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On the Missing Link between Currency Substitution and Crises

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Abstract: Traditional approaches to the etiology of financial crises focus on the fundamentals of an economy, more specifically on the disequilibrium in the balance of payments. The purpose of this paper is to extend this 'first generation' literature of financial crises with a general model that focuses on the quality of a currency as a store of value for asset holding purposes – as opposed to the medium-of-exchange characteristics of a currency that enter considerations of the balance-of-payments approach. A formal model is sketched around a utility function that includes money as an asset held in both local currency and foreign exchange. Given a steady stream of money supply, asset-price considerations in a free currency market make a fixed exchange rate untenable for the local currency and lead to devaluation and to crisis. Impressionistic evidence from the recent experience of financial crises corroborates the hypothesis of currency substitution. The policy implications of the hypothesis parallel those of market incompleteness for asymmetric information, as cast within the framework of asymmetric reputation between the soft and hard currency that leads to currency substitution for asset-holding purposes.

JEL Classification: G14, F31

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Introduction

Currency devaluations have become frequent and familiar events in the regime of floating exchange rates that succeeded the collapse of the Bretton Woods system of international finance. In the last two decades alone 79 countries encountered

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(disorderly) devaluations that qualify as financial crises. The proposition that devaluations are related to the quality of a currency is self-evident and trite. Yet on closer examination the specific quality-challenge that is causally related to a currency's demise has yet to be clearly identified in the literature. The 'quality' of a currency becomes almost irrelevant in discharging a currency's role as a medium of exchange. It turns out that, but for extreme situations (e.g., hyperinflation when exchange takes the form of barter) the quality of a currency is largely irrelevant in transacting (domestic) exchange; even tokens and coupons can be used in exchange of a rudimentary form. In serving as a store of value, however, the quality of a currency assumes special weight, with currencies occupying a continuum from the reserve, to the hard, the soft, and the downright worthless. The reserve/ hard currencies, for example, are treated as store of value internationally, and they are held by central banks in their reserves. The soft and worthless currencies, on the other hand, become the subject of Gresham's law because no one wishes to hold them, and as a result they displace the 'good' currency from circulation. This asset-value quality of a reserve currency is based on reputation, which in the specific case means that there is a credible commitment to stability of reserve-currency price relative to some other prices that matter. Soft currencies, on the other hand, lack this implicit warrantee of relative price stability. The logic of this paper draws a red thread that joins the quality of a currency as an asset to the probability of a currency crisis through the link of currency substitution.

Money is an asset and as such it enters agents' intertemporal budget constraint. A subset of money, currency, is the monetary asset par excellence because of its liquidity characteristics. But not all currencies were created equal. The basic premise of this paper is that there is an ordinal preference-ranking of currencies, with the reserve currency at the top, that becomes especially important when currency is used for asset-holding purposes. Moreover, in a free currency market agents can implement this ordering by moving to higher-ranking monetary assets at small transaction cost. A free currency market, therefore, sets off a systematic process of currency substitution: the substitution of the reserve/hard currency for the soft.[1] Currency substitution can be viewed as the outcome of asymmetric reputation between, e.g., the dollar and the peso in the positional continuum of currencies.[2] It results in an asymmetric demand from Mexicans to hold dollars as a store of value, a demand that is not reciprocated by Americans holding pesos as a hedge against the devaluation of the dollar![3] For example, capital flight across a border constitutes a form of this currency substitution (Collier, Hoeffler and Pattillo, 2001). A complete flight from a currency, in the form of dollarisation, represents the extreme case where any or all of the three functions of a currency - unit of account, means of exchange, and, in particular, store of value – are discharged in a foreign currency (Calvo and Végh, 1996). More familiar are the in-between cases where residents of a

soft-currency country may keep some dollars under the mattress or in a foreign currency account of a local bank. This demand for the foreign currency that ranks higher as an asset-value in exchange for the local currency can lead to the systematic devaluation of the latter. Our specific focus is the substitution of the hard currency and the ensuing systematic devaluation of the soft currency.

The Logic of the Link between Currency Substitution and Crisis

This paper builds on two strands of the literature. Krugman (1979) was the first to develop a model of balance-of-payment crisis due to speculative attacks on the fixed-exchange-rate regime. Flood and Garber (1984) presented the linear version of Krugman's model. This crop of the 'first generation' models fingers the deteriorating 'fundamentals' of an economy as the trigger to the currency crisis (Eichengreen, Rose, and Wyplosz, 1994).

It seems that implicitly this literature focuses on the role of money is as a medium of exchange since the model introduces the arbitrage equation of tradable goods prices or the purchasing power parity equation. The idea of money as the medium of exchange was expanded in two alternative directions that formalized the micro-foundation of the money demand function: the cash-in-advance model (Clower, 1967; Lucas and Stokey, 1987) and the transaction model (Baumol, 1952; Tobin, 1956). In either model, money is held for transaction purposes. However, money also serves as store of value, and enters as such the utility function. Sidrauski (1967) first formulated the Ramsey optimal growth model with both consumption and real money balances in the utility function subject to an intertemporal budget constraint with money. This is the second strand of the literature on which our argument rests.

From the technical perspective, in order to examine whether putting money in the utility function is appropriate, we can ask whether it is possible to rewrite the maximization problem of an agent with transaction costs of money holdings. Feenstra (1986) showed that maximization subject to a Baumol-Tobin transaction technology can be approximately rewritten as maximization with money in the utility function. Moreover, the simple cash-in-advance model of money can be written as a maximization problem by ignoring the cash-in-advance constraint but introducing money in the utility function (Blanchard and Fischer, 1989: 192). Also Obstfeld and Rogoff (1996: 530-532) showed that the money-in-utility-function formula can be viewed as a derived utility function that includes real balances because agents economize on time spent in transacting. Therefore, the-money-in-utility-function formula can be regarded as a general formulation of the micro-foundations of the money demand function.

The novelty in our model lies in fusing and expanding both strands of this literature into a micro-fundamentals model in which optimizing agents engage in currency substitution thus setting-off endogenously serial devaluations that can culminate in a currency crisis. In the process, we expand Krugman's model by introducing money not only as a medium of exchange but also in its role as an asset. Moreover, the utility function in our model contains both domestic and foreign currency, with possibilities of substituting one for the other, especially for asset-holding purposes.

