Exchange Rate Movement of Developing Countries:
An Alternative Theoretical Framework

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Abstract

To explain the exchange rate behaviour the role of foreign exchange reserve has been neglected in the theories of exchange rate behaviour. Either it has been excluded as a determinant or treated as merely residual factor. But foreign exchange reserve has been playing a reasonably important role in determining nominal exchange rate of the countries, more specifically for the developing countries. It may not hold for the countries whose currency has a reasonable amount of use as international money. This paper develops a theoretical framework, in heterodox tradition, to understand exchange rate movement for developing countries by keeping foreign exchange reserve at the centre stage. Also, it suggests that to avoid currency crisis movement of speculative capital need to be restricted.

JEL Classification: F30, F31, F33, F34

Introduction

In the flexible exchange rate system of the Post-BrettonWoods era, after the initial two decades of the transition period, most countries' exchange rate are determined in the foreign exchange market. As a result, the link between the exchange rate and the stock of reserves should not exist. Even so, the countries either follow a managed float or an independent floating exchange rate system. As many countries are following a pegged exchange rate system the stock of reserves is continuing to be an important factor behind the stability of the exchange rate. Even the countries that follow an independent floating exchange rate system have preserved the Central Bank's right to intervene in the foreign exchange market or they have sizeable intervention in the foreign exchange market. So foreign exchange reserves should continue to be one of the important factors behind exchange rate stability.

Most of the theories of exchange rate behaviour have ignored foreign exchange reserves as an important determinant for exchange rate. Foreign exchange reserves are either ignored or treated as a residual factor. This is true for the Mundle-Flemming-Dornbusch theory of exchange rate behaviour, the portfolio balance model and most of the currency crises theories. The monetarists link up reserve changes and exchange rate changes through the changes in the money supply. They say intervention in the foreign exchange market by any central bank will be effective in changing the exchange rate only to the extent that it constitutes a change in the money supply, which resulted in a change in price. Thus according to this view reserves-exchange rate linkage get established through the changes in the money supply. Some economists[i] have argued that sterilized intervention is also effective to change the exchange rate. There are two channels - portfolio balance and signalling, through which they claim that this exchange rate change can take place.

The portfolio balance channel says because of foreign exchange risk, domestic and foreign securities are imperfect substitutes. So investors have to be compensated by a risk premium for holding foreign securities. Sterilized intervention changes the supply of foreign relative to domestic securities. So equilibrium in investors' portfolios gets disturbed. To restore balance a change in risk premium measured as the deviation from uncovered interest rate is required. Hence change in the asset return will change the spot exchange rate. Suppose the Central Bank is selling the foreign currency denominated assets and buying back the domestic currency denominated assets to sterilize the reduction in money supply. Supply of foreign currency denominated assets will increase. So the risk premium for holding domestic currency denominated assets will come down.

The risk premium can be defined as $\phi = r - r^* - \dfrac{\dot{\hat{e}}}{e}$

Where, r is real rate of interest of domestic country, "*" denotes the foreign country, and $\hat{e}$ is expected exchange rate. The exchange rate of the domestic currency is defined by keeping the foreign currency as the denominator.

For a given real rate of interest differential as the risk premiums come down either the present exchange rate has to appreciate i.e e has to come down or expectations about future exchange rate appreciation come down i.e. $\dot{\hat{e}}$ has to go up. In mainstream economics usually it is assumed that $\dot{\hat{e}}$ = f(e). If $f' > 0$ or $f' = 0$ for coming down of risk premium ϕ exchange rate have to appreciate. If regressive expectation operates i.e. for $f' < 0$ $\dot{\hat{e}}$ will go up as exchange rate appreciates. If f' has a very large negative value, the exchange rate will appreciate by a very little amount.

The second channel, signaling says that sterilized intervention is supposed to signal a change in the monetary policy intentions of central banks. The signal activates a response by the private sector to move the exchange rate in the direction that the monetary authority seeks.

