

The Internationalisation of Hong Kong Dollar: An Analytical Framework

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Abstract

This paper models the macroeconomic impact from the “internationalisation” of Hong Kong Dollar under the fixed and floating exchange rate regimes. A three-region model, the Centre, the Periphery and the Rest-of-the-World, is constructed.

The present paper finds that, under floating exchange rates, foreign circulation of home currency increases the volatility of the home exchange rates. Under a fixed exchange rate, however, other than a more volatile level of reserves, foreign circulation has no macro impact on the home economy. This paper also finds that a broader global demand for home asset narrows the gap between domestic and foreign interest rates, which can subsequently lower the likelihood of self-fulfilling currency crisis.

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1. Introduction

This paper models the macroeconomic impact from the “internationalisation” of Hong Kong Dollar. Although it is difficult to pin down an exact definition of the term, “internationalisation of currency”, from the literature, most experts agree that the wider use of home currency and a broader demand of home assets abroad should be a manifestation of the internationalisation of home currency.

In spite of a proliferation of literature in international magazines and policy journals on the internationalisation of US Dollar, Mark, Yen and other currencies (see for example, Doyle (2000), Latter (2000), Porter and Judson (1996), Rogoff (1998), Sprenkle (1993), Tavlas and Ozeki (1992), Krueger and Ha (1995) among others), this topic has not been vigorously addressed in an analytical framework. There is no available analytical model in the literature that I am aware of which tracks the macroeconomic impact of foreign circulation of domestic currency. For the case of Hong Kong, the presence of a periphery economy, at which the Centre’s currency co-circulates, complicates the issue.

The present paper finds that, even though the co-circulation of home currency occurs in the Periphery, its macro impact on the home economy is identical to those from the currency substitution literature, in which home and foreign currencies co-circulate at home. Specifically, under flexible exchange rates, foreign circulation of home currency increases the volatility of the home exchange rates. Under a fixed exchange rate however, other than a more volatile level of reserves, foreign circulation has no macro impact on the home economy. This paper also finds that a broader global demand for home assets narrows the gap between domestic and foreign interest rates, and can subsequently lower the likelihood of a self-fulfilling currency attack.

Section 2 of this paper presents an analytical macro model from which the impact of internationalisation of home currency under fixed and floating exchange rate regimes can be assessed. The impact of internationalisation on the incidence of currency crisis is discussed. Section 3 concludes with a discussion of results.

2. An Analytical Framework

Consider a *modified* Mundell-Fleming model¹, popularised by Dornbusch (1980, Chapters 10, 11) and Krugman (1993), that has three regions, the Centre, the Periphery and the Rest-of-the-World. The Centre’s currency co-circulates in the Periphery, but not in the Rest-of-the-World. There are three assets corresponding to the three regions, A , A^p and A^* , where the superscripts p and $*$ distinguish variables in the Periphery and in the Rest-of-the-World, respectively. The firms and households in the Centre hold all three assets, while those in the Periphery hold assets in the Centre and the Periphery. Those in the Rest-of-the-World hold mainly A^* and a relatively small quantity of A and A^p . The Centre – call this the “domestic economy” – is small compared to the Rest-of-the-World and to the Periphery. Hence, I^p , I^* , Y^p and Y^* , where I and Y are the interest rates and the real national income of the respective region, can

1 The modified Mundell-Fleming framework is chosen because of its tractability. One can regard the Mundell-Fleming model, with its simple functional forms, as a “reduced form” of the more complex inter-temporal model.

be considered as fixed. The Periphery is assumed to adopt a pegged rate, E^p , to the Rest-of-the-World, but may periodically devalue its exchange rate to maintain its competitiveness.²

2.1. The Fixed Exchange Rate Regime

In the goods market, the aggregate demand of the Centre can be written, in a “reduced form”, as a function of domestic interest rate, I , fiscal expenditure, G , and the domestic exchange rate to the Rest-of-the-World, E .

