THE MOVEMENTS OF THE REAL EXCHANGE RATE IN DEVELOPING ECONOMIES: A THEORETICAL CUM EMPIRICAL STUDY

Dissertation submitted to **Jawaharlal Nehru University**
In partial fulfillment of the requirement for
the award of the degree of

MASTER OF PHILOSOPHY

Abhijit Pathak

CENTRE FOR ECONOMIC STUDIES & PLANNING
JAWAHARLAL NEHRU UNIVERSITY
SCHOOL OF SOCIAL SCIENCES
NEW DELHI - 110 067
INDIA
2002

CENTRE FOR ECONOMIC STUDIES & PLANNING
SCHOOL OF SOCIAL SCIENCES
JAWAHARLAL NEHRU UNIVERSITY

New Campus
NEW DELHI - 110 067

July 2002

Certificate

This is to certify the dissertation entitled "***The Movements of the Real Exchange Rate in Developing Economies: A Theoretical cum Empirical Study***", submitted by me in partial fulfillment of the requirements for the award of the degree of **MASTER OF PHILOSOPHY** has not been previously submitted for any other degree of this or any other University.

Abhijit Pathak
(ABHIJIT PATHAK)

We recommended that this dissertation be placed before the Examinees for evaluation.

Prof. Prabhat Patnaik
(SUPERVISOR)

Prof. C. P. Chandrasekhar
(CHAIRPERSON)

Phone : 6107676, 6167557, Ext. : 2421, 6105197 Cable : JAYENU Telex : 031-73167 JNU Fax : (011) 6165886, 6198234

Dedicated to parents

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All the mistakes that remain in the dissertation are mine.

ABHIJIT PATHAK

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Chapter I

Introduction

Exchange rate economics is one of the most researched topics of Economics. Even though over the last two decades research in this field has increased phenomenally, still not much success has been achieved in unraveling the determinants of exchange rate movements. From time to time neo-classical economists have been candid in expressing the difficulties they face in explaining the movements in exchange rate (MacDonald and Taylor, 1992, Harvey 1996)[1]. Despite the fact that it is one of the most well researched fields, in most cases the result of the performance models in empirical testing is so poor that mainstream economists have readily admitted their disappointment (MacDonald and Taylor, 1992).

Over the last two decades, particularly after the breakdown of the Bretton Wood System, the currencies of the developing countries have depreciated at a very high rate. This phenomenon is common both for the Asian and Latin American Countries, though the rate of devaluation is much, much higher for the developing countries of Latin America. For many of the Latin American countries exchange rate management has become a huge problem and they have continuously devalued their exchange rate, changed exchange rate regime and some of them have changed their currency twice or thrice. In some cases in Latin American countries exchange rate has devalued up to (50-100)% in a year. [For Colombia, Mexico, Brazil and others]. High nominal devaluation and high inflation is a very common picture for Latin American countries. On the other hand, Asian countries in most cases have experienced less inflation

[1] MacDonald and Taylor. 1992. "*Exchange Rate Economics: A Survey*", IMF Staff Papers. 39: 1-57.
Harvey, T. John.1996. "*A Post Keynesian View of Exchange Rate Determination*", Journal of Post Keynesian Economics. 14: 61-71

and less devaluation episodes. According to Purchasing Power Parity theory the nominal devaluation takes place to take care of the inflation rate differential between two countries and therefore in the long run, the real exchange rate should be stable and should not show any particular (positive or negative) trend. Here when we are talking about purchasing power parity, we are only interested in absolute purchasing power parity and not in the relative version of purchasing power parity. While year-to-year misalignment in real exchange rate may happen due to short-run adjustment problems, in the long-run 'Absolute Purchasing Power Parity' should hold.

The basic ideas behind the establishment of the Bretton-Wood System after the end of the second World War was to establish a stable medium of exchange for holding wealth and avoid the competitive devaluations, due to trade rivalry of the interwar period, to avoid uncertainty in the international payment system. Capitalism always needs a stable medium of exchange in which wealth can be held, and the value of that medium of exchange should not decline relative to other currencies. For this reason, the US dollar was recognized as an international currency, and fixity of dollar to gold was also made, when all other currencies maintained a fixed exchange ratio with dollar. In 1971, when the US realized that fixity of gold to dollar could not be maintained, due to short-term liquidity pressure generated from Euro-Dollar market (and they did not have that amount of gold), in spite of valiant attempts from Japan and other developed countries dollar was depreciated for the first time in the 3rd quarter of this century. From then though no dollar gold fixity is committed by US, still the dollar is treated as good as gold, and most of the wealth, bonds and reserves are held in dollars and still the dollar is continuing to enjoy the status of a dominant currency though there is no responsibility of maintaining dollar gold parity. During the last quarter of

the 20th century, we have seen that dollar is an extremely stable currency and most of the reserves and bonds are held in dollars, while currencies of almost all the developing countries have experienced very high devaluation.

In this dissertation we would like to see the trend in the long run real exchange rate behavior for some major developing countries, and then examine the factors that can plausibly be said to have some significant impact on the real exchange rate behavior of these countries.

In the second chapterwe would define and construct real exchange rate series for the developing countries of our sample and examine the overall trend they have been following.

In the third chapter we would have a critical examination of the Balassa-Samuelson theorem, which is perhaps the earliest and most influential theory of real exchange rate movements. Balassa and Samuelson try to explain real exchange rate movements, as early as 1964, and since then, both theoretically and empirically, it is the most discussed in all the literature of real exchange rate determination and misalignment.

In the fourth chapter we would see what are the other factors, which are said to have a significant impact on real exchange rate behavior. In many theoretical papers terms of trade, nominal devaluation and government expenditure are said to be the other major factors having a significant impact on real exchange rate movement, other than the productivity bias theory of Balassa-Samuelson. In this chapter we have tested whether these factors have any significant impact on real exchange rate movements of developing countries.

Persistent trade and current account deficit is argued to be one of the major factors for the depreciation of the real exchange rate for many developing countries over the past two decades. However one of the most important developments in international economic relation is the phenomenal increase in capital flow and capital account transactions. Even though in the literature of exchange rate economics current account is still thought of as the driving force, the importance of capital account can never be ignored as capital transactions in the last past decade has overshadowed the trade related transactions even for the developing countries. The liberalized exchange and trade regime adopted by developing countries has witnessed high inflow and outflow of short-term private capital for the last decade, while long-term official flow has almost dried up. Under these circumstances importance of capital flow or capital account should get more attention than it generally gets in the exchange rate determination literature. In the fifth chapter we would mainly concentrate on two important issues. The first one is to see whether high current account deficit leads to depreciation, as many economists think. And then we have also investigated whether net capital flow or private capital flow has any significant impact on real exchange rate for both developing and developed countries. It may well happen that competitive devaluations in the 80s can be one reason for long run real exchange rate to depreciate in 80s, when most of the countries were more or less in fixed or officially managed exchange rate regime. However in the 90s, when most of the countries are under flexible exchange rate and liberalized trade regime competitive devaluation can not be the reason for real exchange rate to depreciate. Under these circumstances, the role of capital account for the real exchange rate behaviour and secular decline in real exchange rate for developing countries vis-à-vis developed countries becomes extremely important and we have investigated this issue in this chapter and the next one. The penultimate chapter discusses in particular

some of the implications of capital flows for the developing economies, while the concluding chapter provides a summary of the arguments of this dissertation.

Chapter II

Real Exchange Rate Movements of Some Developing Countries

The objective of this chapter is to construct long run real exchange rate series and see the long-run trend of these series. Here we have constructed real exchange rate series of 16 developing countries, all of them have the US as one of their major trading partners. Except Zambia all the countries of these sample are from Asia and Latin America. However data limitations have forced us to abandon Zambia and China, as many of the explanatory variables for this country are not available. While working we have seen that many of the countries we initially thought of including does not have very long series. That is why we have tried to take those major developing countries, which have data on the explanatory variables for quite a long time series. We have mainly tried to collect data for real exchange rate construction after 1950. For many of the countries in our sample real exchange rate is constructed from the late 50s or the early 60s also. The methodology of real exchange rate construction will be discussed below.