We extend the 'fundamentals model' (or the 'first-generation model') of currency crisis by incorporating the endogenous currency substitution effects explicitly. Recently, several papers have tried to extend this 'first-generation model' by introducing an endogenous risk premium or an endogenous regime-switching of economic policy (Flood and Marion, 2000; Cavallari and Corsetti, 2000). By focusing on an optimal dynamic response of domestic agents our model is distinguished within this genre of recent literature for its generality. We show that the more pronounced the currency substitution is in a country is, the earlier and the stronger appears the tendency for the local currency to devalue. This tendency holds whether the origins of currency substitution lie in a risk premium or simply in a 'taste' for ratcheting up liquid asset holdings to a harder currency. The intuition behind our theory is straightforward. With strong currency substitution the demand for the domestic currency, relative to the foreign (hard) currency, declines. Given the stream of domestic money-supply growth, a decline in domestic money demand will increase the equilibrium level of domestic prices. This increased domestic price level will lead to devaluation through arbitrage among tradable goods - or simply according to purchasing power parity. A novel feature of this paper is to show empirically that, controlling for the fundamentals, the reputation-asymmetry via-a-vis the reserve currencies triggers systematic devaluations of the soft currencies of emerging economies and developing countries.[4]

The Fundamentals Model of BOP Crisis under Currency Substitution

In a world of free currency markets where currency substitution is the result of agents' maximising calculus, economic expansion becomes eventually untenable for soft-currency countries. In a country with a soft currency, a regime of fixed exchange rate shall be undermined by an expansionary fiscal and/or monetary policy, and the initially fixed exchange rate is bound to collapse. In this section, we will construct a simple model of currency crisis that is triggered by currency substitution. The model portrays a situation where speculation-led crises can occur in a completely rational environment under the basic principles of efficient asset-price arbitrage.

In what follows we extend the log-linear version of Krugman's model (Krugman, 1979; Obstfeld and Rogoff 1996) model by incorporating currency substitution effects.

A Simple Model of the Currency Substitution

Suppose that a domestic representative agent's total money holding, M, is composed of domestic currency, M_l and foreign currency, M_F:

$$M_t = M_{lt} + \varepsilon M_{Ft}$$

where ε is the nominal exchange rate. Suppose a consumer has a homothetic utility function and solves a dynamic problem of money demand. Then the optimal allocation of money holding can be solved as a sub-optimisation problem. Assuming a Cobb-Douglas utility over the domestic and foreign money holdings, a consumer's sub-optimisation problem becomes:

$$Max\ U_t = M_{lt}^{1-\alpha} M_{Ft}^{\alpha}$$
$$s.t.\ M_t = M_{lt} + \varepsilon M_{Ft}$$

From the first-order conditions, we have:

$$M_{lt} = (1-\alpha)\, M_t \quad (1)$$
$$\varepsilon M_{Ft} = \alpha M_t \quad (2)$$

The key parameter α indicates the degree of currency substitution. If $\alpha = 0$, there is no currency substitution effect and a consumer holds only the domestic currency. The condition $\alpha = 0$ is also satisfied in the case of non-convertibility of the domestic currency and strict capital control on domestic agents' foreign currency ownership. In either case, foreign money holding is always forced to be zero. On the other hand, the case of $\alpha = 1$ indicates that domestic residents hold monetary assets exclusively in the form of foreign money. This is the case of complete dollarisation. Hence, the parameter α reflects the degree of softness of a currency, defined as currency substitution for asset-holding purposes. The value of α then represents an inverse transformation of Gresham's law since it is the good (hard) currency that drives out the bad. Gresham's law, nevertheless, still applies when currency is used for transaction purposes.

Now, we can employ the conventional money demand function:

$$\frac{M_t}{P_t} = L(Y_t, i_{t+1}) \tag{3}$$

where P_t is the price level, Y_t is real income and it is the nominal interest rate. Note that the real money demand function can be derived from a dynamic optimisation model of a household (Sidrauski, 1967; Lucas and Stokey, 1987; Feenstra, 1986). Combining Equations (1) and (3), we have the following domestic money demand function:

$$\frac{M_{1t}}{P_t} = (1-\alpha)\frac{M_t}{P_t} = (1-\alpha)L(Y_t, i_{t+1}) \tag{4}$$

We formulate the real side of the model of a small open economy with a foreign exchange rate that complies with purchasing power parity (PPP) and uncovered interest parity (UIP). This model assumes perfect goods market and capital mobility:

$$p_t = e_t + p_t^* \tag{5}$$
$$i_{t+1} = i_{t+1}^* + E_t e_{t+1} - e_t \tag{6}$$

where e is the logarithm of the nominal exchange rate of this economy. The log of the price level, P_t, is denoted by p, and the interest rate is denoted by i. We assume a continuous-time Cagan-type money demand function. Then, using equation (4), the money market equilibrium condition becomes:

$$m_{1t} - p_t = \log(1-\alpha) + \phi y_t - \eta i_{t+1} \tag{7}$$

Combining (5), (6), and (7), we have a dynamic equation of the exchange rate which satisfies PPP, UIP, and money market equilibrium:

$$m_{1t} - \phi y_t - e_t + \eta i_{t+1}^* - p_t = \log(1-\alpha) - \eta(E_t e_{t+1} - e_t) \tag{8}$$

Under the assumption of the small open economy, foreign variables are exogenously given. In order to simplify the argument, we assume that $-\phi y_t + \eta i_{t+1}^* - p_t^* = 0$. Then we have a continuous version of the exchange rate dynamics under perfect foresight as follows:

$$m_t - e_t = \log(1-\alpha) - \eta \dot{e}_t \tag{8a}$$

Monetary Base, Currency Substitution, and the Collapse of the Fixed Exchange Rate Regime