$$Y = y(I, G, E); \quad y_1 < 0; y_2 > 0; y_3 > 0; \quad (1)$$

As for the money market, the following simple money demand and supply equations of the Centre are employed

$$M^d = m(I, Y) PI(P, E^{p*}); \quad m_1 < 0; m_2 > 0; \quad (2)$$

and,
$$M^s = D + ER \quad (3)$$

where $PI(P, E^{p*})$ is the domestic price index, a function of the fixed domestic price, P , and the price in the Rest-of-the-World, E^{p*} .³ D is domestic credit and R is the international reserves of the Centre. Since there is co-circulation of domestic money in the Periphery, the “actual” amount of money that circulates in the Centre (identical to M^d), must account for those in the Periphery, M^p , that is

$$M^d = (D + ER) - \gamma M^p(I, I^p + \Delta E^p/E^p, \Delta E^p/E^p, Y^p) PI^p(P^p, E^{pp*});$$

$$M^p_1 < 0; M^p_2 < 0; M^p_3 < 0; M^p_4 > 0; \quad (4)$$

and,

$$M^s \neq M^d \quad (5)$$

The exogenous parameter, γ , above captures the intensity of foreign circulation. Following the literature on currency substitution, M^p should be a function of the opportunity costs of holding money, such as the interest rate in the Center, I , and the interest rate in the Periphery, $I^p + \Delta E^p/E^p$. The exogenous parameter $\Delta E^p/E^p$ above is the expected rate of depreciation of the Centre’s currency in terms of the Periphery.⁴ The third component in the M^p function, $\Delta E^p/E^p$, captures currency substitution between the

2 The Periphery region here is the Guangdong Province of China and Macau. Macau pegs its exchange rate to Hong Kong Dollar. China has maintained a managed float with a very narrow moving band. It seems reasonable to assume that the Periphery pegs its rate to the Rest-of-the-World.

3 For simplicity, since the Periphery adopts a fixed exchange rate, the price of the Periphery can be aggregated into E^{p*} without the loss of generality.

4 Here, the expected rate of depreciation is assumed to be exogenous rather than endogenously determined within the model. This exogenous rate of depreciation can be regarded as the amount required to clear the balance of payments deficit generated from exogenous shocks. Moreover, this assumption can capture numerous non-market fundamental events that can affect investors’ expectations. In section 3 below, on currency crisis, expectations are formed endogenously and can be self-fulfilling.

Centre's and the Periphery's currency. Y^P is the economic activity in the Periphery that can be conducted in both currencies and is assumed to be exogenous. $PI^P(P^P, E^P, P^*)$ is the price index of the Periphery; It is a function of the fixed non-traded good price and traded good price in the Periphery.

As for the asset market, there are three assets in the model, one from each region. The Wealth (Budget) Constraint says that one of the redundant asset market equilibrium equations – pick the Periphery's asset market equilibrium equation – can be eliminated. The Rest-of-the-World asset market equilibrium equation determines the World's interest rates, I^* , which can be considered as fixed, due to the size of the World's economy. The remaining domestic asset market equilibrium equation solves for the variable I . The domestic asset market demand is a function of the interest rates of the three regions and the wealth from the three regions, as there are domestic asset demands coming from the Periphery and from the Rest-of-the-World; that is

$$\begin{aligned} A^s &= A(I, I^* + \Delta E/E, I^P + \Delta E^P/E^P) [W + \beta (W^* + W^P)] \\ &= A(.) [\beta W^t + (1-\beta) W]; \end{aligned}$$

Where: $\beta < 1$; $W^t = W + W^* + W^P$; $A_1 > 0$; $A_2 < 0$; $A_3 < 0$; (6)

W , W^* and W^P in (6) are the wealth of firms-and-households in the Centre, in the Rest-of-the-World and in the Periphery respectively. The wealth portfolio consists of national assets and national money (or monies). W^t is the total wealth of the World and is assumed to be fixed. The parameter $\beta A(.)$ is the fraction of wealth held in A^s by those in the Periphery and in the Rest-of-the-World. β is an exogenous parameter that captures the degree of openness of the domestic asset market; a larger β means that more foreigners hold the domestic asset A^s . As internationalisation grows, foreigners must increase their demand for assets denominated in the home currency. This specification differs from the conventional portfolio balance models where the domestic asset is assumed to be non-traded ($\beta = 0$).