Obviously the exchange rate regime varies widely from period to period and from country to country, some of the countries deploying even marked structural breaks in exchange rate regime. To appreciate the problem of exchange rate changes, we need to divide our period into two major periods. The first one is the period of the Bretton Woods system, which was in operation from 1950 to1971 and under this regime each country, used to fix its currency vis-à-vis the US dollar when 1 US dollar was equivalent to 35 ounces of gold. Under the BW system each country had to take permission before any devaluation. The objective in Bretton-Woods system was, first, to avoid trade wars through competitive devaluations among the countries, which had been a prominent feature during the intra war years; secondly, the aim was to create a stable currency, the US dollar, in which the wealth can be held. After the breakdown of Bretton-Woods system there is officially, no fixity in price of

the dollar vis-à-vis gold. In the post BW period when most of the developed nation have moved to a flexible exchange rate policy, for developing countries the exchange rate policy varies widely amongst the countries. However there is a trend the last two decades, and especially during the decade of the 90's, many developing countries to have gradually shifted towards a more flexible exchange rate policy rather than having the currencies pegged to the dollar.

To keep the exchange rate rigidly fixed, the national authority would have to participate continuously in the in the foreign exchange market to buy as much of its currency as market participants might otherwise offer to sell, and sell as much of their currency as market participants might otherwise seek to buy. However, in practice, countries rarely seek to keep their currencies rigidly fixed. Instead, countries that adopt a fixed exchange rate arrangement generally provide for a limited degree of flexibility by defining fluctuation ranges or bands around the central parities. Exchange rates are allowed to fluctuate within the bands in response to buy and sell orders of market participants. But to prevent exchange rates from trespassing the limits of the bands, national authorities are committed to intervening when necessary. In the same way countries rarely allow their exchange rates to float freely. In most countries with floating exchange rate policy, the national authorities follow foreign exchange market developments closely through every trading day, sometimes intervening to purchase or sell currencies for the purpose of limiting the fluctuations in the market which excess supply or excess demand can cause. But in this chapter we have tried to the over all long run trend of the real exchange rate of some major developing countries. For a first step now it is extremely important to define real exchange rate and then to describe the methodology before we move on to see the over all trend of the real exchange rate.

A traditional and widely prevailing definition of the real exchange rate relies on the purchasing power parity approach (PPP). According to this view, the PPP real exchange rate (R_{ppp}) is equal to the nominal exchange rate[1] (E) corrected (i.e., multiplied) by the ratio of the foreign price level (p*) to the domestic price level (p). Here, nominal exchange rate is defined as domestic currency per unit of dollar, (Such as Rs. Per dollar)

$R_{ppp} = E\ P^*/P$.

Although this definition of real exchange rate has not been influencial in academic writing for quite some time now, it is still widely used by policy makers and other practitioners (Edwards Sebastian).[2]

However in most modern theoretical works the real exchange rate (R) is defined as the domestic relative price of tradable goods (P_T) to non-tradable goods (P_{NT}). In this case real exchange rate is defined as $R = P_T/P_{NT}$.

This definition has certain advantages as described by Sebastian Edwards.

1. This definition summaries incentives that guide resource allocation across the tradable and non-tradable sectors.

2. This definition of real exchange rate provides a good index of the degree of international competitiveness of the country's tradable sectors.

[1] Here nominal exchange rate, E implies domestic currency per unit of US dollar.

[2] Edwards, Sebastian. 1989. "*Real exchange Rates, Devaluation and Adjustment.*" Cambridge, Mass: MIT Press

The construction of an empirical measure of real exchange rate has for some time posed a non-trivial problem to the applied researchers. In particular it is not easy to find exact empirical counterparts to P_T to P_{NT}. The numerous discussions on how to appropriately measure real exchange rate have in fact generated little agreement among practitioners .In the literature consumer price index, wholesale price index and the GDP deflator are used as price indices. However in the long run all of these move more or lees in the same direction; so, in the measurement long run real exchange rate movements all of these would give more or less same picture. In fact various World Bank studies[3] which have constructed real exchange rate by various price indices in long run, there is no significant difference in the movement of different real exchange measures. However in short run, year-to-year variations, there can be some differences. But in most cases the overall long run real exchange rate picture remains more or less the same.

In our study we would use the real exchange rate

$RER_i = R_i = E\ WPI^{US}/CPI_i^{DOM}$

Where E is the annual average of nominal exchange rate. E represents units of domestic currency for per unit of dollar i.e. to say for India, E is Rs. per dollar. WPI is the whole sale price index in the US and is the proxy for the foreign price for the tradable and CPI is the consumer price index of country i and is considered as a proxy for the domestic price of non tradable.[4] For India, for instance, the time series of real exchange rate is calculated by taking, for each year, the nominal exchange rate (Rs/$).WPI(US)/CPI(India). From our index it is clear that increase in the real exchange rate (R) will actually indicates a depreciation of the

[3] Isard, Peter and Symansky, steven. 1996" Long-Run Movements in Real Exchange Rates", IMF Occasional Paper. 7-28.

[4] For china we do not get long run data for CPI or WPI and therefore we have used GDP deflator in place of CPI.

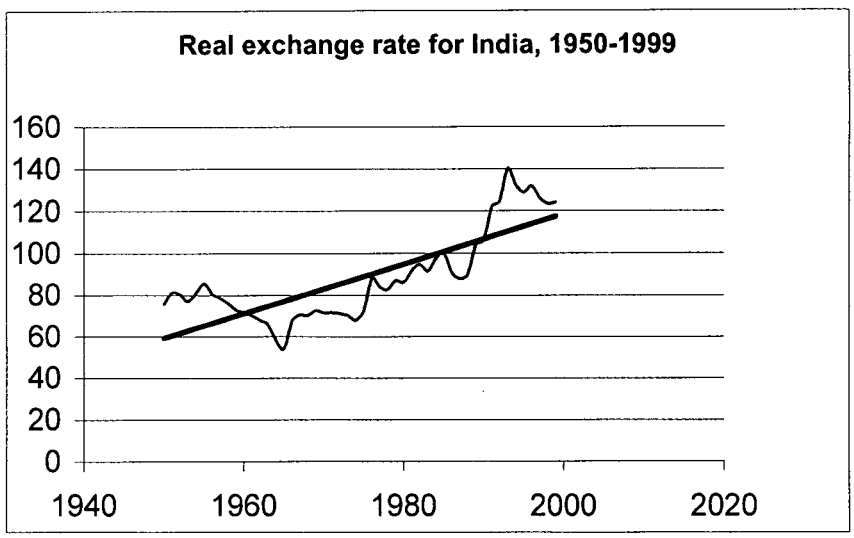
domestic currency. In our real exchange rate construction we have taken a certain year's as our base year, and the year the real exchange rate is taken as hundred as 100 and with respect to this base year the whole series is constructed on this basis. The choice of this base year can be arbitrary, as it will not in any way affect the long run picture. However in our study we have taken 1985=100 as the base year.

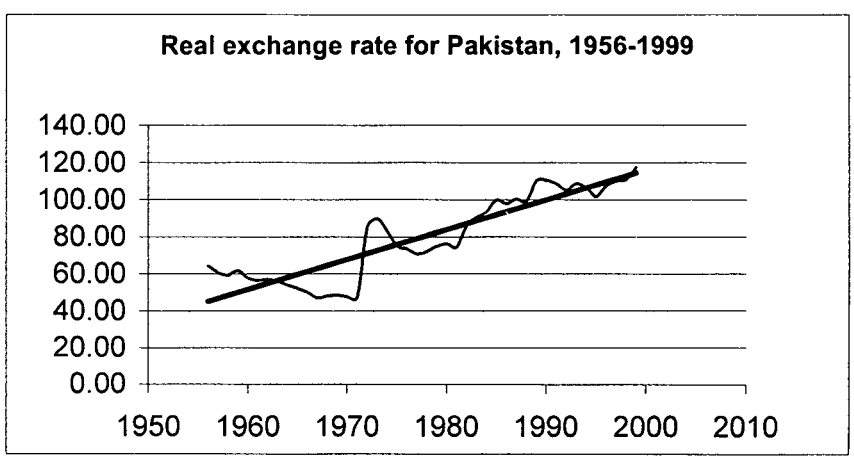
The data source of this real exchange rate construction is IFS (International Financial Statistics, published by The International Monetary Fund). All the data that are collected are annual data, i.e., the annual average of nominal exchange rate, CPI, WPI. In the case of WPI of the USA it is the producer price index, which is taken as the WPI.