All of these theories have linked up the reserve change and exchange rate by keeping monetary policy in center stage. The obvious criticisms of these theories are their assumptions of a full employment situation as well as an exogenous money supply. We argue that there is no need to bring in monetary policy to establish the linkage between the exchange rate and reserves. The level of reserve stock will itself create the expectation regarding the future exchange rate. If the majority of foreign exchange traders believe that a particular currency is expected to appreciate, these traders will buy the currency to realize capital gains. A net increase in the demand for this currency will lead to its actual appreciation i.e. actual exchange rate of a period depends upon the expected exchange rate of that period and if the average expectation is that the exchange rate will appreciate the actual exchange rate will appreciate. This expectation about the exchange rate will change with the change in the stock of reserves. This change in expectations about the exchange rate will influence capital flow and capital flow will also influence the expectation about the exchange rate. Ultimately the exchange rate will change.

I

Our alternative theoretical proposition - let us assume that in the foreign exchange market two kinds of agents are active- 1) Central Banks and 2) Private foreign exchange traders. Both the agents buy and sell foreign exchange. From the decisions of their selling (supply) and buying (demand) foreign exchange, the foreign exchange rate gets determined in a free market. An individual private foreign exchange trader

tries to guess what on the average other foreign exchange traders are thinking about the future exchange rate of a particular currency. If he expects that others on average are having an expectation of appreciation, he would tend to buy that currency to make capital gains. When most of the other private foreign exchange traders have a similar expectation of currency appreciation, the market sentiment to buy that currency would dominate and the currency would tend to appreciate in a bullish market. One of the indicators of this expectation can be capital flow. If one or two banks lend to a particular country it generates confidence among other bankers regarding that country's credibility as a borrower which itself generates the expectation of at least stability (if not appreciation) of its currency value. Hence capital flow can be an indicator of a change in the expected exchange rate. Now the Central banks can intervene in the foreign exchange market by buying and selling the currency. In the mid-1990s the total foreign exchange reserves of central banks were almost $800 billion. It was less than the equivalent of any single days' turnover in the world's foreign exchange market, which indicates that one central bank or even a number of central banks intervening together in exchange markets may not hope to counter a concerted onslaught on a particular currency or currencies by the exchange markets. The lack of quantitative power on the part of the central banks means that to become effective any central bank must act upon the exchange rate expectations that are held in the market, i.e. the role of central bank intervention is to change this expectation. The Central bank's policy of intervention would be effective if the foreign exchange traders believe that it will be effective. This belief depends significantly upon the position of the stock of reserve held by the central banks, e.g. by the RBI in the Indian context. Suppose, the rupee is depreciating, the RBI may start to or be expected to sell dollars and buy rupee to halt the downward movement of the rupee. If the foreign

exchange traders expect that it is the average expectation of the market that this intervention will be sufficient to maintain the stability of the Indian rupee, then they might begin to buy the rupee in the hope that the exchange rate would appreciate as a result of RBI's intervention. If it is the average perception then it will actually lead to either stability or appreciation of the rupee. If private traders expect that RBI intervention is not sufficient to maintain stability of the rupee, then the exchange rate would not be expected to appreciate and the foreign exchange traders will sell rupees in a bearish mood. The rupee will then actually continue to depreciate further and RBI's intervention will be ineffective. The expectation regarding the effectiveness of the central bank intervention, of a particular country depends upon the stock of reserves it has. This expectation will change with the change in the stock of reserves. Taking into consideration these factors foreign exchange traders will form the expectations about the change in exchange rate. Hence, the change in reserve as well as capital flows will play the role of determinants of change in the exchange rate.