To complete the model, the current account or the net savings is used to tie the goods market and the asset market together. Under a pegged exchange rate, the adjustment of W is determined by the current account, CA , or savings minus investments and government expenditure, $S - Inv - G$:

$$dW/dt = CA = S(I, W) - Inv(I) - G = s(I, W, G) = 0; \quad (7)$$

where: $s_1 > 0$; $s_2 < 0$; $s_3 = -1$;

At equilibrium, dW/dt is zero. The four endogenous variables (I , M^d , W , Y) can be solved from the four equations, (1), (2), (6) and (7). The following derivatives, with respect to the exogenous parameters, can be derived

$$\begin{aligned} dI/dG &= K/(K s_1 - s_2) > 0; \\ dW/dG &= -1/(K s_1 - s_2) < 0; \\ dY/dG &= y_1 dI/dG < 0; \\ dM^d/dG &= EP^*(m_1 + m_2 y_1) dI/dG < 0; \end{aligned}$$

$$\begin{aligned}
dI/dI^* &= A_2 s_2 / (K s_1 - A_1 s_2) > 0; \\
dW/dI^* &= - A_2 s_1 / (K s_1 - A_1 s_2) > 0; \\
dY/dI^* &= y_1 dI/dI^* < 0; \\
dM^d / dI^* &= EP^*(m_1 + m_2 y_1) dI/dI^* < 0; \\
dI/d\beta &= A(W^t - W) s_2 / [A(1-\beta)s_1 - (\beta W^t + (1-\beta) W)A_1 s_2] < 0; \\
dW/d\beta &= - s_1 / s_2 dI/d\beta < 0; \\
dY/d\beta &= y_1 dI/d\beta > 0; \\
dM^d / d\beta &= EP * (m_1 + m_2 y_1) dI / d\beta > 0;
\end{aligned} \tag{8}$$

The variable K above is

$$K = A (1-\beta) / [A_1 (\beta W^t + (1-\beta) W)] > 0;$$

And when β rises, K falls.

The impacts of I^p , $\Delta E/E$ and $\Delta EP/EP$ are similar to those from I^* . Hence, the derivatives with respect to those variables will not be presented. An inspection on equations (1), (2), (6) and (7) reveals that the money market equilibrium equation, (4), solves exclusively for R. This is noteworthy because the M^p function, no matter what form or magnitude it takes, will not affect the macro variables (I, M^d , W, Y), that are determined exclusively by equations (1), (2), (6) and (7). The impact of foreign circulation of currency, therefore, affects only the level of reserves, R, but not the *other* endogenous macro variables.⁵ A moment's reflection suggests that this result should hold under other modelling techniques. More formally:

Proposition 1: Under a pegged exchange rate system, the only impact of foreign circulation of domestic currency is on the domestic level of reserves. All other domestic macroeconomic variables are unaffected by the amount of foreign circulation.

The variance of the reserves can be derived from (4) as follows:

$$\text{VAR}(ER) = \text{VAR}(M^d) + \gamma^2 \text{VAR}(M^p) + 2\gamma \text{COV}(M^d, M^p); \tag{9}$$

where $\text{VAR}(\cdot)$ and $\text{COV}(\cdot)$ are the variance and covariance of the respective variables. The value of $\text{COV}(M^d, M^p)$, in general, is non-negative because the endogenous variable, I, affects both M^d and M^p in the same direction.

The literature on the optimum reserves (see Clark (1970) among others) suggests that the optimal level of reserves that a central bank should hold depends on the stochastic nature of the external shocks (captured by the variance of the reserves) and on the cost of adjustments when the reserves have been occasionally exhausted. Therefore one can conclude that excessive fluctuation of reserves, arisen from the increase in foreign circulation of home currency, will increase the level of optimum reserves needed by central banks.

⁵ This can also be explained intuitively in the conventional IS-LM model that, under a fixed rate, the constantly shifting LM-curve has no impact on the macro variables of the economy. M^p affects only the LM-curve.