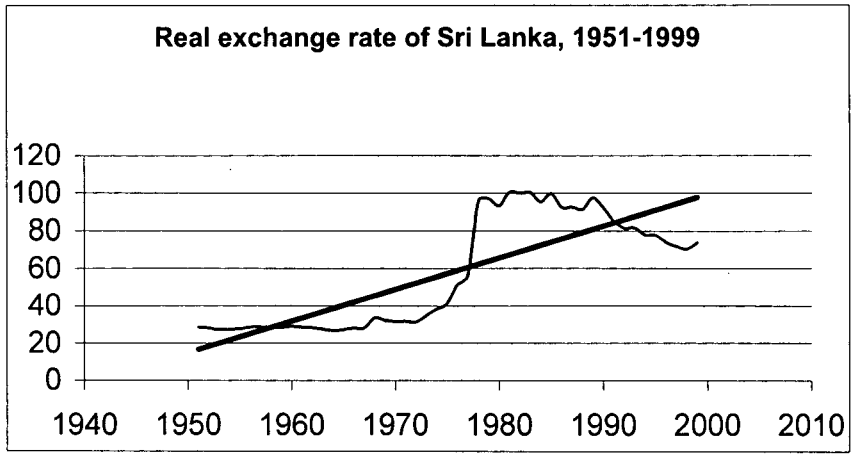
Now let us see the long run[5] trend of the "real exchange rate" of some of the developing countries: India, Pakistan, Sri Lanka, Korea, Malaysia, Indonesia, Thailand, Philippines, China, Colombia, Costa Rica, Chile, Mexico, Venezuela and Zambia.

[5] The way we have defined real exchange rate any increase or upward trend implies depreciation.