The balance sheet of the Central Bank is represented as

$$B_H + \varepsilon A_F = MB \tag{9}$$

where B_H represents the domestic government bond ownership of the central bank. A_F is the total foreign asset holdings, i.e., foreign bonds and reserve currency, of the central bank. The central bank's monetary base is $M_1 = \mu\ MB$, where $\mu > 1$ represents the money multiplier. Hence, Equation (9) gives

$$M_1 = \mu(B_H + \varepsilon A_F) \tag{10}$$

From Equation (8a), we can see that a fixed exchange rate regime generates

$$m_{1t} - \bar{e} = \log(1-\alpha) \tag{11}$$

Suppose that the Central Bank is required to finance an ever-increasing fiscal deficit by buying government bonds thus expanding its nominal holdings of domestic government debt, B_H. If the growth rate of domestic bond stock is constant at λ, we have

$$\dot{B}_H = B_H \lambda \tag{12}$$

Following Krugman (1978), we can calculate the shadow exchange rate under the flexible exchange rate assumption and no foreign reserves, i.e., $A_F = 0$. In this situation, the central bank's balance sheet equation (10) implies that

$$m_{1t} = \log\mu + b_{Ht} \tag{13}$$

where b_H indicates the log of the central bank's bond holding. This equation (13) simply indicates that the central bank's liability should be equal to domestic asset when foreign reserves are exhausted. By combining equations (12) and (13), it becomes obvious that the money supply increases at the constant rate λ after the collapse of the fixed exchange rate regime, i.e. $\dot{m}_{1t} = \lambda$. Moreover, from equation (8a), we can easily see that $\dot{m}_{1t} = \dot{e}_t = \lambda$ along the balanced growth path. Therefore, inserting Equations (13) into Equation (8a), we obtain

$$b_{Ht} - e_t = -\log\mu + \log(1-\alpha) - \eta\lambda$$

Finally, we can derive the log of the shadow exchange rate, which is defined as the floating exchange rate that would prevail if the fixed exchange rate regime collapsed, as follows:

$$e_t = b_{Ht} + \log\mu - \log(1-\alpha) + \eta\lambda \tag{14}$$

We can see that $\partial e_t / \partial \alpha > 0$. This indicates that the currency substitution will induce potential devaluation of the exchange rate over time. As a result, the speculative attacks and resulting collapse of the fixed exchange rate would occur earlier. We can formally derive the time path to the collapse as follows. From Equation (11), we have

$$b_{Ht} = b_{H0} + \lambda t \tag{15}$$

where b_{H0} is the initial value of the central bank's government bond holding. Combining Equations (14) and (15), together with $e_T = \bar{e}$, we can derive the time elapsed to the collapse of the fixed exchange rate regime as follows:

$$T = \frac{\bar{e} - b_{H0} - \log\mu + \log(1-\alpha)}{\lambda} - \eta.$$

Hence, we can easily inspect that $\partial T / \partial \alpha < 0$. Again, the softness of a currency is negatively related to the timing of the currency crisis. As indicated in Figure 2, e_T is the cross-over point from fixed to flexible exchange rate, indicating devaluation. The equation and figure denote that exogenous currency substitution, totally independent of the fundamentals, will lead to an early collapse of the stable exchange rate regime (Figure 2).[5] It is important to note that even with a modest expansion in the level of government indebtedness, λ, a large currency substitution effect, α, can accelerate the onset of the crisis. This is applicable to the recent Asian crises where the government account was in balance and otherwise the fundamentals were solid (Yotopoulos and Sawada, 2000).

The intuition behind this result should be straightforward. A high degree of currency substitution results in shrinking the demand for the domestic currency (equation 4). Given the flow of money supply, a decline in domestic money demand will increase the price level under the equilibrium condition of the domestic money market. According to the PPP, equation (5), this increased price level will lead to devaluation. Although the devaluation rate itself will be the growth rate of the money supply, it is the currency substitution that shifts the locus of the shadow exchange rate toward the devaluation. Based on these arguments, when there is a habit-formation of currency substitution, we may assume that the foreign-currency-preference parameter will increase in response to a devaluation, i.e., $\alpha = \alpha(e)$ with $\alpha' > 0$. Then once a country's currency behaves as a soft currency, domestic agents will switch from domestic currency to foreign hard currency as store of value. Accordingly, the dynamic locus of shadow exchange rate line, represented by equation (14), will be shifted continuously toward further devaluation (Figure 2). This mechanism creates the possibility of self-validating devaluation spirals. Soft currencies depreciate systematically and the crisis occurs frequently. This is a simple representation of the

Y-Proposition: in free currency markets hard currencies fluctuate while soft currencies depreciate systematically (Yotopoulos, 1996, 1997).

This result indicates that even under a prudent fiscal policy and pristine economic conditions, strong currency substitution precipitates a devaluation that may turn into a financial crisis. On the other hand, capital outflow control with conservative monetary and fiscal policy will enable a country to avoid a currency-substitution-led devaluation. Therefore, a mildly repressed exchange rate may achieve the desired level of demand for domestic currency.

Moreover, a tight regulation on the banking sector will also contribute to avoid a currency crisis. To verify this argument, note that a lower money multiplier will put off the timing of the collapse of the fixed exchange rate regime since $\partial T / \partial \mu < 0$. Recall that the money multiplier is defined as

$$\mu = \frac{c+1}{c+r_D+d}$$

where c, r_D, and d represent the currency-deposit ratio, the required reserve ratio, and the excess reserve-deposits ratio, respectively. Therefore, we can easily see that increasing the required reserve ratio will postpone the BOP crisis.

In fact, the use of reserve requirements as an appropriate financial-sector reform and an adjustment device against capital inflows has been widely discussed recently (Cole and Slade, 1998; Calvo, Leiderman, and Reinhart, 1993). When most of international capital inflows take the form of increased short-term bank deposits, a sudden reversal of the inflows may quickly result in bank insolvencies and failures. Many countries with a problematic financial sector experience ineffective or inappropriately low reserve requirements. This leads domestic banks to undertake risky projects that ultimately result in bank insolvencies. Hence, the government in an attempt to prevent an overheated credit expansion in the financial sector might opt to insulate the banking system from short-term capital inflows. High reserve requirements are the operational policy intervention to this effect. For example, a 100 percent required reserve ratio could be imposed on deposits with the shortest maturity. Moreover, prudent reserve requirements contribute to reducing the risks of private banks through imposing high capital-to-risk-asset ratios and thus inducing banks to hold low-risk assets. Moreover, the central bank can use the rent created by this operation to cover capital deficiencies in the event that banks became insolvent and need arises to have them merged, sold, or liquidated (Cole and Slade, 1998). Although this scheme would impose a burden on the banking system and could result in some dis-intermediation of the capital inflows, it has the advantage of decreasing banks' exposure to the risks of sudden reversals of capital flows and enhancing financial prudence.