2.2. A Diagrammatic Illustration

To illustrate the model diagrammatically, consider a current account deficit has occurred at the Centre. Equations (1) and (7) are pictured on the right-hand-side diagram of Figure 1. The middle diagram depicts the money market, or equations (2), (3) and (4); The Y variable in the money demand equation of (2) is replaced by its functional form in (1), that is

$$M^d = m (I , G , E , P^*); \quad (10)$$

The “realised” money supply of the Centre equals $(D + ER)$, the vertical (dotted) line in the middle diagram, minus the demand from the Periphery, M^p . The “realised” money supply curve is the “thick” positively sloping money supply curve in middle diagram. The left-hand-side diagram is the domestic asset demand and supply (equation (6)).

The initial interest rate is at I_0 . The initial current account deficit (see equation (6)) depletes domestic wealth, W , which in turn lowers the demand for A , or shifts the asset demand to the left. The interest rate, which must clear the asset market, will rise until the current account deficit is eliminated. Furthermore, as W falls, domestic savings will rise (the Savings line in the right-hand-side diagram shifts rightward), narrowing the current account deficit.

As illustrated by Figure 1, the equilibrium interest rate, I_1 , and the equilibrium quantity of money in domestic economy, M_1^d , are independent of M^p . The size of M^p , compared to the case where there is no M^p at all (that is, the vertical lines marked by M_1^d and M_0^d), leads only to a larger fluctuation in reserves, by the additional amount of ΔR_0 in Figure 1.

2.3. Currency Crisis

The model below combines the market fundamental explanation and the self-fulfilling speculation explanation of currency crisis. Following the work by Bensaid and Jeanne (1998), Jeanne (1997), Obstfeld (1996), among others, let $\Delta E/E (= \Delta E^p/E^p)$ be replaced by $\pi^e \Delta E/E_0$, where $\Delta E/E_0$ is an exogenous amount of devaluation required by market fundamentals. π^e is the perceived probability of devaluation (or the credibility of the central bank, as discussed by Barro and Gordon (1983)) by the private sector which could differ from the actual probability of devaluation, π . Following the literature, let U be the benefit of a pegged rate, which can be positive or negative, and C be the sunk cost or the opt-out cost of the fixed exchange rate regime. There is an unobservable random term, v , in the benefit function that takes a uniform distribution with frequency $1/2\varepsilon$ and a zero mean.⁶ The peg will be maintained if

$$U (I) + C + v \geq 0; \quad (11)$$

The U function above is negatively related to the domestic interest rate. High domestic interest rate leads to a contraction in output and employment. Moreover, high interest rate raises the level of

6 The random term here could be the contemporaneous shocks of the economy or the uncertainty on the type of government. A “tough” (“soft”) government will have a high (low) opt out cost C . This uncertainty could be captured by v .

bankruptcies, weakens the domestic banking sector and lowers the net worth of firms.⁷ U therefore captures the internal target of the central bank. From the model in the preceding section, the domestic interest rate can be derived as a function of exogenous variables, that is $I = I(\pi^e \Delta E/E_0, \beta)$.

The (actual) probability of devaluation, π , can be calculated from the distribution of v as follows:

$$\pi = [\varepsilon - C - U(\pi^e \Delta E/E_0, \beta)](1/2\varepsilon); \quad U_1 < 0; U_2 > 0; \quad (12)$$

The signs of the above partial derivatives, U_1 and U_2 , are derived from (8).

In Figure 2, the solid line is equation (12). The 45-degree line is where $\pi = \pi^e$. Define π^e_c to be the critical value of expectation, such that equation (12) cuts the 45-degree line at $\pi = \pi^e_c$. Above (below) this critical value, the actual and the expected devaluation will move towards one (zero). As v is a random variable, the π^e_L (π^e_s) is the level of π^e where the actual π is one (zero), specifically

$$\begin{aligned} U(I(\pi^e_L \Delta E/E_0, \beta)) + C + \varepsilon &= 0; \\ U(I(\pi^e_s \Delta E/E_0, \beta)) + C - \varepsilon &= 0; \end{aligned} \quad (13)$$

If ε converges to zero, π^e_L and π^e_s will converge to π^e_c . In Figure 2, the solid, positively sloping curve of equation (12) will be vertical. Therefore, provided that ε is not too large, equation (12) should have a positive slope larger than one.