Statistical Appendix






Real exchange rate of Sri Lanka, 1951-1999
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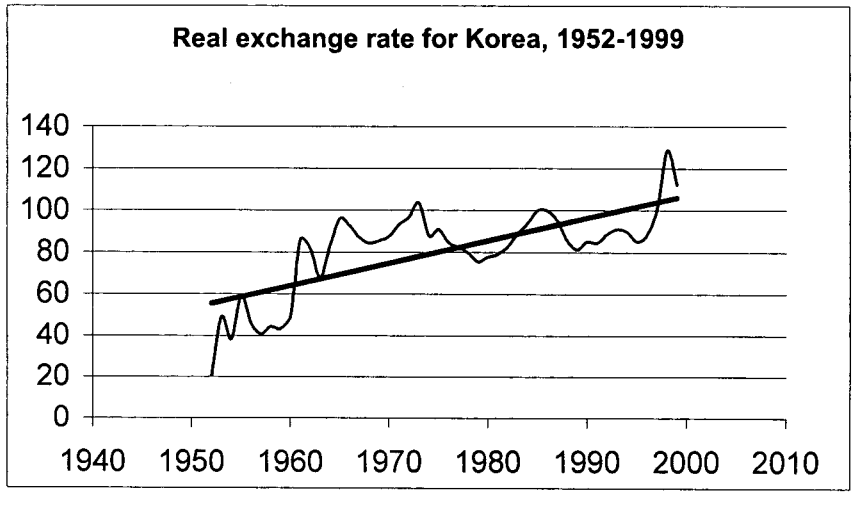
Real exchange rate for Korea, 1952-1999
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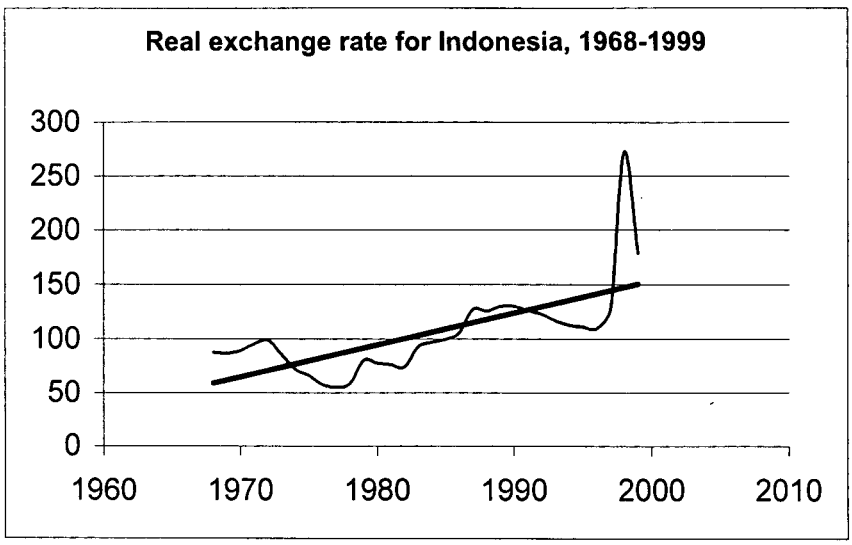
Real exchange rate for Indonesia, 1968-1999
300
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200
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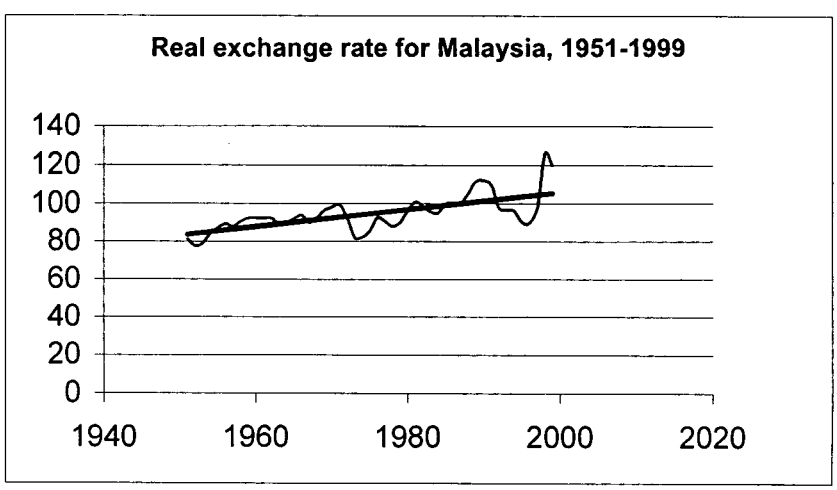
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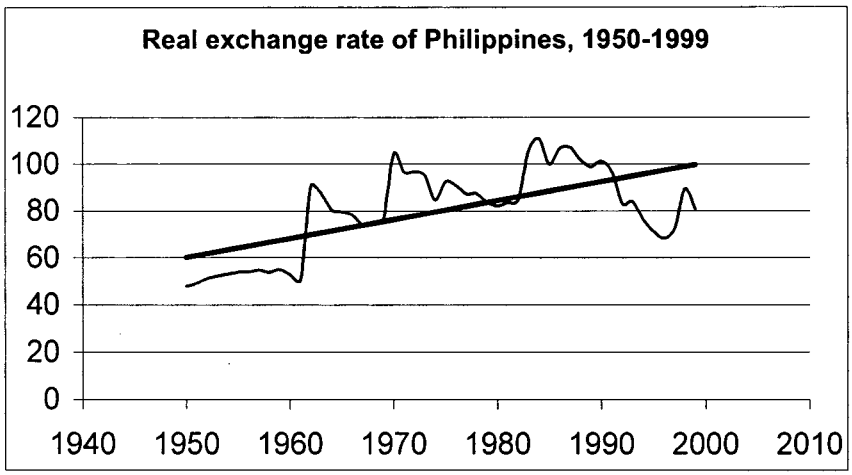
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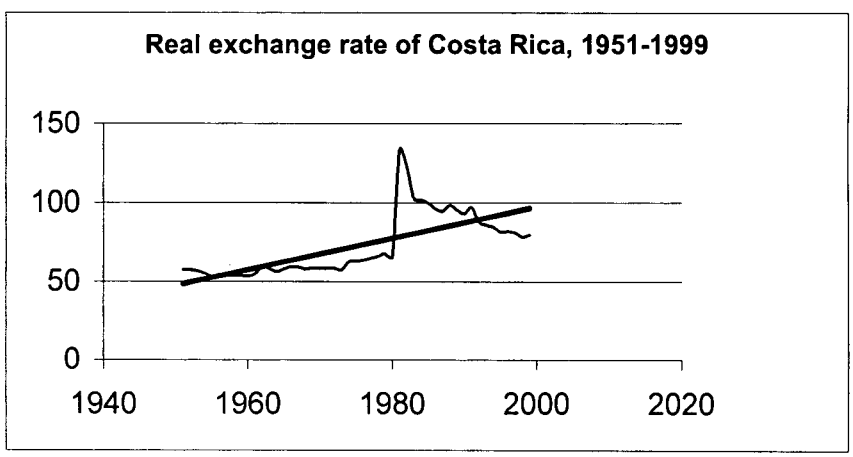
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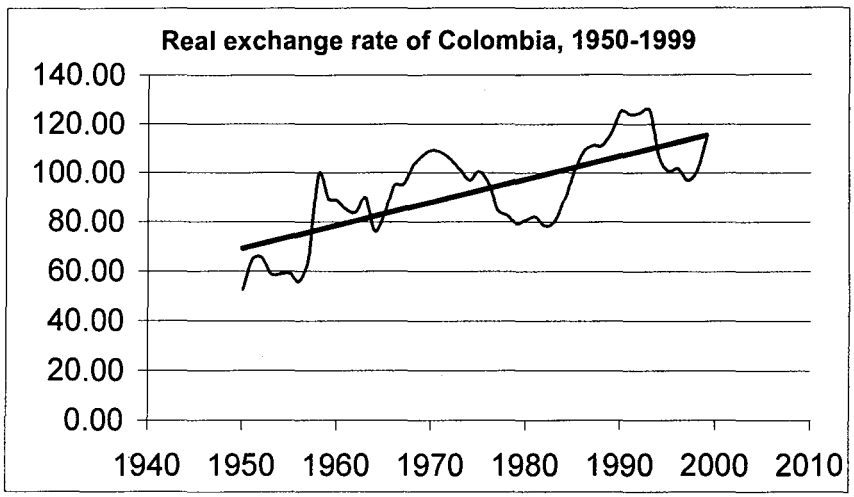
Real exchange rate of Colombia, 1950-1999
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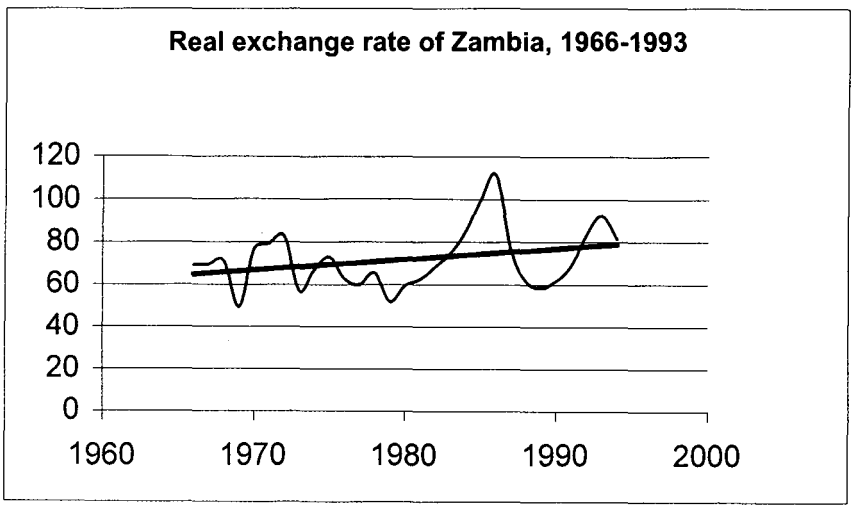
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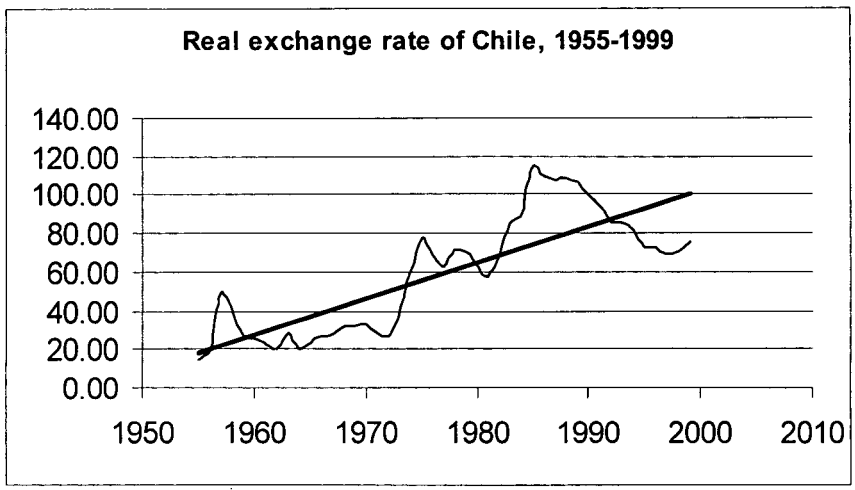
Real exchange rate of Chile, 1955-1999
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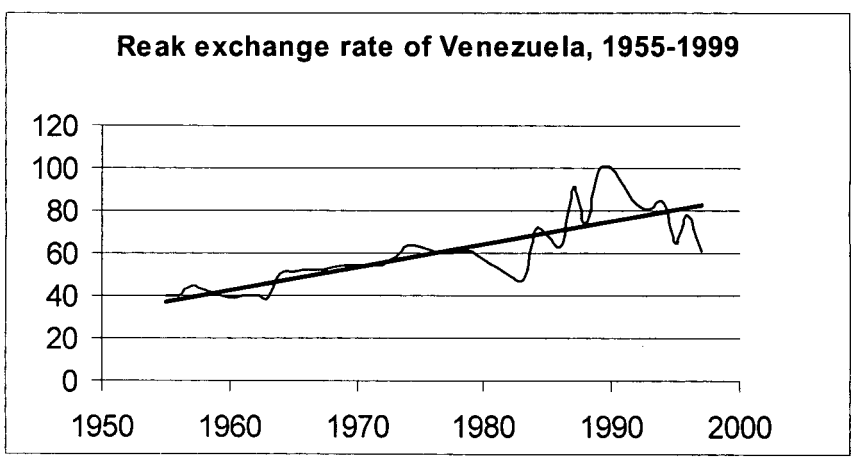
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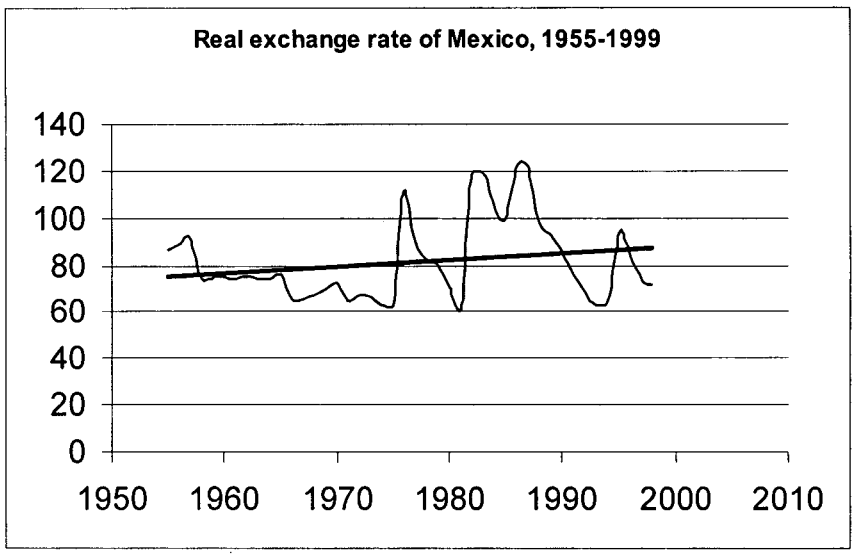
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140
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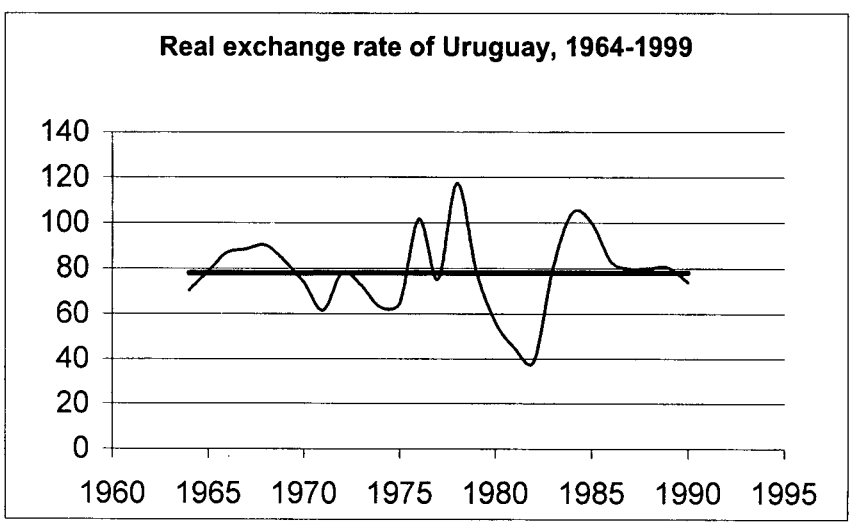
Real exchange rate of Uruguay, 1964-1999
140
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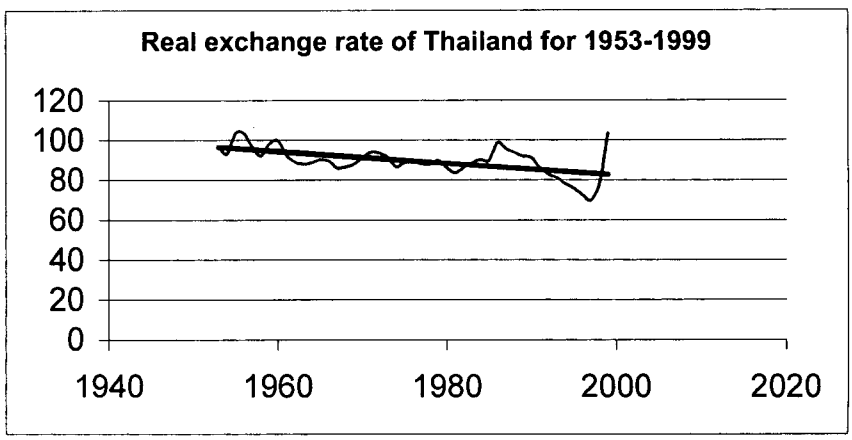
Real exchange rate of Thailand for 1953-1999
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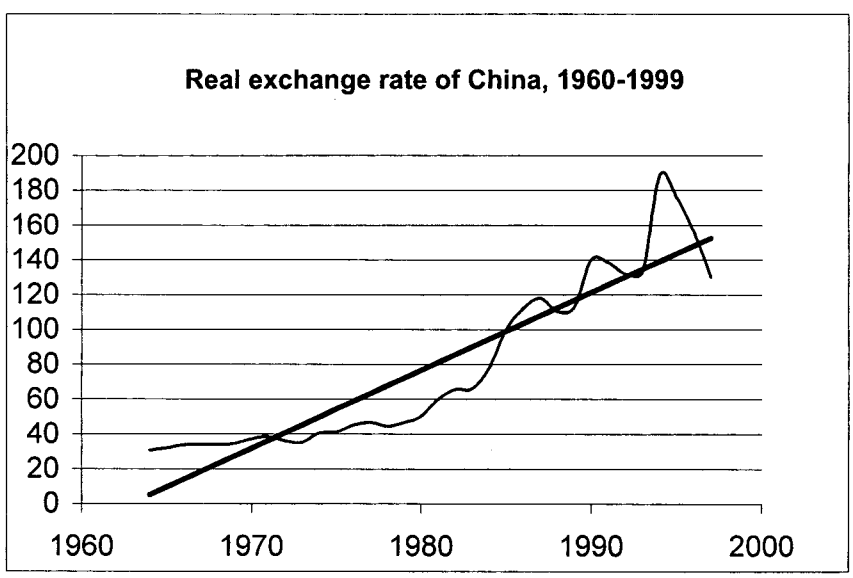
2000
2020