Empirical Implementation

The objective of this section is not to provide full empirical testing of the model. It will suffice to formulate the empirical counterpart of the theoretical model and to present some numerical and impressionistic evidence on the validity of a model of currency-substitution-triggered devaluations.

The Empirical Counterpart to the Currency-Substitution Model of Devaluation

The empirical counterpart of the model of currency substitution-led devaluation can be depicted in a number of diagrams. First, however, it needs to be modified to account for some extreme assumptions that were incorporated in the theoretical framework. Since the model assumes a perfectly competitive international goods market and perfect international capital mobility, we should control for the gap between these simplified assumptions and reality. In other words, equation (14) represents a hypothetical exchange rate under PPP and UIP. Under imperfect capital mobility, equation (14) can be modified and approximated as follows:

$$e_t = b_{Ht} + \log\mu + \alpha + \eta\beta_1\lambda \qquad (14a)$$

where β_1 is a parameter which represents the degree of capital mobility.

In estimating equation (14a) the following components need be distinguished:

(i) Recall that the first two terms of the RHS are equal to nominal money holdings, m_{1t}. Therefore, these two terms represent the fundamental PPP components of exchange rate due to trade in goods (and services), combined with the money-market equilibrium condition. Figure 3-a represents the implicit market mechanism of PPP exchange rate among tradables, PPP_{Tt}, i.e., excluding the nontradables that are transacted in domestic currency.

(ii) If there is no capital control, $\beta_1 = 1$, as represented by equation (14). In this case, the equilibrium exchange rate is also affected by the currency substitution term α and the domestic money supply (Figure 3-b).

(iii) If there is strict capital control and foreign exchange is limited to the international trade of goods, then $\beta_1 > 1$. As represented by Figure 3-c, under strict capital control against short-term portfolio investments, the available amount of foreign exchange in the market is limited. The existence of the currency substitution-driven demand for foreign exchange bids up the equilibrium level of foreign exchange rate. The resulting foreign exchange rate is the black market exchange rate, *BM*, which is higher than the equilibrium nominal exchange rate under perfect capital mobility in Figure 3-b:

$$BM_t = \ln PPP_{Tt} + \alpha + \beta \qquad (14b)$$

where PPP_{Ti} is the fundamental PPP part and β represents the degree of capital control.

(iv) Since the official nominal exchange rate (NER) is usually managed by the government in soft-currency countries, the previous cases need reflect the official NER. *BM*, in specific, does not necessarily represent the official NER. *BM* is regarded as the logarithm of the black market exchange rate which reflects the existence of currency substitution by the domestic residents and foreign exchange market interventions of the governments. Finally, subtracting NER from the both sides of (14b), we have the empirical model of currency substitution parameter or the currency softness index α_{it}:

$$BM_{it} - \ln NER_{it} = \ln PPP_{Tit} - \ln NER_{it} + \beta D_{it} + \alpha_{it} \qquad (18)$$

Given the proper specification and necessary data this model can be put to an empirical test that would supply the value of the currency substitution parameter, α_{it}.

Some Impressionistic Evidence on the Validity of the Model

The previous sections have generalised the treatment of financial crises by introducing currency substitution as a trigger for devaluation while controlling for the fundamentals of an economy. Ignoring capital flight and foreign cash on hand, an adequate measure of currency substitution would have been the ratio of foreign currency deposits to *M2*. Lacking that, we can examine the process intuitively by constructing an imperfect proxy of the currency substitution variable, α_t, and observing its behaviour over time and especially during a crisis. The feasible proxy consists of the ratio of time, savings, and foreign-currency deposits in the deposit-money-banks to a broader measure of money, *M2*, which also includes time, savings, and foreign currency deposits. Monthly data of these variables are extracted from International Financial Statistics of the International Monetary Fund. Note that the deposit banks comprise commercial banks and other financial institutions that accept transferable deposits such as demand deposits. Again disregarding capital flight and foreign currency on hand, this measure of currency substitution can be regarded as the upper-bound of α_t since the data commingle in the numerator foreign currency deposits with other time and savings deposits.

Casual empiricism makes the sequence of events that goes from currency substitution to devaluation palpable in the case of the Asian crises of the late 1990s

(Figure 3). In the crisis-hit countries, we can easily verify that currency devaluation coincided with strong currency substitutions.

In the case of Korea (Figure 3a) the currency substitution proxy trended upwards since the second quarter of 1996 and its acceleration peaked the second quarter of 1997, coinciding with the timing of the crisis. Thereafter, the rate of acceleration of currency substitution levelled off and the exchange rate started receding from its crisis peak. In the case of Malaysia (Figure 3b) the acceleration of the proxy for currency substitution started in early 1997, peaked by mid-1998 with the crisis, and levelled out in the fourth quarter of that year when currency controls were instituted. In Indonesia (Figure 3c) the acceleration of the currency substitution started in early 1995 and did not peak until late 1999, a year after the onset of the crisis, due probably to the political complications that intervened in the interim. Finally in Thailand (Figure 3d) the acceleration of currency substitution started in 1996 and peaked in 1997 and 1998, along with the timing of the currency crisis.

Casual observation of all four figures suggests a synchronicity between the increase in the proxy variable and the currency devaluations of 1997 and 1998. This is consistent with our theoretical framework: switching behaviour from domestic to foreign currency ratchets up to devaluation.

