EXCHANGE RATE MOVEMENT
OF DEVELOPING COUNTRIES
An Alternative Theoretical Framework

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[*Abstract:* *The role of foreign exchange reserves in explaining exchange rate behaviour has been neglected in exchange rate theories which either excluded these reserves as a determinant or treat them merely as a residual factor. However, while this may not be the case with currencies that have a reasonable amount of use as international money, foreign exchange reserve have been playing an important role in determining the nominal exchange rates of developing countries. This paper develops a theoretical framework, in heterodox tradition, for understanding exchange rate movements in developing countries by keeping foreign exchange reserve at the centre stage. The analysis also suggests that to avoid currency crises, developing countries need to restrict the movement of speculative capital.*]

Introduction

In the flexible exchange rate system of the post-Bretton Woods era, the exchange rates of most countries' have come to be determined in the foreign exchange market. As a result, in principle the link between the exchange rate and the stock of reserves should not exist. Countries however follow various type of pegged exchange rate system, such as, managed float or an independent floating exchange rate system etc.. 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 do have sizeable intervention in the foreign exchange market. Therefore foreign exchange reserves should be one of the important factors behind exchange rate stability.

This paper tries to develop a theoretical framework, in heterodox tradition, for understanding developing country exchange rate movements by keeping foreign exchange reserves at the centre stage. Most theories of exchange rate behaviour have neglected these reserves as an important determinant of the exchange rate, either by ignoring them or by treating them as a residual factor. This is true of the Mundell-Fleming-Dornbusch theory of exchange rate behaviour, the portfolio balance model and most of the currency crises theories. Monetarists link up reserve changes and exchange rate changes through the changes in the money supply. In the monetarist framework, intervention in the foreign exchange market by any central bank will be effective in changing the exchange rate only to the extent that it brings about a change in the money supply with a resultant change in the price-level. Some economists[1] have argued that sterilized intervention is also effective in influencing the exchange rate through either of two channels — portfolio balancing and signalling.

The portfolio balance approach says that because of foreign exchange risk, domestic and foreign securities are imperfect substitutes. Investors therefore have to be compensated by a risk premium for holding foreign securities. Sterilized intervention changes the supply of foreign securities relative to domestic securities and disturbs the equilibrium in the investors' portfolios. To restore balance a change in risk premium measured as the deviation from uncovered interest rate is required. Hence the 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, the supply of foreign currency denominated assets will increase. Consequently 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 have to 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 1> $f' > 0$ or $f' = 0$, for the

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[1]   Dominguez, K and Frankel, J A (1993), Schwartz, A. J. (2000)

risk premium 'ϕ' to come down the exchange rate has to appreciate. If regressive expectation operates, i.e., for $f' < 0$, then $\dot{\hat{e}}$ will go up as exchange rate appreciates. If f' has a very large negative value, the exchange rate will appreciate by a very small amount.

The second channel, signalling 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 discussed thus link up the reserve changes and exchange rate movements by keeping money supply at the centre stage. The obvious criticisms of these theories relate to their assumptions of a full employment situation as well as an exogenous money supply. This paper is premised on the contention paper that there is no need to make such assumptions or bring money supply into the picture to establish the link 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.

The remainder of this paper is organised as follows. The first section develops the theoretical framework. Based upon this framework section two then further explores exchange rate behaviour and concludes that to avoid currency crisis the movements of speculative capital need to be restricted The paper get concluded with a summing up paragraph.

I. Theoretical Framework

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 flows can be an indicator of a change in the expected exchange rate.

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 day's turnover in the world's foreign exchange markets. This indicates that no single central bank or even a number of central banks intervening together in exchange markets can hope to counter a concerted onslaught on a particular currency or currencies by the exchange markets. This lack of quantitative power on the part of the central banks means that for its intervention in the foreign exchange market to be effective a central bank must act upon the exchange rate expectations that prevail in the market. In other words, the role of central bank intervention is to change these expectations and it would be effective only to the extent that foreign exchange traders believe that it will be effective. This is where the stock of reserves matter because this market belief depends significantly upon the magnitude of the stock of reserves held by the Central bank.

Suppose the rupee is depreciating, in Indian context, the RBI may start to or be expected to sell dollars and buy rupees 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, the relationship between changes in reserves, capital flows, and the expected exchange rate can be written as follows:

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

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

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

K= capital account inflow

We assume that 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.

We can further write,

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

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

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

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

$$or, \frac{de_t}{dt} = g(\frac{dR_t}{dt}, K_t)$$

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

straight line with positive slope, AB, in Figure-1 (for simplicity, we have assumed this functional relationship as a straight line).