Real exchange rate of China, 1960-1999
200
180
160
140
120
100
80
60
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From the above statistical appendix we see that in long run most of the countries have shown a secular decline in real exchange rate except Thailand and Uruguay. For Thailand we have seen that real exchange rate has actually appreciated while for Uruguay real exchange rate in long term has no particular positive or negative trend even though its real exchange rate has fluctuated heavily over the period.

The objective of this dissertation is twofold: first is to see why real exchange rates of developing countries are experiencing a secular decline over long period of time. And secondly, we would try to test the traditional theories of real exchange rate determination to see whether the factors that are said to be major determinants of long term real exchange rate have actually any significant impact on real exchange rate and can successfully explain the secular decline in real exchange rate or there are some other factors influencing real exchange rates, particularly after 1990, in the post liberalization period.

In the second chapter therefore we would visit the most influencial and celebrated Balassa-Samuelson theorem which says that in the long run it is the productivity differential between the countries that will determine the real exchange rate appreciation or depreciation, i.e. countries with higher (lower) productivity growth relative to trading partners will experience an appreciation (depreciation) of real exchange rate in the long run.

In the 3rd chapter we would see whether the terms of trade, government consumption expenditure or nominal devaluation, have any impact on real exchange rate.

In the 4th chapter we would visit the current account and capital account explanation of real exchange rate determination.

A Note: Even though Latin American Countries have experienced very high rates of nominal devaluation over the period of time, still in many cases they have not experienced real exchange rate depreciation and in some cases they have even experienced real exchange rate appreciation in spite of very high rates of nominal devaluation. The reason lies in the very high rate of inflation. On the other hand Asian countries generally have more stable rates of nominal exchange rate devaluation, but they have experienced high rates of real exchange rate devaluation compared to nominal devaluation. Some people[6] have argued that the devaluation and inflation circle in Latin American countries is self perpetuating and aggravating. Devaluation cum inflation is actually causing more devaluation and more inflation. Countries like Uruguay, which have experienced such high rate of nominal devaluation from period to period, have nonetheless experienced no real exchange rate depreciation. However in long period most Latin American countries have experienced real exchange rate depreciation. So in this context we see that Asian courtiers are more stable than the Latin American countries in terms of their avoidance of high inflation and high devaluation rates, even though in recent years their real exchange rate has depreciated more rapidly than Latin American countries.

[6] Ghei, Nita and Hinkle, Lawrence E. 1999. "A Note on nominal Devaluations, Inflation and the Real Exchange Rate",in Lawrence, Hinkle E. and Peter, Montiel J. 1999.(ed) "*Exchange Rate Misalignment: Concepts and measure for developing Countries*", Oxford University Press, World Bank Research Observer Publication.

Chapter III

Productivity Bias and Real Exchange Rate: A Critique of Balassa-Samuelson Theory

3.A. 1.Balassa-Samuelson theorem

The major factor, which affects the real exchange rate, the factor that has received the most attention, is the productivity bias as mentioned in the Balassa- Samuelson effect. This is mainly a supply side argument and while it is a long known explanation, in recent years it has undergone some revival of interest. Although many others had perceived the existence of such a productivity bias, Balassa in 1964 provided the most persuasive analytical argument for this bias.

The basic proposition of Balassa – Samuelson[1] theorem is that if one country's growth of productivity of the tradable sector relative to non-tradable sector is higher than that of the other then the former will be experiencing a real exchange rate appreciation. A very related prediction of the Balassa-Samuelson theorem is that the faster growing countries will experience real exchange rate appreciation relative to slow growing countries because it is assumed that the country experiencing higher rate of growth is due to higher rate of growth of their tradables sector as the rate of growth of non-tradables sector is always very low.

The argument goes in the following way.

Assumptions

1. Prices of tradable are equalized across the countries.
2. Countries money wage rate is determined only by the productivity of the tradable sector.

[1] Balassa, Bela.1964. "*The Purchasing Power Parity D octrine: A Reappraisal*", Journal of Political Economy .72: 584-596.And,

Samuelson, Paul. 1964. "*Theoretical Notes on Trade Problems*" Review of Economics and Statistics 46:145-154.

3. Productivity grows faster in tradable sector than in the non-tradable sector.

4. Production in both traded and non traded sector are operating under constant return to scale using capital and labour

5. Capital is highly mobile across sectors and across countries and real interest parity holds.

When a country's income grows faster than it's trading partner, it implies that the country with higher income growth is becoming more productive than it's partner. Now productivity is not uniform over all the industries. It is assumed that productivity growth in the non-tradable sector (Balassa 1964, has taken services as non-tradables) is very low in all the countries. So it is the productivity growth of the tradable sector of the country over its trading partners, which is driving the higher increase in the per capita income than its trading partner. It is also assumed that wage rate is actually determined by the productivity of the tradable sector. Now as productivity in the tradable sector increases, money wage of this sector should increase at least in proportion to the increase in productivity and the prices of the tradable sector will be the same as international price level. With the increase in money wage in the tradable sector, wage in the non-tradable sector will also increase given the complete mobility of labour and capital. Productivity increase in the non-tradable sector being very low, price of non-tradable will increase. As the price index consists both tradables and non tradables, even though non tradables do not enter in to international trade, the higher increase in the price of non tradables in the economy with more rapidly growing per capita income would ensure that the inflation rate in the economy would be higher. This country, therefore, will experience the real exchange rate appreciation relative to its trading partners. Thus the real exchange rate will be determined strictly by supply side factors and the key relevant factor is

the growth in productivity. (Theoretically, productivity implies total factor productivity. But while using empirical examples Balassa has used labour productivity as a proxy for total productivity as no data for total factor productivity are available).