In our model currency substitution is no longer an issue of deteriorating quality of a currency because of deterioration in the fundamentals of an economy. As long as currency that is used for asset-holding purposes is a positional good and a free currency market provides for currency switching at negligible transaction cost, it pays for agents to ratchet up by substituting the reserve/ hard currency for the soft. Agents' expectations for devaluation generate self-fulfilling outcomes. Expectations thus become important determinants of devaluation.

Contrary to the Asian crises that occurred when the fundamentals of the economy were in pristine condition, the Mexican crisis transpired in an environment of deteriorating fundamentals. Still the evidence suggests that the collapse of the peso was strongly related to the acute currency substitution that was taking place contemporaneously (Yotopoulos, 1996; Figure 4). The anatomy of the devaluation of the Mexican peso of December 1994 can further inform the effects of currency substitution (Yotopoulos, 1997).

The peso had been previously pegged (at 3.5 pesos to 1 U.S. dollar) and it was initially devalued by roughly 20 percent. Within a week, in late December, the efforts to support the peso had failed and a free exchange rate was adopted that stabilized for a while (at 6 pesos to 1 U.S. dollar). The peso has continued a gradual devaluation since then. There have been two (largely complementary) views of serious observers on what went wrong with the peso. One is the fundamentals story, and the other the story of the flight of foreign financial capital.

The fundamentals story has certain merit. There had been a persistent current account deficit that by the end of 1994 had grown to 7.6 percent of GDP. Liberalization of a previously repressed economy was bound to contribute to the current account deficit, and it did. Dismantling of long-standing restrictions on imports, reducing tariffs and opening up the economy into a world-market system drove imports up. The consumerist drive is reflected in the rate of personal savings decreasing from 15 percent of GDP in 1988 to 7.4 percent in 1994. How was the Mexican penchant for consuming more and saving less financed? Enter the second story, the flood of foreign finance.

The net foreign capital streaming into Mexico in 1994 rose to $30 billion. Little of that was in equity capital of corporate investment in plant and equipment. And little was in long-term government debt, which actually had been drastically reduced from its pre-crisis peaks. Most foreign capital was short-term and it went to financial instruments or to portfolio investments. It was attracted by high interest rates, and it has been described as 'the lemming-like march of multinational banks and mutual funds bearing loans to emerging markets' (McKinnon, 1995). The explanation offered for the collapse of the peso invokes the panicky exit of this capital through the revolving door of financial flows. This supply side of the Mexican crisis also has merit.

But the import binge cannot explain the total debacle, and the supply of foreign financial capital was certainly not forced on non-consenting adults and on unwilling Mexican clients. What has been left out of both stories is the demand side by holders of pesos for currency-substituting the dollar. The data that emerged confirmed the alternative view (Economist, August 26, 1995). For the moth of December the Central Bank lost $6.7 billion in reserves. Of this loss, the trade deficit for the month accounts for $1.7 billion. Foreign investors sold a total of only $370 million worth of debt and equity. This meagre sell-out should come as no surprise, being consistent with the analysis in the previous section. The foreign investor in the financial capital market stands to capture his capital gains after the devaluation, when the leveraged peso loans can be paid back with cents on the dollar. It is after the crisis that the capital flight starts, not before. The unaccounted balance of the loss in reserves is $4.6 billion. This accounting gap is consistent with the expectation of the currency-substitution hypothesis.

The capital flight that is intimated in the case of Mexico can provide by its extent and timing strong corroborative evidence on the explanatory value of the currency substitution hypothesis. Capital flight took place in the Asian crisis episodes, but noticeably late in the cycle. IMF data analyzed by the Korea Institute of Finance show that capital took flight from the crisis economies only after the event: in the fourth quarter of 1997, which was after the onset of the crises (Cho and Rhee, 1999). In the final quarter of 1997, capital flight from Korea amounted to $ 89 billion, or -18.9

percent of GDP, as compared to a positive flow of 0.7 percent of GDP for the third quarter of the year, when the crisis was being staged. Similar figures are reported for the fourth quarter of 1997 for the other countries (in percent of GDP, with the third quarter figures in parentheses): Indonesia, -15.8 (3.3); Thailand, -22.1 (-15.1); Philippines, -6.1 (9.0).[6] Not unlike the case of Mexico, these data imply that financial capital coming into the region during the bubble times was leveraged in local currency loans that were immediately converted into dollars. When the bubble burst and the devaluations followed, the leveraged loans were paid off at 50 cents to the dollar and the investors took their gains across another national currency border, or even home to Geneva, Frankfurt or New York.

The Hong Kong experience of September 1998 provides additional confirmation of this scenario. With a monetary board and the Hong Kong dollar tied to the U.S. dollar, the one-way-option game changes slightly. The foreign capital that is leveraged into a HK dollar loan is partly used to sell short the Hong Kong stock market index and partly to convert into U.S. dollars, which was called 'the double play.' Given the existence of a monetary board, the currency substitution of the latter part of the loan results in an inevitable tightening of the money supply. Tight money leads to higher interest rates and a shift of funds from stocks to bonds. The ensuing decline of the stock market index rewards the shorts who cash out and take their capital home. The unpredicted intervention of the Hong Kong Monetary Authority into the stock market that followed the detection of this game brought howls of indignation from the financial press in New York.[7]

Conclusions

Since 1980 three-quarters of member-countries of the IMF, developed, developing, and emerging alike, have been hit by financial crises. In the 1990s financial crises have become especially virulent occurrences. The 'fundamentals' models of financial crises can still do service but only with an increasing dose of willing suspension of disbelief.

This paper extends the first-generation models of financial crises to allow for a systematic devaluation of soft currencies that is independent of the fundamentals of an economy. In a globalized world of free foreign exchange rates and free capital movements, the demand for ratcheting up the quality of a currency used as an asset increases. Moreover, in the situation of a free currency market, where devaluation may happen, but it may not, currency substitution becomes an alluring one-way option for an optimizing agent. By selling the peso short for foreign exchange, the 'speculator' will reap a capital gain if the exchange regime collapses, but will not suffer an equivalent loss if it does not. What then prevents the public from becoming

speculators at large by currency-substituting the reserve currency? It is not only the local elites who have liquid assets to protect who turn their pesos into dollars. Pesos can also be bought by fund managers abroad, or they are borrowed locally by leveraging a few million dollars' deposits into a peso loan that is also invested into dollars. Come devaluation, the international speculator pays back the peso loan in cents on the dollar and takes the balance of his dollars to another corner of the globe, thus spreading the crisis by 'contagion'.