Formally, we can write,

$$\frac{d\hat{e}_t}{dt} = \phi(\frac{dR_t}{dt}, K_t)\dots\dots\dots\dots\dots\dots\dots\dots\dots(1)$$

Where, $\hat{e}_t = $ expected exchange rate,

dR/dt = change in stock of reserve at period t

K= capital account inflow

Actions flow from the judgement about the future. Suppose the majority of foreign exchange traders believe that a particular currency is expected to appreciate. These traders will buy the currency because by doing so they will realize capital gains. A net increase in the demand for this currency will lead to its actual appreciation i.e. the actual exchange rate of a period depends upon the expected exchange rate of that

period and if the average expectation is that the exchange rate will appreciate, then the actual exchange rate will indeed appreciate.

Formally we can write,

$$e_t = f(\hat{e}_t), f' \succ 0$$

$$\therefore \frac{de_t}{dt} = f' \frac{d\hat{e}_t}{dt}$$

$$now, \frac{d\hat{e}_t}{dt} = \phi(\frac{dR_t}{dt}, K_t)........................from(1)$$

$$\therefore \frac{de_t}{dt} = f'\phi(\frac{dR_t}{dt}, K_t)$$
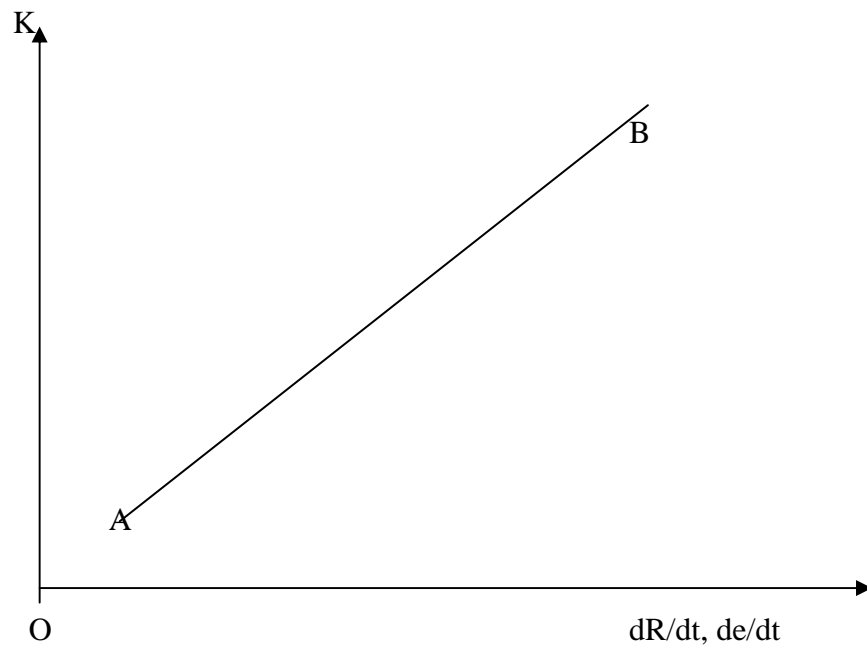
$$or, \frac{de_t}{dt} = g(\frac{dR_t}{dt}, K_t)$$

Figure 1

Now, dR/dt, change in reserve and K, capital flows are positively linked with each other for a given de/dt, change in exchange rate. If capital inflows increases for the existing change in exchange rate, the reserve will increases, otherwise the exchange rate will appreciate. If the change in the reserve stock increases, it will create the expectation that this particular currency's value may go up and it will create further capital inflows. So for a given exchange rate we can represent this relation with the

positively slope straight line, AB, in figure1 (For simplicity, we have assumed this functional relationship is a straight line).

The validity of the relationship between exchange rate change, foreign exchange reserve change and capital flows stated in the figure1 depends upon two conditions, first, change in foreign exchange reserve is exogenously determined and second capital inflow should be autonomous to the current account or to be precise current account deficit should not have significant influence on exchange rate.