Figure 2 summarises the basic mechanism of self-fulfilling crisis, which is intimately tied to the credibility of the monetary authority. When β increases, equation (12) shifts leftward (see the broken line in Figure 2) and raises the critical value of expectation, π^e_c . In other words, an increase in the integration of domestic assets abroad *lowers* the chance of self-fulfilling currency crisis. To see this intuitively, let equation (6) take a linear form:

$$I = g_0 I^* + g_1 I^p + g_2(\pi^e \Delta E/E_0) + g_3[A^s/(\beta W^t + (1-\beta)W)]; \quad (14)$$

where $g_3'(\cdot) > 0$; g_0 , g_1 and g_2 are positive parameters.

Equation (14) is a variant of the familiar interest rate parity. The last term g_3 captures the relative supply and demand conditions of domestic assets. The presence of this term comes from imperfect asset substitution. An increase in asset demand (an increase in β) raises the price of assets (for example, the price of bond) and lowers its yield (for example, the domestic interest rate). Therefore, the Centre's interest rate, I , falls. However, a fall in I also lowers W via equation (8), which offsets some of the initial increase in asset demand. Nonetheless, to be logically consistent, the offset cannot be complete. As β

⁷ In the literature, Masson (1995), Obstfeld (1996), among others, employ an expectation-augmented Phillips curve and use unemployment rate in the benefit function. However, the ultimate functional form is very similar to the present choice of interest rate. It is perhaps more realistic to use interest rate in the benefit function for Asian economies and unemployment rate for Europe's 1992 crisis economies. In the literature, R is normally not in the benefit function of central bank, because if a sufficiently high interest rate can be tolerated, any level of R , no matter how low it is, can be replenished.

increases to one, g_3 must reach its minimum. Equation (14) therefore demonstrates that the gap between the world interest rate and the domestic interest rate will narrow when β increases. Since high domestic interest rate increases the chance of currency crisis, a lower domestic interest rate, offered by global integration of the domestic asset market, must lower the chance of crisis, *ceteris paribus*.

Summing up, global integration of domestic assets (the parameter β) lowers the likelihood of self-fulfilling currency crisis while foreign circulation of home currency (the parameter γ) has no impact on the domestic interest rate and on the likelihood of self-fulfilling crisis.

2.4. A Floating Exchange Rate Regime

In this scenario, although the Centre adopts a floating exchange rate, the Periphery is assumed to adopt a pegged rate, E^P , to the Rest-of-the-World, but may periodically devalue its exchange rate to maintain its competitiveness. This implies the Centre's exchange rate with the Rest-of-the-World must be proportional to the Centre's exchange rate with the Periphery (that is, $E = E^P E^{P^*}$). With this information, the aggregate demand of the Centre, that is equation (1), can be linearised to the following form:

$$Y = a_0 - a_1 I + a_2 E + a_3 G; \quad (15)$$

As for the asset market, instead of equation (6), the *relative* asset supply and demand equation is used here for simplicity. Note that, in the global asset demand for A^{s*} , the asset demand can be written as a function of W^t alone (i.e., $EA^{s*} = A^*(.)W^t$), without the domestic asset integration parameter β in it. This is because the size of W and W^P are relatively small compared to the size W^t . Hence, β should have only a negligible effect on the global demand for A^{s*} .⁸ The ratio of domestic asset to the Rest-of-the-World asset can now be written as follows:

$$A^s / E A^{s*} = [A(.) / A^*(.)] [\beta + (1 - \beta) (W / W^t)]$$

Again, because of the relative size, W / W^t should be a negligible number. The above equation can be rewritten in the following functional form, with $B(.) = A(.) / A^*(.)$:

$$A^s / E A^{s*} = B(I, I^* + \Delta E / E, I^P + \Delta E^P / E^P) \beta;$$

$$B_1 > 0; B_2 < 0; B_3 < 0; \quad (16)$$

In (16), the term, $I^P + \Delta E^P / E^P$, affects both the asset demand for A^s and for EA^{s*} negatively. One can assume that the impacts of $I^P + \Delta E^P / E^P$ on both asset demand equations are very similar and hence offset

8 Alternatively, the demand for A^{s*} can be written as coming from two groups of agents: $A^*(.)[W + \beta (W^* + W^P)] + A^{**}(.)\{W^t - [W + \beta (W^* + W^P)]\}$, where $A^{**}(.)$ ($A^*(.)$) is the asset demand for A^{s*} coming from the group who do not (do) hold A and A^P . Thus, if $A^*(.)$ approximately equals to $A^{**}(.)$, the asset demand can be written as $A^*(.)W^t$.