3.A.2 Mathematical exposition of the theory.

It is interesting to see the argument more rigorously through a mathematical model. Let us assume that the supply of labour is fixed and it is the only input in production. The production function exhibits constant returns to scale. The average product of labour in traded and non-traded goods sectors are denoted by A_T and A_N respectively. The nominal wage rate W is measured in the local currency. The nominal wage is actually determined in traded goods sector and it prevails over the economy, as labour is mobile between sectors at home. We are also assuming that the nominal exchange rate is determined by the purchasing power parity of tradables. The variable with a star indicates corresponding value in foreign country. With the assumption of perfect competition,

$P_T = (W/A_T)$, $PN = (w/A_N)$, $P_T^* = W^*/A_T^*$, $P_N^* = W^*/A_N^*$

These figure are in terms of local currency.

Now as we have assumed that purchasing power parity holds, then

$E = \frac{P_T^*}{P_T}$, and from here we can say that $\log E = \log P_T^* - \log P_T$ (where E domestic currency per unit of dollar i.e. like Rs/$).

Suppose the price indices of both the countries are as follows.

Let $P = [P_T]^{1-\alpha} [P_N]^{\alpha} \quad 0 < \alpha < 1 \quad (1)$

$P^* = [P^*_T]^{1-\beta} [P^*_N]^{\beta} \quad 0 < \beta < 1 \quad (2)$

Real exchange rate as we defined earlier in chapter II is, $R = E P^*/P$.

Let, $r = \log(R)$

Taking log of equation 1 and 2 we get

$r = \log(R) = \alpha [\log(A_T/A_N)] - \beta [\log(A^*_T/A^*_N)] + \log(E) + [\log(W/A_T) - \log(W^*/A^*_T)]$ eq (3)

As we have assumed that purchasing power parity holds,

$\log(E) = \log(W^*/A^*_T) - \log(W/A_T)$ eq(4)

Therefore Using (4)

$r = \log(R) = \alpha [\log(A_T/A_N)] - \beta [\log(A^*_T/A^*_N)] + [\log(E) + \log(W/A_T) - \log(W^*/A^*_T)]$

or, $r = \log(R) = \alpha [\log(A_T/A_N)] - \beta [\log(A^*_T/A^*_N)]$ eq(5)

If we assume further that people's preferences are same across the countries, i.e. the weights of tradable and non-tradable are same across the countries (i.e. $\alpha = \beta$), and purchasing power parity holds, then we get,

$$r = \log(R) = \alpha \log \left[\frac{A_T / A_N}{A^*_T / A^*_N} \right] \quad \text{eq(6)}$$

$$\text{If, } \left[\frac{A_T / A_N}{A^*_T / A^*_N} \right] = A \quad \text{eq(7)}$$

$$\text{then, } \frac{1}{R}\frac{dR}{dt} = \alpha \frac{1}{A}\frac{dA}{dt} \quad \text{eq(8)}$$

Equations 6 and 8 express the main argument of Balassa and Samuelson, i.e., relative productivity growth of tradable sector to non-tradable sector between two countries is the determinant of real exchange rate change.

From the above equations we also see that it does not matter whether the exchange rate regime is fixed or flexible and that is why Rogoff[2] claimed that this Balassa- Samuelson theory would hold irrespective of the exchange rate regime being followed.

3.B. Some other studies

In the literature, the major empirical success that has been claimed in defence of Balassa-Samuelson theorem relates to the yen dollar real exchange rate. The appreciation in this is explained by change in the relative productivity differential of the tradables compared to the non-tradables sector between these two countries[3]. Officer made one of the most rigorous studies in 1976[4]. He examined, through an econometric exercise, the empirical validity of the Balassa-Samuelson theorem and did not find any support for it. When he used (GDP/EMP_i) [5], as the explanatory variable he got insignificant result. And when he used tradable to non-tradable productivity ($PRODT/ PRODNT_i$)[6] instead of per capita real gross domestic product he found a significant result, exactly in

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[2] Rogoff, Kennth. 1996."*The Purchasing Power Parity Puzzle*", Journal of Economic Literature.34: 647-668.

[3] Richard, c. Marston (1987) who put forward a model of the real yen-dollar rate using disaggregated OECD data found that sectoral productivity differential can quantitatively explain the trend in the yen, relative to dollar.
Marston, Richard c.1987. "*Real Exchange Rate and Productivity Growth in United States and Japan*", in "*Real-financial linkages among open economies*". Eds. : Sven W. Arndt and J. David Richardson. Cambridge, MA: MIT Press, 1987, 71-96.

[4] Officer, L. H. 1976 b. "*Productivity Bias and Purchasing Power Parity: An Econometric Investigation*". IMF Staff Papers. 23: 545-579.

[5] GDP /EMP_i = ratio of GDP (at current process) per employed worker in country i to GDP (at current prices) per employed worker in the standard country, where the numerator is converted from domestic currency to the standard currency by means of the PPP between the two countries,

[6] ($PRODT/ PRODNT_i$)= ratio of "ratio of productivity in the traded sector of the economy of country i to productivity in the non-traded sector" to "ratio of productivity in the traded sector of the economy of the standard country to productivity in non-traded sector," where "productivity" is defined as GDP (at constant prices) originating in the sector per employed worker in the sector.

the opposite direction of what Balassa had claimed. Kenneth Rogoff (1996)[7] has undertaken a cross section study where he did not find any significant corroboration of the Balassa- Samuelson theorem. He however used per capita real gross domestic product of the sample countries with respect to USA. Froot and Rogoff (1991)[8] did not find any significant effect for growth differential of tradables sectors across EMS countries for the years 1979-1990. Similar findings were obtained by Patrick Asea and Enrique Mendoza (1994)[9] who applied a general equilibrium model to disaggregate sectoral data for 14 OECD countries over the year 1975-1990. Their model incorporates adjustment costs to moving factors across sectors. They found that sectoral differences in productivity growth helps to explain the trend rise in service prices within OECD countries, but have much less power in explaining real exchange rate movement. A study by Takatoshi Ito, Peter Isard and Steven Symansky (1997)[10] in NBER also found no uniform support for the Balassa –Samuelson theory for the fast growing developing nations of South East Asia. David Heish(1982)[11] found some evidence in favor of the Balassa- Samuelson model using time series data both for Germany and Japan, as did Obstfield (1993)[12]. According to Rogoff (1996) "Heish's result however may be somewhat sensitive to his inclusion of the real wage differential, which is closely correlated with the

[7] Rogoff, Kennth. 1996."*The Purchasing Power Parity Puzzle*", Journal of Economic Literature.34: 647-668.

[8] Froot, Kenneth A. and Rogoff, Kenneth, "*The EMS and EMU and the Transition to a common Currency*", in NBER Macro Economic Annual. Eds by Stanly Fischer and Oliver Blanchard. Cambridge. MA.MIT Press, 1991. 269-317.

[9] Asea, Patrick k. and Mendoza, Enrique G.1994. " *The Balassa-Samuelson Model: A general Equilibrium Appraisal*" Review of international Economics. 2, 3: 244-267.

[10] Ito, Takatashi., Israd, Peter., Symansky Steven.1997."*Economic Growth and Real Exchange Rate: An Overview of Balassa- Samuelson Hypothesis in Asia*", NBER Working Paper.5979.

[11] Heish, David.1982. "*The Determinants of the Real Exchange Rate: The Productivity Approach*", journal of International Economics. 12, 2: 355-362

[12] Obstfeld, Maurice.1993. "*Model Trending Real Exchange Rates*", U.C. Barkely CIDER Working Paper. C93-011.

real exchange rate, as a right hand side variable". Sebastian Edwards[13] in 1989 for a sample of 12 developing countries for the period 1960-1985, did not find any result in favour of the Balassa-Samuelson theorem. So here we see that even though for developed countries in some cases there is some success for the Balassa-Samuelson theorem, the theorem is found to have no significant impact on real exchange rate movements of developing countries, though the number of studies are much less for these countries than for the developed countries. In any case, we have seen no significant success so far of the Balassa-Samuelson theorem in explaining the long run real exchange rate movements of the developing countries. In this chapter we would like to make an econometric investigation of the validity of the Balassa-Samuelson theorem in explaining the real exchange rate movements of the group of countries of our sample for the period 1982-1996. A more comprehensive study for the developing countries as a whole is not possible owing to serious data limitation.