The currency-substitution hypothesis of devaluation and financial crises has policy implications that are parallel to those of market incompleteness. Analogous to the case of incomplete credit markets (Stiglitz and Weiss, 1981), the market in foreign exchange is incomplete because of 'asymmetric reputation' between the reserve and soft currencies. The remedy of the market ailment is identical in both cases: price controls, that is, maintaining 'mildly repressed' interest rates in one case, exchange rates in the other. Mercifully, it is easier to determine the degree of repression that is requisite in the foreign exchange market. The exchange authority has to ration out of the market the component of foreign exchange demand that is due to 'precautionary' motives. There is no need to repress the current account items. Imports can be fully funded with foreign exchange and so is repatriation of profits for foreign investors. But there is need to scotch the demand for foreign exchange that buys a one-way bet on the depreciation of the local currency, and in the process makes depreciation inevitable.

Besides (or barring) foreign exchange controls, a 'moderately repressed exchange rate' can be achieved by controlling and moderating the inflow of short-term capital, thus partly avoiding the (foreign) component of the 'one-way option' that can lead to systematic devaluations of soft currencies. Regulation of the banking sector serves the same end. By setting, for example, higher reserve requirements the money multiplier is lowered thus improving banks' capital to risk-asset ratio. In sum, the policy implications of the currency-substitution hypothesis of financial crises are geared towards diffusing the pressure for devaluation of soft currencies that arise in a globalization environment where reserve and soft currencies compete for asset placement in agents' portfolia.

NOTES

[1] Our definition of currency substitution is not the only one employed in the literature. In fact the concept of currency substitution is rather ambiguous in economics. For a survey of different definitions, see Giovannini and Turtelboom (1994).

[2] In this formulation of the reputation-based continuum between reserve/hard and soft currencies, a free currency market makes foreign exchange into a 'positional good' (Hirsch, 1976; Frank and Cook, 1976;

Frank, 1985; Pagano, 1999). Following that literature, in a shared system of social status, e.g., it becomes possible for an individual (a good) to have a positive amount of prestige (reputation) such as a feeling of superiority, only because the other individuals (other goods) have a symmetrical feeling of inferiority, i.e., negative reputation (Pagano, 1999). In a free currency market, the simple fact that reserve currencies exist, implies that there are soft currencies that are shunned.

[3] Keynes (1923) called 'precautionary' this new slice added on the demand for foreign exchange that impinges asymmetrically on the conventional demand-and-supply model for determining exchange rate parity.

[4] In a two-country general equilibrium model one could show the impact of asymmetric reputation as a zero-sum game (Pagano, 1999). For simplicity, we consider only one-sided reputation in this paper.

[5] Note that the first generation currency crisis model a la Krugman (1979) is the special case of our model with no currency substitution effects, i.e., $\alpha = 0$.

[6] Malaysian data do not exist due to the exchange control regime that was imposed in August 1997.

[7] Wall Street Journal, editorial, September 1997.

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Figure 1.: Timing of the Crisis

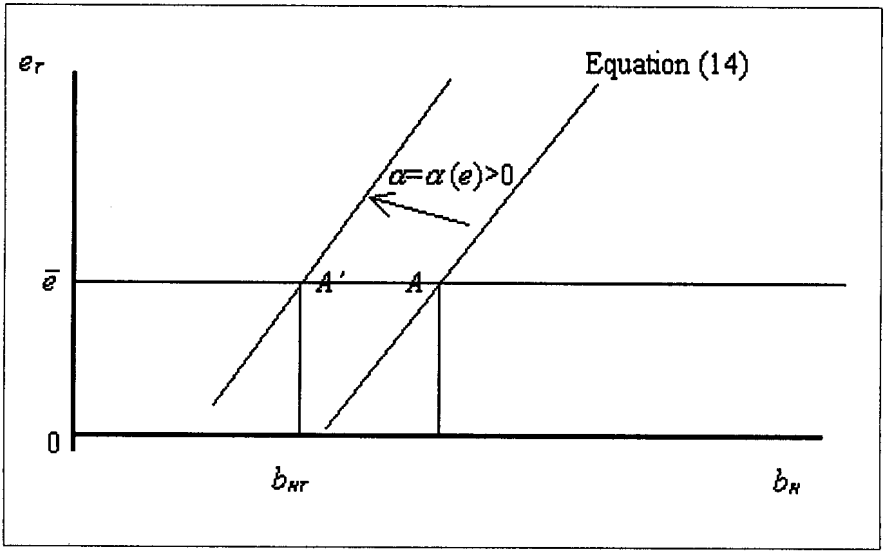

Figure 2a.: Determination of Equilibrium PPP Exchange Rate Through International Trade of Goods

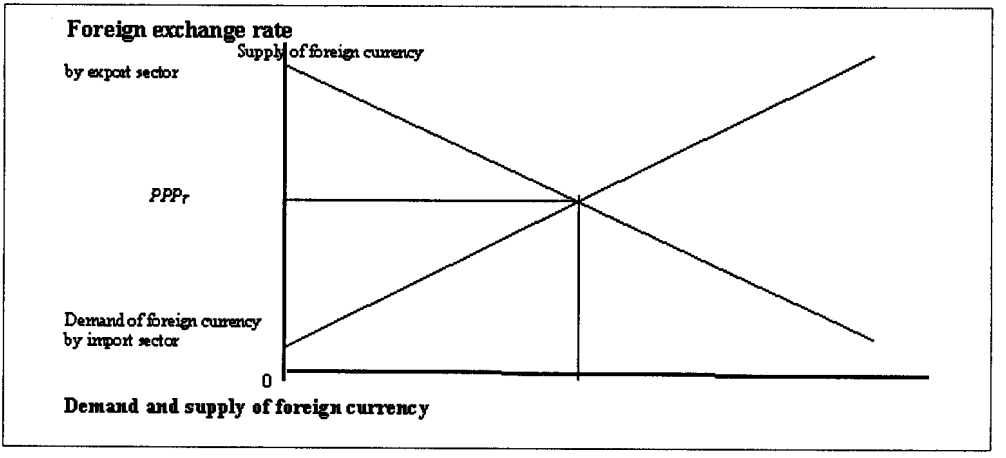

Figure 2b.: Determination of Equilibrium Exchange Rate Under PPP and Perfect Capital Mobility