Since we are not dealing with the Hume's price-species-flow mechanism here, equation (6) will not be needed. The advantage of using the asset demand *ratio* is that W is eliminated without loss of generality. Equation (7) will not be needed to eliminate W from the system of equations.

each other. With this assumption, B_3 is now zero. Equation (16) can be linearised to the following form:

$$I = b_0 - b_1 \beta E + b_2 (I^* + \Delta E/E); \quad (17)$$

As A^s and A^{s*} are constants, they do not appear in the linear form above.

Finally, the money market equilibrium equation under floating exchange rates and its linear version is

$$M^s = D = [m(I, Y) + \gamma M^p (I, I^p + \Delta E^p/E^p, \Delta E^p/E^p, Y^p)] E^p;$$

Or:

$$M^s = c_0 + c_1 Y - c_2 I - \gamma (I + \alpha I^p + c_3 \Delta E^p/E^p + c_5 Y^p) + c_4 E; \quad (18)$$

Again, the parameter γ in (18) captures the magnitude of foreign circulation of home currency. The impacts of the exogenous parameters on the three endogenous variables, Y , I and E , can be derived from the three equations, (15), (17) and (18), as follows:

$$\begin{aligned} dY/dG &= a_3 (b_1 \beta (c_2 + \gamma) + c_4) / \Delta > 0 \\ dI/dG &= a_3 b_1 \beta c_1 / \Delta > 0 \\ dE/dG &= -a_3 c_1 / \Delta < 0 \\ dY/dM^s &= (a_1 b_1 \beta + a_2) / \Delta > 0 \\ dI/dM^s &= -b_1 \beta / \Delta < 0 \\ dE/dM^s &= 1 / \Delta > 0 \\ dY/dI^* &= b_2 [a_2 (c_2 + \gamma) - a_1 c_4] / \Delta \\ dI/dI^* &= b_2 (a_2 c_1 + c_4) / \Delta > 0 \\ dE/dI^* &= b_2 (a_1 c_1 + (c_2 + \gamma)) / \Delta \\ &= b_2 [a_1 c_1 + (c_2 + \gamma)] / [c_4 + a_2 c_1 + b_1 \beta (a_1 c_1 + (c_2 + \gamma))] > 0 \\ dY/dI^p &= \alpha \gamma (a_1 b_1 \beta + a_2) / \Delta > 0 \\ dI/dI^p &= -\alpha \gamma b_1 \beta / \Delta < 0 \\ dE/dI^p &= \alpha \gamma / \Delta > 0 \\ dY/d\beta &= -b_1 E b_2 [a_2 (c_2 + \gamma) - a_1 c_4] / \Delta \\ dI/d\beta &= -b_1 E b_2 (a_2 c_1 + c_4) / \Delta < 0 \\ dE/d\beta &= -b_1 E b_2 (a_1 c_1 + (c_2 + \gamma)) / \Delta < 0 \\ dY/d\gamma &= M^p (a_1 b_1 \beta + a_2) / \Delta > 0 \\ dI/d\gamma &= -M^p b_1 \beta / \Delta < 0 \\ dE/d\gamma &= M^p / \Delta > 0 \end{aligned}$$

where
$$\Delta = c_4 + a_1 b_1 \beta c_1 + a_2 c_1 + b_1 \beta (c_2 + \gamma); \quad (19)$$

The impact of $\Delta E/E$ ($\Delta E^p/E^p$) in (19) is the same as I^* (I^p) and hence not reported.