3.C. Methodology and Data Description

The data for real exchange rate used in the first chapter are also used here and therefore the source of data and methodology is the same as in the earlier chapter. Now in this study we will have to construct separate series for the productivity of tradable sector as well as non-tradable sector for both the developing countries of our sample and for USA. Most studies that are available for developing countries have used per capita labour income or per capita income as the proxy for productivity, which is why it

[13] Edwards, Sebastian1989. *"Real and Monetary Determinants of Real Exchange Rate: Theory and Evidences from Developing Countries"*, Journal of Development Economics 29: 311-41.

remains true that none of them made an exact test of the theorem except officer (1976 b)[14]. The major reason for taking per capita labour income or per capita income, as a proxy for productivity is that there exists no total factor productivity estimate or labour productivity estimate that is directly available. For an exact test we need data for productivity of both tradable and non- tradable sectors. As it is not possible to get total factor productivity data for developing countries we have used labour productivity as a proxy for total factor productivity. Obviously this is not an accurate measure of total factor productivity but in the absence of proper data it is the nearest proxy that we can construct and this proxy, has been used by many others also in their respective studies (Officer1976 b, Chinn1997)[15]. However we should first mention how we have defined "tradables" and " non-tradables". Most studies are done for the developed countries [16] and consider only manufacturing sector as the "tradable", but as our study is for developing countries we have taken both manufacturing and agriculture as the "tradable" sector. For "non-tradable" sector we have taken only the service sector, where "services" consist of the following

a. Trade, restaurants, hotels, commerce.
b. Transport, storage, communications.
c. Finance, insurance, real estate, bus services.
d. Community, social and personal services.

[14] Officer, L. H. 1976 b. "*Productivity Bias and Purchasing Power Parity: An Econometric Investigation*". IMF Staff Papers. 23: 545-579

[15]Officer, L. H. 1976 b. "*Productivity Bias and Purchasing Power Parity: An Econometric Investigation*". IMF Staff Papers. 23: 545-579 .

[16] Chinn Menzie and Louis Johnston. 1996. "*Real Exchange rate Levels, Productivity and demand Shocks: Evidence from a panel of 14 Countries*", NBER WP 5709.And,
DeGregerio, Josepe and Wolf, Holger C.1994. "*Terms of Trade Productivity and Real Exchange Rate*". NBER working Paper 4807.And,
DeGregerio, Josepe,. Alberto, Giovannini and Wolf, Holger C.1994. " *International Evidence of Tradables and Non- tradables*" European Economic Review. 38:1225-1244

Data for agriculture, manufacturing and services are collected from World Development Indicators CD-ROM, 2001, for the period 1982-1996, at constant local currencies. As World Table does not give the required data for USA after 1988, we have collected the required data for USA from 'National Account Statistics', published by the United Nations, which also give the above-required data at constant local currencies.

Data for labour however are collected from "Year Book of Labour Statistics", various issues, published by the ILO (International Labour Organization). We have added labour employment of agriculture and manufacturing sector to get the total employment of the tradable sector. Similarly, to get the total employment of the non-tradable sector we have added the labour employment of the above mentioned four categories under services (as services are taken as non- tradable) to get the total labour employment of the non- tradable sector. As "Year Book of Labour Statistics", which is the only source of international data of labour force does not provide data for Colombia and Uruguay for the years 1982 and 1983, we have used the method of interpolation to obtain the data for labour employment by sectors for these two countries.

Now in order to get labour productivity data for tradable sector we have divided the total value added in the tradable sector (agriculture + manufacturing) at constant local prices by total labour employment in the tradable (agriculture + manufacturing) sector. Similarly we have obtained data for labour productivity in non-tradable sectors also. Taking a base year as 100 we have constructed the labour productivity index for both tradable and non-tradable sectors and for all the countries in our sample including USA. We did not get long-term data on labour employment for Mexico, Zambia and China. So they are left out from the sample.

3.D.Test results and implications

In order to test the Balassa-Samuelson Theorem we have tested the model

1. $\Delta R = \text{constant} + \Delta A + \varepsilon$ (9)

2. $$\frac{1}{R}\frac{dR}{dt} = \lambda + \frac{1}{A}\frac{dA}{dt} + \varepsilon \qquad (10)$$

The main reason for using these models is that the level of the real exchange rate in many studies are found to be non- stationary. In order to avoid this problem we have used the data either in first difference or in percentage terms and that is actually what the Balassa-Samuelson theorem says.

As we have long time series data (15 years), for 12 countries[17] we are using Generalized Least Square method for regression. We test for the presence of heteroskedasticity in both the models above (eq.9, and eq.10). In both the cases result of Cook-Weisberg test for heteroskedasticity showed that there is heteroskedasticity problem in the data. This heteroskedasticity in the data may arise from the fact that, there are certain countries which are experiencing higher rates of growth than the others over the period.

There is no reason why productivity growth in one developing country would be correlated with the productivity growth in other countries so we rule out the possibility of cross sectional correlation. However as we have quite a long time series data, possibility of autocorrelation within a

[17] India, Pakistan, Sri Lanka, Korea, Malaysia, Indonesia, Thailand, Philippines, Colombia, Costa Rica, Chile, Venezuela . Only these countries of our sample have long time series data on Labour employment and therfore only for these countries we have been able to construct data for labour productivity.

country series can not be ruled out and therefore we use AR(1) process in the model.

Table1: Regression of Real Exchange Rate on Relative Productivity Differential by Using the Eq(9)

Model: ΔR = constant + ΔA + ε_t, where all the symbols have been defined earlier.
Cross-sectional time-series FGLS regression
Coefficients: generalized least squares
Panels: heteroskedastic
Correlation: panel-specific AR(1)

Estimated covariances = 12 Number of obs = 180
Estimated autocorrelations = 12 Number of groups = 12
Estimated coefficients = 2 No. of time periods = 15
Wald chi2(1) = 2.45
Log likelihood = -606.632 Prob > chi2 = 0.1172

dreer	Coef.	Std. Err.	Z	P>|z|
rddd	7.06836	4.511531	1.57	.117
cons	.7146298	.5816343	1.23	-.425352

dreer= first order difference of real exchange rate, rddd= first order difference of A , where A is as defined earlier in the equation (7)

Cook-Weisberg for heteroskedasticity
Ho: Constant variance
chi2(1) = 29.43
Prob > chi2 = 0.0000

Table 1 (using eq.9) clearly shows that there is no significant relationship between productivity growth differential and real exchange rate depreciation even at the 10% level of significance.

Table2: Regression of Real Exchange Rate on Relative Productivity Differential by Using Eq(10)

Model: $\frac{1}{R}\frac{dR}{dt} = \lambda + \frac{1}{A}\frac{dA}{dt} + \varepsilon$

where all the symbols have been defined earlier.

Cross-sectional time-series FGLS regression
Coefficients: generalized least squares
Panels : heteroskedastic
Correlation: panel-specific AR(1)

Estimated covariances	= 12	Number of obs	= 180
Estimated autocorrelations	= 12	Number of groups	= 12
Estimated coefficients	= 2	No. of time periods	= 15
		Wald chi2(1)	= 3.78
Log likelihood	= -621.8064	Prob > chi2	= 0.05

pcreer	Coef.	Std. Err.	z	P>|z|
pcddd	.1269012	.0550153	1.94	.052
cons	1.068399	.6412835	1.67	.096

dpreer= % change in real exchange rate, pcreer= % change in A, where A is defined in the equation (7)

Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
chi2(1) = 228.11
Prob > chi2 = 0.0000

The results of the second regression (Eq. 10) shown in Table 2 show that there is a significant relationship between productivity growth differential and percentage change in real exchange rate but the relation is exactly the opposite of what Balassa-Samuelson had predicted. Here the result shows that the higher the relative productivity growth of the tradable sector of country A compared to that of its trading partner B the greater will be the depreciation of its currency, *which is exactly the opposite of what Balassa had claimed.* In fact using tradable to non- tradable

productivity data, Officer (1976.b)[18] got a similar kind of result. When he used per capita income growth of a country relative to that of the US as proxy for productivity, he found the relationship between relative productivity growth and real exchange rate movements to be insignificant. But when he used relative productivity of tradable sector to non-tradable sector between the two countries, he got a result similar to what we have got above. The main reason for this result is that in the last two decades many of the developing countries have relative to the US experienced higher rates of growth of productivity in the tradables sector compared to the non-tradables sector but they have also experienced real exchange rate depreciation, which naturally disproves Balassa-Samuelson argument. Our result shows that there are factors other than productivity bias that has decisive effect on the movements in real exchange rate.