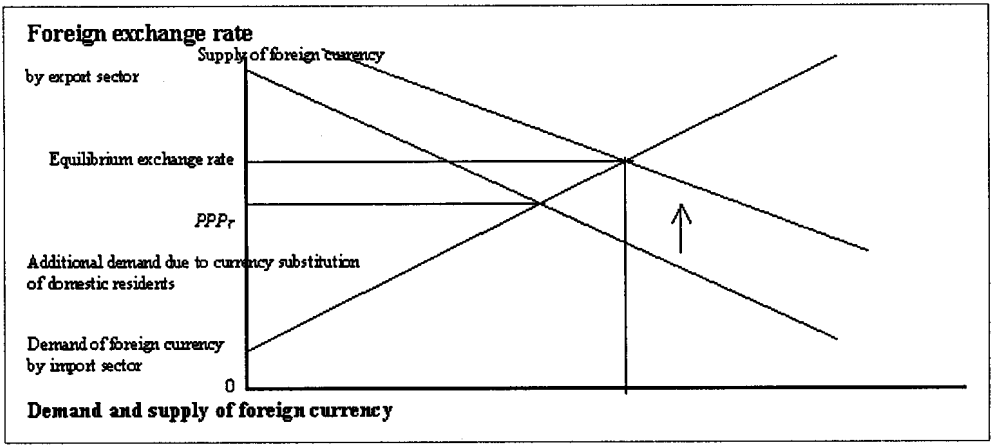

Figure 2-c Determination of Equilibrium Exchange Rate Under PPP and Strict Capital Control