Now, the question is why we need these two conditions. The necessity of these two conditions is laid in the fact that change in stock of reserve is nothing but the aggregate of net capital inflow and net current account surplus. If changes in the reserve and net capital flows are the two determinants of exchange rate change, then the current account has to be the adjusting factor to maintain the balance of payment identity.

To keep the exchange rate stable each country needs a critical level of stock of reserves. This critical level should be such that it would be sufficient to generate the expectation that the intervention by the Central Banks will be effective enough to keep the exchange rate stable. Every Central Bank will try to have at least the critical level of foreign exchange reserve. Now the Central Banks' perceptions of the requirement of the reserve determine these critical levels. They generally do not make it public beforehand. Hence, change in the reserve stock is determined by the central banks and it is exogenous here. If the current account is not influencing capital flows and rather itself is sensitive to capital flows then we can say that current account surplus is the adjusting factor.

The gradual replacement of traditional bank loans with marketable security issues has led to a proliferation of the high risk financial transactions since the late 1980s which

relies, as a source of profit, on the rather uncertain movements in exchange rates and interest rates. These profits are essentially short run and speculative in nature. As the control over capital flows by the financial institutions has increased, the importance of having short-run profits has increased. The competition between institutional investors manifests itself as a persistent requirement to demonstrate superior returns in order to attract more funds. Successive high short-run gains in each period are more effective in this respect than the longer-term returns. In US the typical stock was held in 1992-93 for an average of a little over two years, compared to over four years ten years ago and seven years in 1960[ii]. The average holding period for institutional investors is less than two years, compared to almost five years for individuals. The foreign exchange market also shows the reflection of it. A very large part of currency trades are very short run. Given that the vast majority of trades are not for the finance of trade in goods and services or long-term investment, these short-term trades must be based on expectations of gains derived from changes in the value of financial assets.

The new instruments are mainly meant for hedging against the risk in the exchange rate change or rate of interest change. This essentially means transferring risk to others. Short-run profits are gained through transferring risk. It has no link with the return on the physical capital in the economy. This ultimately led to gradual disconnection from real world, because to earn profits the capital market no longer is looking towards the real world. Through transferring risk this market is able to draw profit on its own and sustain itself. The foreign exchange transactions per day, due to this hedging, constitute more than 60% of total average per day foreign exchange turnover. As a result capital inflows are coming in to countries mainly for speculative gains. Now speculative gains can come from the fluctuations in exchange rate and rate

of interest. For the countries, whose levels of exchange rates fluctuations are very high, naturally the speculative gain motive from exchange rate fluctuations will dominate in attracting capital inflows.

Now we shall try to look theoretically at how current account balance can influence the interest rate of a country. Suppose a country's current account balance is increasing. If the economy is in under full employment equilibrium for a given exchange rate the income will increase, the aggregate demand will increase. The demand for money will increase. With an unchanged money stock the rate of interest will increase. If money supply is endogenous stock of money will increase and rate of interest will be unchanged. Hence, changes in current account balance can affect capital flows through rate of interest in an under full employment equilibrium economy for a given exchange rate only if the money supply is assumed to be exogenous. At full employment an increase in current account balance will change the price not the rate of interest. Even if we assume that the money supply is exogenous (which can be questioned) capital flow may not be sensitive to change in the rate of interest, most probably for the developing nations, as the levels of exchange rate fluctuations are high for them.

Now we shall examine the influence of current account on capital flows through exchange rate. If we look at the data of the whole world the capital transaction has increased to such a level that the foreign exchange transaction for foreign trade and services is very negligible today. The volume of transaction in the year 2004 stood at close to $1.9 Trillion per day[iii]. In 2004 global volume of exports of goods and services was $8.66 trillions. It means this was on average about $32.8 billion per trading day. So foreign exchange trading was 58 times as great as trade in goods and services. Further, it has been felt that there is a need to defend the exchange rate

against the volatility of international financial flows. In fact the World Bank has already told the developing countries to keep the their reserves according "to variations in the capital account, rather than in terms of months of imports, since the level of gross flows is higher following the integration". It shows that there is a smaller impact of trade in goods and services than of capital flows on exchange rate movement because it has a much smaller share in world foreign exchange transactions.