The validity of the relationship between exchange rate change, foreign exchange reserve change and capital flows stated in the Figure-1 depends upon two conditions. First, that the change in foreign exchange reserves is exogenously determined, and second, that the capital inflow is autonomous of the current account or to be precise, current account deficit does not have a significant influence on the exchange rate.

Figure-1
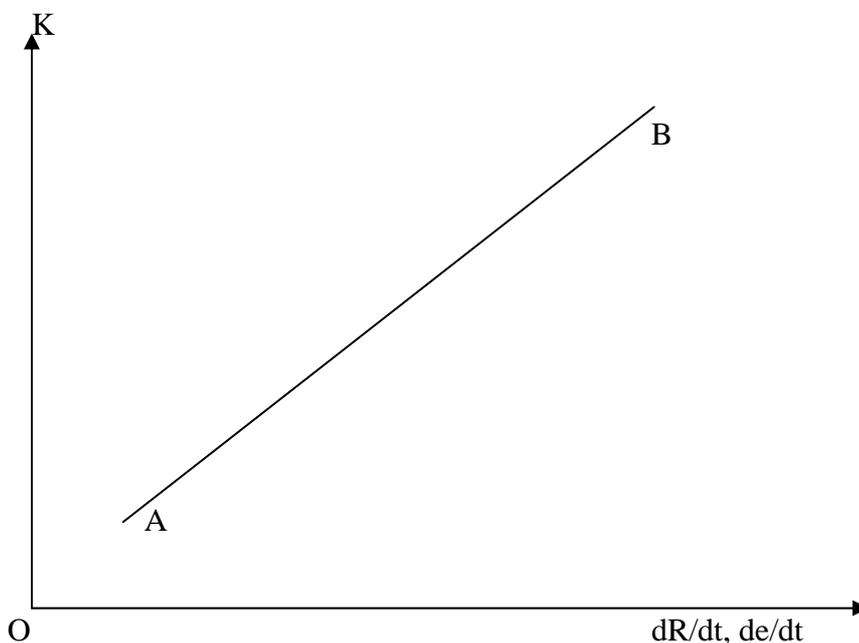
Why do we need these two conditions? Their necessity arises from the fact that change in stock of reserve is nothing but the aggregate of net capital inflow and net current account surplus. If changes in the reserves and net capital flows are the two determinants of exchange rate change, then the current account has to be the adjusting factor to maintain the balance of payment identity. Let us therefore examine the validity of these two conditions.

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 maintain at least at the critical level its foreign exchange reserves, based on its own perceptions about what this appropriate level is. Since they do not generally make public beforehand this level, the change in the reserve

stock is determined by the central banks and it is treated as exogenously given here. If the current account is not influencing capital flows significantly and rather itself is substantially 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 earlier and seven years in 1960[2]. 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 leads to gradual disconnection from real world, because to earn profits the capital market is no longer 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 the total average per day foreign exchange turnover. As a result, capital inflows are coming into 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.

Let us now look theoretically at how the current account balance can influence the interest rate of a country. Suppose a country's current account balance is increasing. If

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[2]   Eatwell, J. (1996)

the economy is in under full employment equilibrium for a given exchange rate the income will increase, the aggregate demand will also 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 remain 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. Even if we assume that the money supply is exogenous (which can be questioned) capital flow may not be sensitive to changes in the rate of interest, most probably for the developing nations, as the levels of exchange rate fluctuations are high for them. At full employment an increase in current account balance will change the price, not the rate of interest..

Next we shall examine the influence of current account on capital flows through the exchange rate. If we look at the data of the whole world capital transactions have increased to such a level that the foreign exchange transactions for foreign trade in goods and services is negligible today. The volume of transaction in the year 2004 stood close to $1.9 trillion per day[3]. 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[4] 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 flows can influence the current account balance through various channels. If capital flows influence the exchange rate then changes in the exchange rate will influence both imports and exports. Also, increase in capital flows increases 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 constrained economy.

Capital flows can influence the current account not only through imports and exports, but also through the factor income flows they generate. We have seen that the gross transactions 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 had flows of

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[3] B.I.S. (2005)

[4] World Bank (1997)

factor payments on capital in excess of 10% of their gross current account flow in 1998[5]. For Japan it was close to 30% throughout 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 usually within the range from 10% to 20%. For developing countries also the flows constituted by investment income, compared to their current account flows has been large, though not as large as in the developed world. The Latin American countries positions in this regard are quite comparable to that of the developed world. But for East Asian countries and India the ratio is not that large, varying roughly between 3 to 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, it 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.

