Y}_d - R_d\right)\left(1 - MG_d\right)^{-1} \tag{C3}$$

Similarly, from (9a)

$$L = \left(R_f + \dot{p}_f\right)^{-1} Y_f \tag{C4}$$

Then, using (13a) and the fact that, given a fixed world output, $Y_f = V - Y_d$, we have

$$Y_d\left(1 - LG_f\right) = V - L\left(R_f - G_f \overline{Y}_d\right) \tag{C5}$$

and using (6) to eliminate Y_d gives

$$R_f = L^{-1}V - G_f \overline{Y}_d + \left(G_f - L^{-1}\right)\left(E + T + R_d^k\right) \tag{C6}$$

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Özet

Doğrusal olmayan bir kur-değişim modeli ve uluslar arası borçlanmada histeresis

Modelin yurt içi ve yabancı olmak üzere para ve bonodan oluşan dört ayrı portfolyosu vardır. Model iki ülkeli olup, yerel ülke borcunu net olarak tanımlamaktadır. Yerel ve yabancı ülke arasındaki varlık (asset) akımı 'cari işlemler ve sermaye hesabı arasındaki karşılıklı ilişkiyle belirlenir. Hem varlık hem de mal piyasası doğrusal olmayıp (non-linear) uluslararası borç ve kur ilişkisi üç yerde denge sağlayabilir. Bu makalenin esas amacı yerel ve yabancı ülkenin hem para politikalarına hem de ticaretine gelecek bir şokun dönüşü olmayan (irreversibility) bir dış borca ve ayrıca reel kurun da eski haline dönemiyeceğini göstermektir. Bu durum yeni gelişmekte ve az gelişmiş ülkelerin karşılaştığı 'Borç tuzaklarına ışık tutar. Bu makale "Hollanda hastalığı" diye adlandırılan yeni kaynak bulunması, ticaret üzerindeki sürekli etkiler, sermaye konrollerinin reel kurlara etkisi ve projeye bağlı borç şeklinde ortaya çıkan şoklar, bir ülkenin "borç tuzağına" düşmesine sebep olabileceğini göstermektedir.