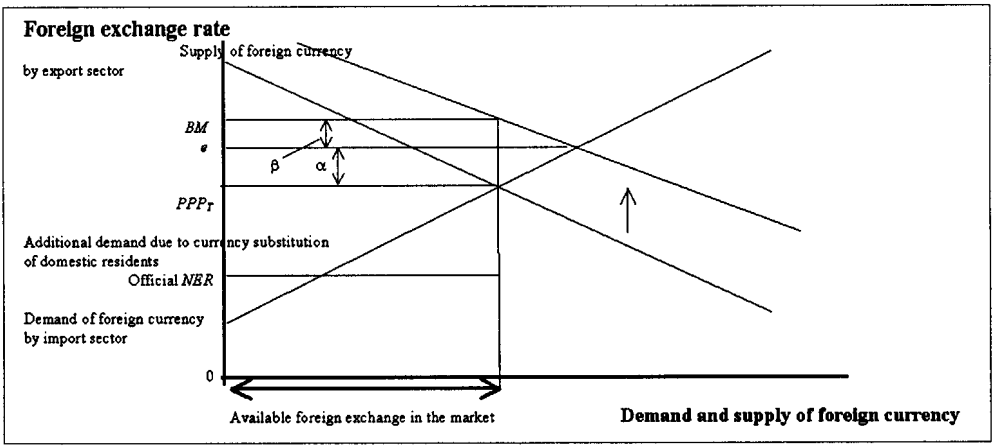

Figure 3a.: Currency Substitution and Devaluation in South Korea

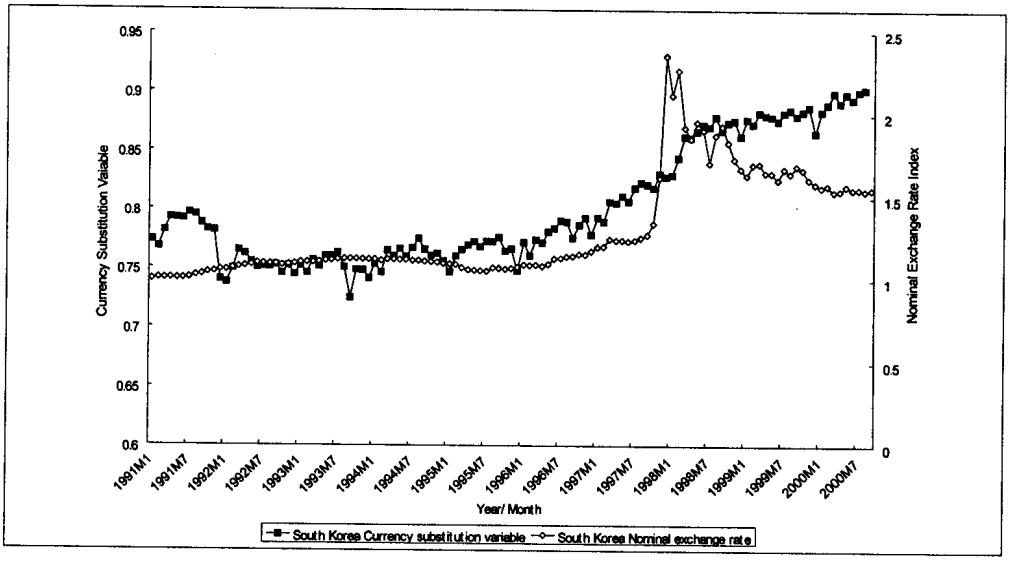

Figure 3b.: Currency Substitution and Devaluation in Malaysia

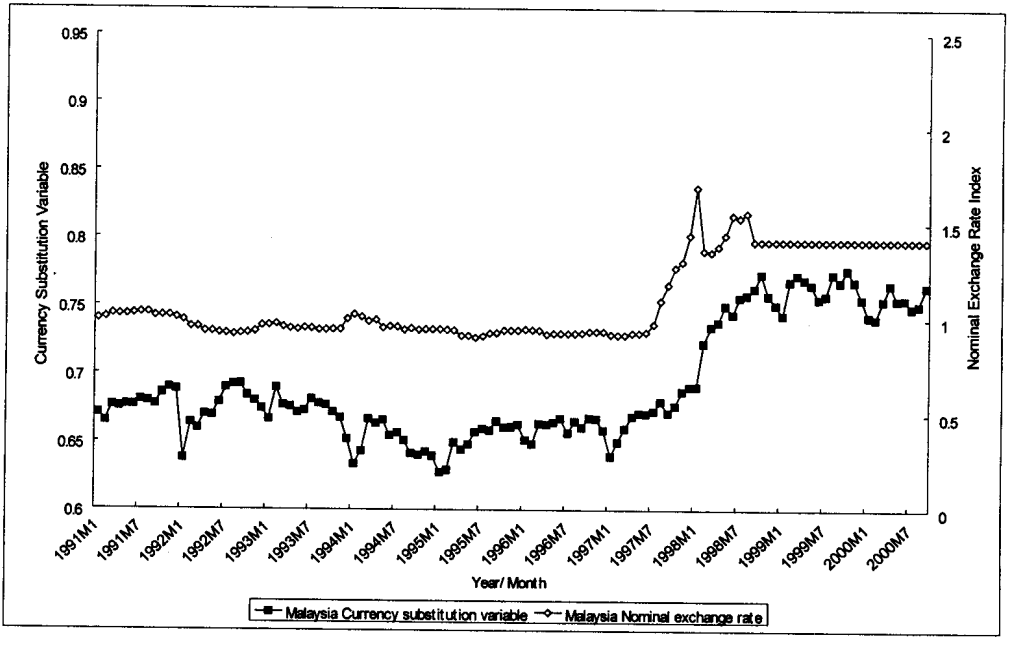

Figure 3c.: Currency Substitution and Devaluation in Indonesia

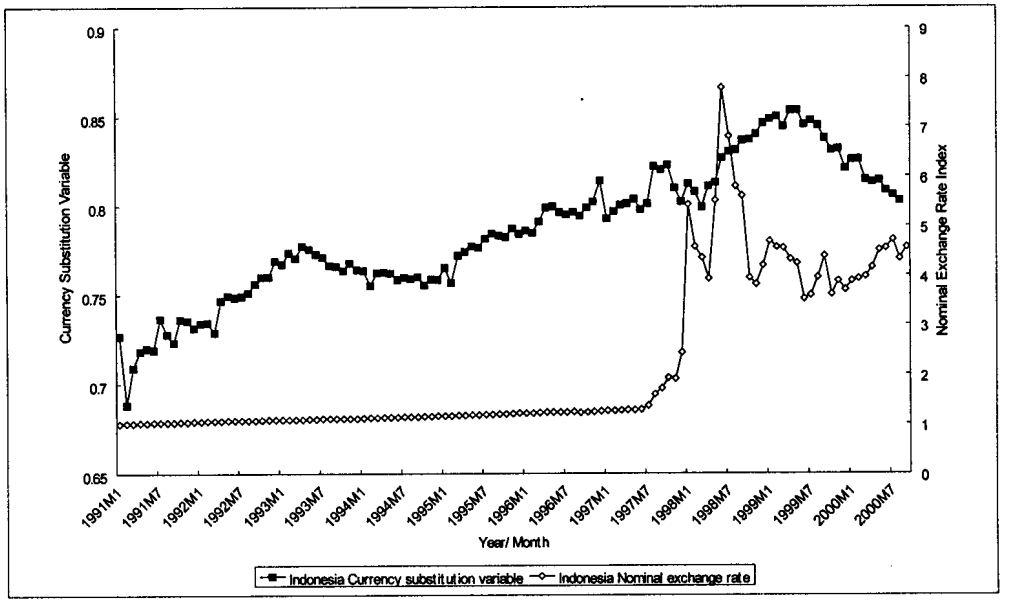

Figure 3d.: Currency Substitution and Devaluation in Thailand

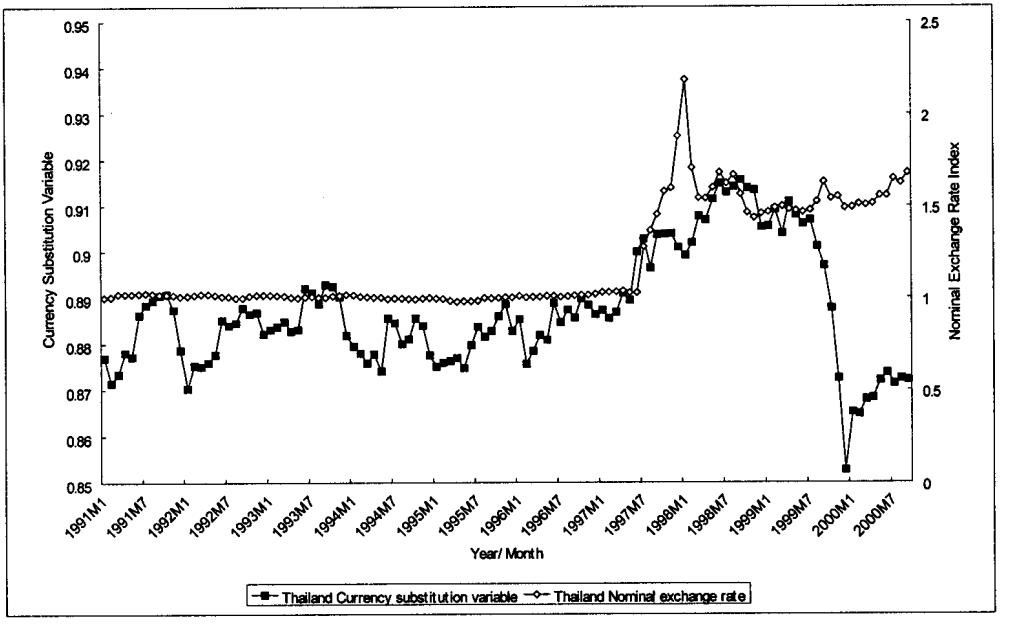

Figure 4.: Currency Substitution and Devaluation in Mexico