Now capital flow can influence the current account balance through various channels. If capital flows influence the exchange rate then through changes in the exchange rate will influence both imports and exports. Also increases in capital flows increase the international purchasing power of a country and that will help to increase imports through an increase in average propensity to imports of a foreign exchange constraint economy.

Capital flow can influence the current account not only through imports and exports but also through the factor income flows it generates. We have seen that the gross transaction of foreign exchange due to the income earned from foreign investment, as a proportion to current account is quite a large amount. All the G-7 countries have flows on factor payments on capital more than 10% of their gross current account flow in 1998[iv]. For Japan it is close to 30% through out the period of 1982-1998. For the U.S.A. throughout the period of 1982-98 it was around 20%. For other industrially developed countries also it was within 10% to 20%. For developing countries also the flows constituted by investment income, compared to their current account flows is large, though not as large as in the developed world. For Latin American countries it is quite comparable to the situation in the developed world of the North. But for East Asian countries and India it is not that large. It is roughly around 3-6%. Now we

should check how capital flows influence the current account through the net investment income route. If a country gets net capital inflows, thus implies that it is a net borrower country. Net investment income should be less than zero. If a country is a net exporter of capital then its net investment income should be greater than zero. This is true if the world capital market is perfectly integrated, the time lag between investment and return is not very long and the stock of capital invested abroad is smaller than the stock of capital invested by the foreigners into that country.

As we have described before, changes in foreign exchange reserves are exogenously determined in our model. But capital flows are endogenous. We need to know what influences capital flows. Capital flows into a country for two motives - income earning and capital gaining. If the income earning motive is the dominant one, capital flows will be sensitive to the rate of interest change and less sensitive to exchange rate change. And if capital gaining is the dominant motive, capital flows will be sensitive to exchange rate change and less sensitive to rate of interest change. It is expected that developed countries' rate of interest policy is relatively more effective to attract capital flows compared to that of developing countries. On the other hand, the capital flows that come into developing countries are more sensitive to exchange rate changes.

A plausible answer to why capital flows are insensitive to real rate of interest changes for developing countries but sensitive to such real rate of interest changes for developed countries may be because the currencies of developed countries enjoy the expectation of greater stability in their currency value. And, it discourages foreign investors to have capital gains motive. So capital flow is less sensitive to the exchange rate change in the developed world. For developing countries the exchange rate fluctuates much more compared to the developed world. So even if the rate of interest

increases in the developing world the foreign investors are unsure about the return because of high exchange rate fluctuations. It is this which explains why in developing countries capital flows are more sensitive to the percentage changes in exchange rate than to the rate of interest differentials.

Table 1
The Role of Different Currencies as International Currency in 1998

(as a share of a currency in total use)

Currency	Pegging of minor currency	Foreign exchange reserves held by central banks	Foreign exchange trading in world markets	International capital markets	International trade	Cash held outside home country
US Dollar	0.39	0.57	0.87	0.54	0.48	0.78
Deutsche mark	0.06	0.13	0.30	0.11	0.16	0.22
Japanese yen	0.00	0.05	0.21	0.08	0.05	Na
Pound sterling	0.00	0.03	0.11	0.08	0.15	0.00
French franc	0.29	0.01	0.05	0.06		0.00
Other EMS currency	0.04	NA	0.17	NA		0.00
ECU	0.00	0.05		0.01	0.00	0.00
Other/unspecified	0.22	0.15	0.29	0.12	0.16	NA

Source: Economic Report of the President transmitted to the congress, 1999

Now the currencies of the developed countries have much greater use as international money compared to those of the developing countries. They have a very large use as an international medium of exchange as well as a reserve currency (due to the store of value as well as medium of exchange functions). Usually, the currency, which has these two functions, also functions as a unit of account. All these functions require stability in the value of the currency. So a greater use of a currency as international money requires a greater stability in its value. Since the currencies of the developed countries have much greater use as international money (See Table 1[v]), the general expectation is that these countries' exchange rates are more stable compared to developing countries.