Now, 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 can be 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 reasonable to presume that developed countries' rate of interest policy is relatively more effective in attracting capital flows compared to that of developing countries. Capital flows that come into developing countries instead are more likely to be sensitive to exchange rate changes.

A plausible explanation for the different degrees of sensitivity of capital flows to real rate of interest changes for developing countries and developed countries lies in the fact that the currencies of the latter group of countries enjoy expectations of greater stability in their currency value. 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

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[5]   Source of the data is Balance of Payment Statistics, Various Annual Issues, IMF. Washington

developed countries have much greater use as international money (see Table-1[6]), the general expectation is that these countries' exchange rates are more stable compared to developing countries.

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

This expected stability discourages foreign investors from having a capital gains motive and capitals flows are therefore less sensitive to the exchange rate change in the developed world. In the case of developing countries however, the exchange rate fluctuates to a much greater extent. 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. That makes capital flows to these countries more sensitive to the percentage changes in exchange rate than to the rate of interest differentials. Hence, for developed countries the capital flows can be altered through the rate of interest change but the same does not hold for developing countries.

Others also share this observation. In fact, Mihir Rakshit[7] 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*

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[6] 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

[7] Rakshit, M.(2002, p. 255)

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, for the developing countries we can write

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

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
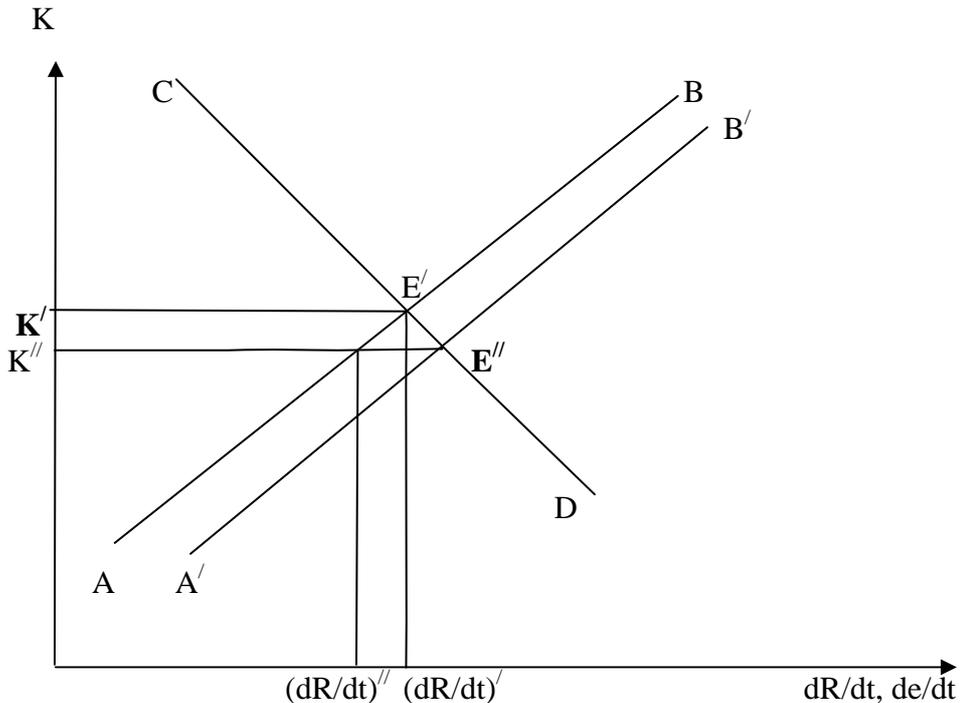
The point E′ in figure-2 signifies how much will be the change in exchange rate for a given change in foreign exchange reserve. To understand its mechanism—let us suppose, that the central bank wants to increase the stock of reserves at a faster rate. So dR/dt will

go up. Then E′ will tend to move towards the right. As a result exchange rate will depreciate and capital outflow will start and AB line will 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, from point E′ there will be tendency to move downward. 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. Further Explorations

Let us assume that whatever capital flows are coming are entirely absorbed by the central bank. It implies de/dt = 0. So, the line AB (Figure-3) will have 45° slope. Now the question is when can a country have a line like this? A central bank will absorb the entire capital flow if it feels 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 also has its own costs. Generally, in developing countries the foreign exchange reserves are kept in highly liquid US dollar or other developed countries currency like Euro denominated assets. Naturally, the rates of return of these assets are quiet low compared 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 or not will depend upon a cost-benefit analysis by taking into account all these factors.