The impact of internationalisation of the Centre's currency under floating exchange rates can be examined from the derivatives in (19). Suppose the expected devaluation of the Centre's currency increases

which need not be well-founded (i.e., $\Delta E/E = \Delta E^P/E^P$ rises from zero to some positive number). This will lead to a flight from domestic currency, which will lead to further depreciation. Intuitively, if the amount of foreign circulation of domestic currency is large (a large γ), the flight from domestic currency should make domestic exchange rates more unstable. This is evident from the derivatives dE/dI^* and dE/dI^P in (19), which should be the same as the derivatives of E with respect to $\Delta E/E$ and $\Delta E^P/E^P$. An increase in the γ will increase the magnitude of those derivatives. Therefore, large circulation of the Centre's currency in the Periphery will increase the fluctuation of the exchange rates of the Centre. But, an increase in domestic asset integration (a rise in β), will lower the volatility of the Centre's exchange rates.

Finally, the impact of internationalisation on the efficacy of monetary policy is also of interest. From the derivatives in (19), it is clear that an increase in foreign circulation of home currency, γ , will lower the impact of monetary policy (M^S) on all macro variables Y , I and E . However, the impact of β on monetary policy is unclear.

2.5. Impact on the Periphery

The above model considers the impact of foreign circulation of home currency on the home economy. Its macroeconomic impact on the Periphery economy has not been addressed. A moment's reflection will suggest that it should be similar to those in the Centre. As long as the Periphery adopts a pegged rate with the Rest-of-the-World, Proposition 1 can be extended to the Periphery economy as well. The Periphery's money market equilibrium equation is

$$M^{dp} = (D^p + E^{pr}R^p) + \gamma M^p (I, I^* + \Delta E/E, I^p + \Delta E^P/E^P, Y^p) \text{PI}^p(P^p, E^{pr} P^*);$$

where M^{dp} is the demand for money in the Periphery. It is apparent from the above equation that currency substitution in the Periphery "crowds out" the level of the Periphery's reserves, leaving all Periphery's macroeconomic variables intact as well.

The above discussion assumes that the Centre adopts a pegged rate. If the Centre adopts a flexible exchange rate, then the impact of co-circulation of currencies in the Periphery will come from the Centre's interest rate and exchange rates, but not through the Periphery's own macro variables.

3. Conclusion and Policy Implications

This paper has chosen two exogenous parameters, γ and β , to represent the magnitude of internationalisation of the domestic currency. Under a pegged rate, the only impact of foreign circulation of domestic currency is on the level of reserves. The rest of the macroeconomic variables are generally unaffected by the amount of foreign circulation. This result should be quite robust to model specifications. The intuition is, the amount of currency in domestic circulation, which is endogenously determined under a fixed exchange rate, is solved in the money market equilibrium equation. That means the level of reserves and the amount of foreign circulation must "crowd" each other out. Provided that the level of reserves is not so dangerously low that it alters the behaviour of the monetary authority, macroeconomic variables should be unaffected.

Global integration of domestic assets narrows the difference between the domestic interest rate and foreign interest rate. This in turn lowers the likelihood of a self-fulfilling currency attack. This interesting finding should not be regarded as contradictory to the conventional view that capital mobility destabilises the pegged rate. The conventional view argues that, with capital mobility, expectation can destabilise (there is also a wide range of destabilising π^e in the present framework). The conventional view compares the situation with and without capital mobility. The present result argues that, under the existing full liberalisation of the capital account, a more integrated capital market raises the critical value of expectation (π^e_c) for stabilising speculations.

As for the case of floating exchange rates, a large amount of foreign circulation of domestic currency increases the instability of the domestic exchange rates. Moreover, the efficacy of monetary policy decreases with increasing foreign circulation of domestic currency. Although the present model suggests that the efficacy of monetary policy will be weakened, similar to the prediction from the literature on currency substitution, its importance may be over-stated. This is because the monetary authority can always adjust its money supply to accommodate for the foreign circulation of domestic money. Nevertheless, the amount of foreign circulation remains an important consideration for choosing the appropriate exchange rate regimes for the economy.

Although the model developed above involves many special assumptions with little claims for its realism, the main points of the analysis should go through in a variety of models. It nonetheless provides the underpinnings for policy discussion.