Hence, for developed countries the capital flows can be altered through the rate of interest change. Whereas, for developing countries rate of interest policy won't be

effective to attract capital flows. The capital flows in developing countries are sensitive to exchange rate changes and not to interest rate changes.

Others also share this observation. In fact, Mihir Rakshit[vi] has written

"The severity of external credit crunch a country faces following some large negative shock depends also on the country's standing in the international financial market. When faced with pressing balance of payments problems, along with depressed economic conditions at home, Great Britain or France could in early 90s have kept their currencies within the ERM band by inducing capital inflows through jacking up interest rates, provided they were prepared to endure a prolonged spell of unemployment and output loss. However, even though the long term fundamentals of South Korea, Malaysia and Thailand were stronger, at least not worse than the European economies in distress, the former failed to attract foreign capital even when their interest rate went through roofs."

So, we can write for the developing countries,

$$K_t = \Im\left(\frac{de_t}{dt}\right) \text{ and } \Im' \prec 0$$

for simplicity, we assume a linear form of this functional relation and incorporate it into figure 1. The line, CD, in figure 2 represents this functional relation.
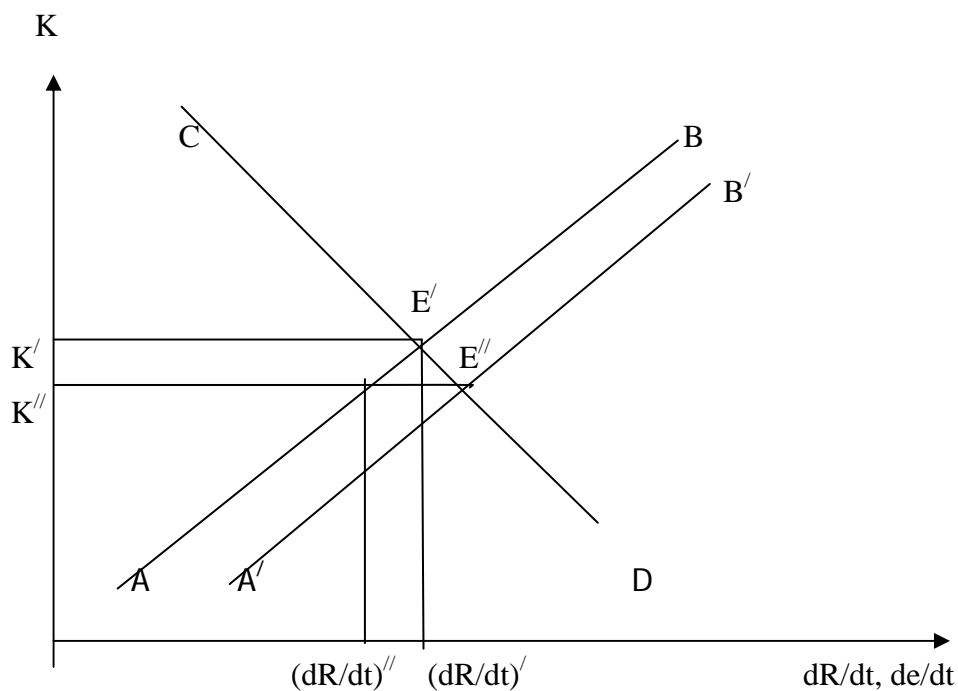