Suppose now that there is an optimum ratio of the stock of net foreign capital inflow and the stock of reserves, at which a developing country's central bank will absorb 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. The increasing stock of reserves will however create an expectation of a future exchange rate appreciation and this will attract further capital flows. The increasing costs associated with the increasing stock of reserves would however mean that beyond a period the central bank will not absorb the entire net capital inflows and then the 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 in the slope of the line will take place at a faster rate. Ultimately the net capital inflows would reach a level where the stock of reserves would not be sufficient to generate confidence that exchange rate will be at least stable in the future. And, the collapse of the exchange rate will start.

Now, let us consider an alternative scenario. Let us assume that the central bank may 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 of such levels of purchases may be the depreciation of the exchange rate. And if this creates an expectation that the central bank will continue to purchase foreign exchange in the same way, the exchange rate may depreciate for quiet some time. But as such purchases will continuously increase the stock of reserves, there will be a continuous pressure on exchange rate to appreciate as more and more traders in foreign exchange market will expect such an appreciation. Therefore, after a certain point the effectiveness of the central bank's policy will vanish 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 again eventually force the central bank 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
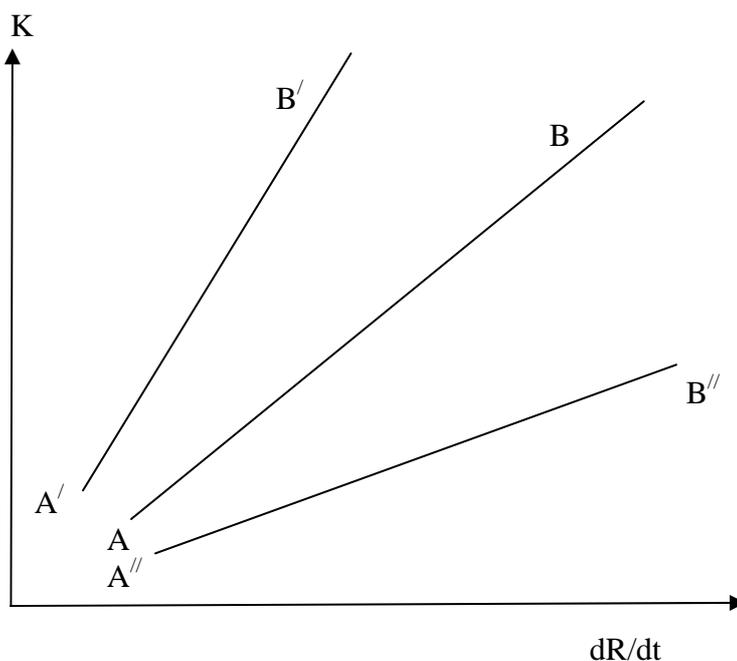
It follows from the above that there is no way a developing country can avoid a currency crisis if it is open to speculative capital flows. If such crises are to be avoided, the only option is to change the nature of capital flows by putting in place some capital control measures that would restrict the inflows of speculative capital.

But the question is - why are developing countries so hesitant to impose capital control measures? The answer is the pressure from international finance capital as well as the big industrial monopoly capital in developing countries because capital controls go against their interest. Why finance capital does not want capital controls is quite evident. Big industrial monopoly capital also does not want them because openness to capital flows reduces the cost of capital to them. They can get high premiums on their equity issues and in case they are unable to put this low cost capital to productive uses, they can invest it in the stock market or adopt other means of inter-corporate investment. As a result they can earn profit without undertaking production activity and increase their control over resources. As a consequence, their monopoly power goes up.

Summing Up

This paper has developed a theoretical framework for understanding the relationship between the stock of a developing country's foreign exchange reserves and its exchange rate. This relationship has been generally neglected in theories of the exchange rate. But in the contemporary context of a world characterized by openness to speculative capital flows, it is of critical importance for developing countries whose currencies do not have significant use as international currencies. For such countries, the framework developed demonstrates that the relationship between the reserve stock and the exchange rate, working through the role of the former in shaping expectations about the latter's future, sets of a dynamic at whose conclusion a currency crisis becomes inevitable. As such this paper reinforces the case for capital controls in developing countries.

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ISID has developed databases on various aspects of the Indian economy, particularly concerning industry and the corporate sector. It has created On-line Indexes of Indian Social Science Journals (OLI) and Press Clippings on diverse social science subjects. These have been widely acclaimed as valuable sources of information for researchers studying India's socio-economic development.

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