Policy makers may wonder what are the macro impacts to a financial centre such as Hong Kong, when its currency is used to denominate a significant value of financial instruments issued by offshore entities, such as supranational issuers, foreign banks, and China's enterprises (e.g., via H share issues). Technically, when Chinese enterprises raise funds from the rest of the world via Hong Kong, it can be regarded as an output of the financial service sector of Hong Kong (Y in the present model). There should *not* be a net outflow or inflow of the Hong Kong dollar, *ceteris paribus*, even though the issued stocks and bonds are denominated in the Hong Kong dollar. This is because Chinese firms must eventually exchange the Hong Kong dollar into the renminbi before the funds can be used in China. However, Chinese enterprises will inevitably decide to hold some Hong Kong dollars to facilitate their transactions. This will lead to a net outflow of the Hong Kong dollar to the periphery and its impact should be captured by an increase in the money demand in the periphery, M^p (or γ), of the model.

Policy makers are also concerned that during a currency crisis, excessive home currency abroad may aid the run for domestic reserves and aggravate the crisis. While this concern is understandable, it is not well-founded. The present analysis shows that foreign circulation of home currency does increase the fluctuation of the reserves in a pegged exchange rate (the ΔR_0 in Figure 1), but it (the parameter γ) affects neither the macro variables nor the likelihood of currency attacks (the value of π^e_c). For large-reserve economies like Hong Kong, this is not a concern at all. As for the medium-and low-reserve economies, the present study suggests that policy makers in those economies should increase their optimum level of reserve to account for this additional fluctuation.

Finally, the present model suggests that as long as Hong Kong sticks to a pegged rate, co-circulation of the Hong Kong dollar in Guangdong should have no impact on *China's* macroeconomic variables and on the likelihood of a currency crisis *for China*. On practical grounds, based on the largest estimate that there is roughly HKD 19 billion in the South China area, the ratio of this to China's total foreign reserves is approximately 1.66 percent. Moreover, China's capital account is still not fully convertible. Based on these facts and figures alone, it is difficult to see how the excessive circulation of HKD in Guangdong could increase the instability of the renminbi.

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Figure 1

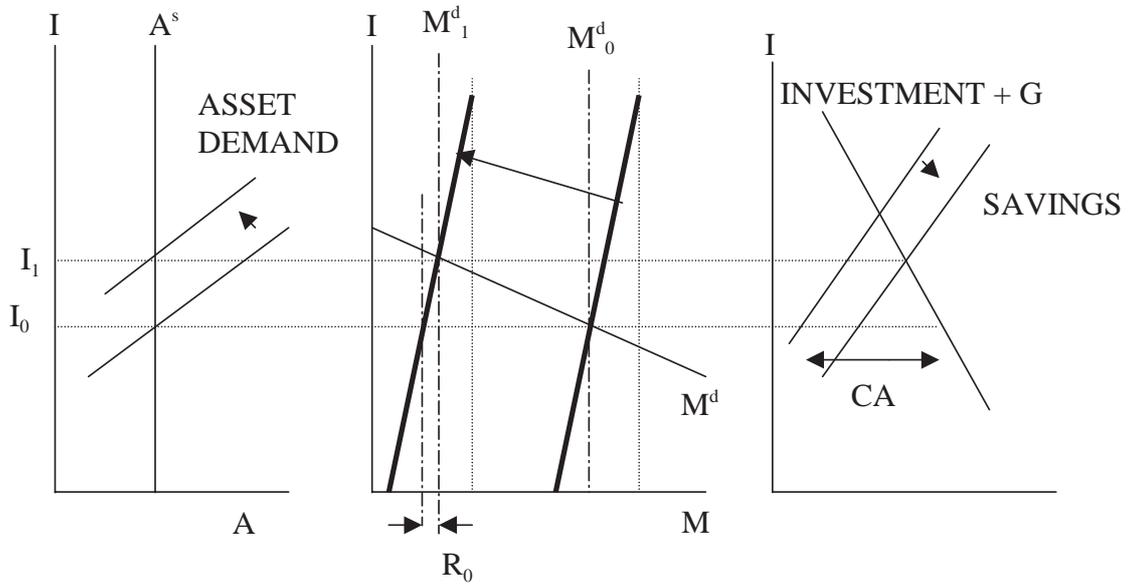


Figure 2