figure 2

The point E in figure 2 signifies for a change in foreign exchange reserve how much will be change in exchange rate. To understand the mechanism of it — Suppose, the central bank wants to increase the stock of reserves at a faster rate. So dR/dt will go up. Then there will be tendency of $E^{/}$ to move towards right. As a result exchange rate will depreciate and capital outflow will start and AB line start moving downwards, and the new equilibrium will be at $E^{//}$. Suppose, there is an increase in the US Fed rate and capital outflow is taking place from a particular developing country. The capital flow has come down to $K^{//}$ at a given dR/dt i.e. $(dR/dt)^{/}$. As a result the exchange will depreciate, say at point $E^{/}$. Now for $K^{//}$ the required dR/dt is $(dR/dt)^{//}$. So the addition to stock of reserves will come down. And it will put pressure on the exchange rate to appreciate and this may bring some capital inflows also. As a result the exchange rate appreciates and moves towards $E^{/}$.

II

Suppose, whatever capital flows are coming everything is being absorbed by the central bank. It implies de/dt = 0. So, the line AB (figure 3) will be with slope of 45°. Now the question is when can a country have a line like this? A central bank will absorb the whole capital flows, if they feel that the country does not suffer from problem of getting finance. Also not absorbing whole capital flows will bring appreciation of exchange rate and that may have an adverse impact on the real economy. But the accumulation of reserves is also having its own costs. Generally, in developing countries the foreign exchange are kept in highly liquid US $ or other developed countries currency like Euro denominated assets. Naturally, the rates of return of these assets are quiet low compare to the rate of return earned by capital flows coming to the developing countries. So, whether, the central bank will absorb

the whole capital flows depending upon a cost-benefit analysis by taking into account all these factors.

Suppose, there is a optimum ratio of stock of net foreign capital inflow and stock of reserve for which a developing country's central bank absorbed whatever net capital inflows are coming. So, the economy is in line AB (figure 3, for simplicity, we have removed the line CD of figure 2). And the exchange rate is stable. But capital flows are continue to come, as an increasing stock of reserves will always create this expectation that in future the exchange rate will appreciate, the stock of reserve will go up and as it has a cost, after certain period, the central bank will not absorbed the whole net capital inflows and exchange rate will appreciate. Then the slope of the line AB will increase from 45°. It will move towards $A^{/}B^{/}$ in figure 3. As exchange rate appreciation will bring capital inflows at greater rate, the increase of slope of line will be increased at a faster rate. Ultimately, one day, the net capital inflows will reach such a level that the stock of reserves will not be sufficient to generate confidence that exchange rate will be at least stable in future. And, the collapse of exchange rate will start.

Now, let us assume, according to the central bank, it can purchase more foreign exchange than what net capital flows are bringing in. i.e., the slope of the line AB is lower than 45°, i.e., $A^{//}B^{//}$ in figure 3. The immediate effect may be it will depreciate the exchange rate. And if this creates a expectation that the central bank will continue to do so, the exchange rate may be depreciate for quiet some time. But as it will increase the stock of reserve continuously, there will be a continuous pressure on exchange rate to appreciate as increasingly more and more traders in foreign exchange market will expect exchange rate to appreciate. And so after certain point the effectiveness of this policy will have vanished. And exchange rate will start to

appreciate. More capital flows will come, the stock of reserves will further go up and exchange rate will appreciate further. The increasing burden on the economy due to the increasing stock of reserves will force the central bank one day to purchase less foreign exchange than the net capital inflows and the AB line will start moving upward. As a result the rate of exchange rate appreciation will increase further, more capital flows will come and the country will move towards a currency crisis.

Figure 3
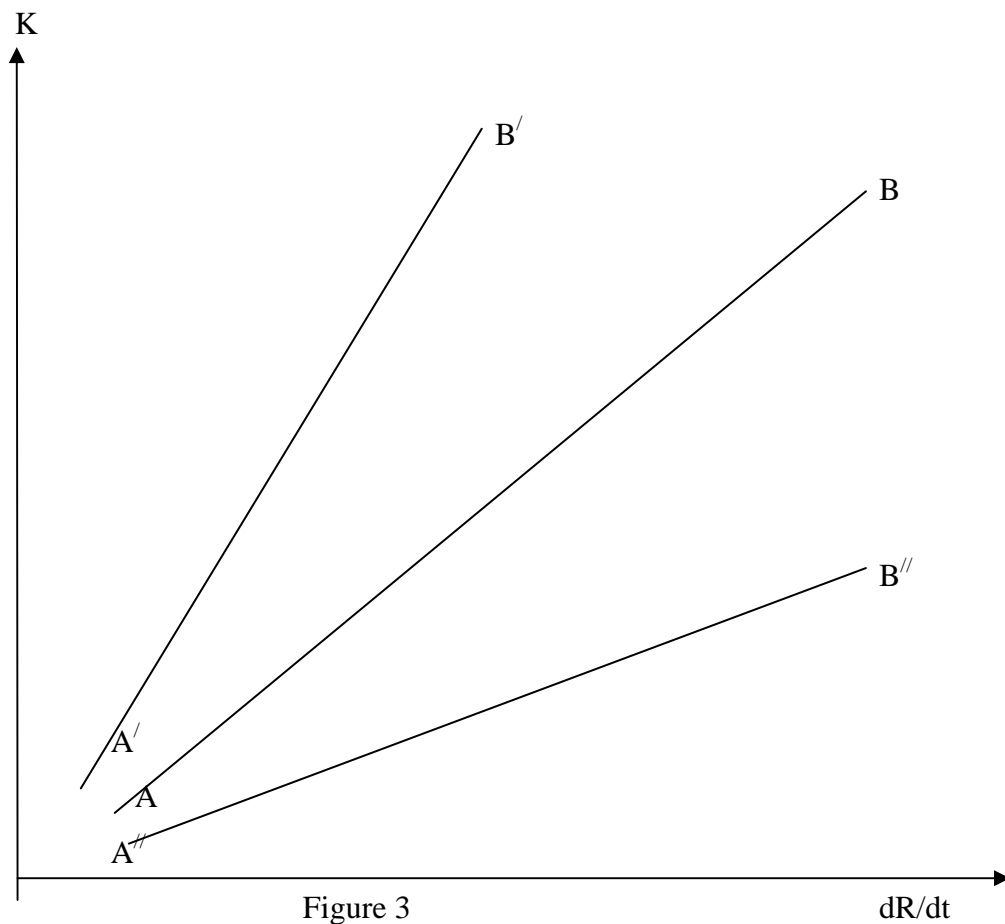
So, there is no way a developing country can avoid a currency crisis. The only option is to change the nature of capital flows — that is the speculative nature of capital flows has to be changed — the only policy option available to developing countries is to put some capital control measure, so that the inflows of speculative capital get restricted.

But the question is why developing countries are so hesitant to put some capital control measures? The answer is, putting on capital control is against the interest of finance capital as well as big industrial monopoly capital of developing countries. It is quiet evident, why finance capital does not want capital control. The big industrial monopoly capital does not want it because it reduces the cost of capital to them as they will be able to get high premium in their equity issues and also if they cannot invest these low cost capitals into productive purposes, they can invest in the stock market or adopt other means of inter-corporate investment. As a result they can earn profit without taking production activity — increase the control over greater resources. As a consequence, their monopoly power goes up.

End Note
[i] Dominguez, K and Frankel, J A (1993),
Schwartz, A. J. (2000),
[ii] Eatwell, J. (1996)
[iii] B.I.S. (2005),
[iv] Source of the data is Balance of Payment Statistics, Various Annuls Issues, IMF. Washington
[v] For more recent information see Galati, Gabriele and Philip Wooldridge, (2006) "The Euro as a Reserve Currency: A Challenge to the Pre-eminence of the US Dollar?" BIS Working Paper No-218, B.I.S. Basle
[vi] Rakshit, M.(2002, p.255)

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