Now I would like to mention some of the criticisms of Balassa-Samuelson theorem

a) The major objection is that it assumes that the purchasing power parity holds for the tradable sector. Many people have argued that this actually does not hold even in the long run[19].

b) As productivity increases in the developed countries, organised workers have been able to increase their money wage exactly in same proportion to the increase in productivity. While for developing countries, where a huge reserve army of labour always exists, trade unions are weaker, and therefore money wage may increase in a much lesser

[18] Officer, L. H. 1976 b. "*Productivity Bias and Purchasing Power Parity: An Econometric Investigation*". IMF Staff Papers. 23: 545-579

[19] Isard, Peter.1977. " How Far can We Push the Law of One Price", American Economic Review. 67(5): 942-48.
Knetter, Michael M. 1993. "International Comparisons of Price to Market Behaviour", American Economic Review. 83(3): 473-86

proportion than the increase in productivity. So with the increase in productivity, the price of tradable goods may decreases relative to the developed countries.

c) It is a completely supply side argument and does not take account of the demand side factors, which may be a cause of the failure of this hypothesis.

d) The assumption that wage rate will be determined by the productivity of the tradable sector, and not by the overall productivity of the economy, is a very strong and unpersuasive assumption.

e) In recent years service sector led growth is observed in many developing countries and therefore the wage rate may not be entirely determined by the productivity of the tradable sector. In fact we can question the basic empirical premise that fast-growing countries generally experience extra-rapid productivity growth in the traded goods sector. One might also ask whether the effect, even if it has existed in the past, might continue to operate during the coming century, as technological advances sharply improve labour productivity in many service sectors, such as banking and insurance. In any case, we see that the Balassa–Samuelson theorem can not explain the secular decline in the real exchange rate and that may be due to the fact there are certain other factors which are actually much more decisive for the real exchange rate movements than the productivity bias factor as claimed by Balassa and Samuelson.

Chapter IV

Impact of Government Consumption Expenditure, Terms of Trade and Nominal Devaluation on Real Exchange Rate

In the last chapter we have seen that the well-discussed Balassa-Samuelson effect is hardly successful in explaining the long run real exchange rate movement of developing countries. In this chapter we would examine and discuss three other factors, which are said to have a significant impact on real exchange rate, a) Government consumption expenditure. b) Terms of trade movement, and c) Nominal devaluation.

4.A.1. Government consumption expenditure and real exchange rate

The argument that says that increased government expenditure will cause long run real exchange rate to appreciate is very simple and proceeds as follows. The non-tradables sector provides a major share of government consumption and as government consumption increases, the consumption of non-tradables by the government increases. This increased consumption by the government will increase demand for non-tradables and therefore the price of non-tradable relative to tradables. This will cause the real exchange rate to appreciate. Even though in the literature [1]it is regarded as one of the factors which influences long run real exchange rate, still economists have argued that this is extremely a short run factor (Rogoff 1992).[2] Rogoff emphasized that any such effect of an increase in government consumption on non-tradable would be transitory, because demand shocks can affect the real exchange rate in small a country and only to the extent that capital and labour are not perfectly

[1] See, Edwards, Sebastian (1989) "*Real exchange Rates, Devaluation and Adjustment.*" Cambridge, Mass: MIT Press
And,
Lawrence, Hinkle E. and Peter, Montiel. J. 1999. "*Exchange Rate Misalignment: Concepts and measure for developing Countries*", Oxford University Press, World Bank Research Observer Publication.

[2] Rogoff, Kenneth. 1992." *Traded goods Consumption Smoothing and the Random Walk Behaviour of the Real Exchange Rate*", Bank of Japan Monetary and Economic study. See also in Rogoff 1996. " Purchasing Power Parity Puzzle", JEL. 34. 647-668.

mobile across sectors. Froot and Rogoff (1991) [3]found that among EMS countries, government spending is a significant determinant of the real exchange rate. De Gregorio, Giovannini and Wolf (1994)[4] found similar result and concluded that as government spending tends to fall more heavily on non-tradables and increase in it causes the relative price of non-tradables to increase and thus appreciation in real exchange rate. However Sebastian Edwards (1989)[5], for a sample of 12 developing countries during 1960-1985, did not get any significant impact of government consumption expenditure on the real exchange rate. Also, Chinn Menzie and Louis Johnston (1996)[6], using panel data for 14 OECD countries for 22 years, did not get any favorable result about the long run relation of real exchange rate and government consumption spending. In this chapter, we would like to make an empirical investigation to check the validity of this argument for the sample of 13 countries over the period 1982-1997, for which the data source and methodology will be discussed later in this chapter.

4.A.2. Terms of trade deterioration and real exchange rate

There is a wide spread perception, backed by and theoretical argument (see, Hinkle & Montiel1999)[7], that, the terms of trade have a significant

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[3] Froot, Kenneth A. and Rogoff, Kenneth, "*The EMS and EMU and the Transition to a common Currency*", in NBER Macro Economic Annual. Eds by Stanly Fischer and Oliver Blanchard. Cambridge. MA.MIT Press. 1991. 269-317.

[4] De Gregario, Giovan J., Giovannini, Aleberto and Wolf, Holger C. 1994. " *International Evidence of tradable and non-tradables inflation*", European Economic Review. 38,6: 1225-1244

[5] Edwards, Sebastian. 1989"*Real exchange Rates, Devaluation and Adjustment.*" Cambridge, Mass: MIT Press

[6] Chinn, Menzie and Louis, Johnston. 1996. "*Real Exchange rate Levels, Productivity and demand Shocks: Evidence from a panel of 14 Countries*", NBER WP 5709.

[7] Lawrence, Hinkle E. and Peter, Montiel J. 1999. "*Exchange Rate Misalignment: Concepts and measure for developing Countries*", Oxford University Press, World Bank Research Observer Publication.

impact on real exchange rate movements and that an adverse movement of terms of trade for developing countries (i.e. decrease in terms of trade) is the major factor underlying the long run depreciation of the real exchange rate. However, theoretically it is not very clear why a decrease (increase) in terms of trade will cause depreciation (appreciation) of real exchange rate. At the same time there are no unambiguous results in empirical literate of the terms of trade having significant impact on the real exchange rate in the direction mentioned by the theory. Some of the studies have got significant result that improvement (decline) in terms of trade would cause real exchange rate to appreciate (depreciate), while others did not get any significant impact of terms of trade on real exchange rate.

The terms of trade is nothing but, Price of export/price of import or, Unit value of export/Unit value of import

Now suppose, the unit value of exports increases, and the terms of trade improve (when unit value of import is constant). Then income will increase and demand for non-tradables will also increase. Therefore the price of non-tradables will rise which would lead to an appreciation of the real exchange rate. But there is one substitution effect also. As the initial price or unit value of exports increases the production of exports will also increase and labour will shift from the non-tradables sector to the tradable sector. Therefore the supply of non-tradables will also decrease when the demand for it increases due to the increase in the unit value of exports, which would increase the prices of non-tradables. Here in this case both income and substitution effect operate in the same direction and surely there will be an increase in the prices of non-tradables and therefore an appreciation of the real exchange rate. Now suppose, the unit value of imports increases (terms of trade deteriorate). Obviously, the income

effect will be negative here. But as the import price increases production of import competitive industries will increase causing labour to move from the non-tradables to importable sector. Thus the supply of non-tradables will decrease. Here the substitution effect and income effect are operating in the opposite direction and the ultimate impact on non-tradable price is ambiguous and will depend on the strength of these two effects. So, theoretically, what the net impact on real exchange rate of terms of trade movements will be is not unambiguous. The empirical literature is also does not give any unambiguous picture. Sebastian Edwards (1989)[8] for a study of twelve developing countries, for fifteen years found that terms of trade improvement (decline) has significant impact on real exchange rate appreciation (depreciation). This result was significant at 5% level of significance. DeGregerio and Wolf (1994)[9] for a sample of fourteen developed countries found that the terms of trade have significant impact on the real exchange rate exactly in the same direction as Edwards got. On the other hand Devereux and Connolly (1996)[10] for a group of Latin American countries could not find any significant impact of the terms of trade on the real exchange rate, except for the case of Argentina. For Argentina he found that the terms of trade improvement (decline) will lead to the real exchange rate appreciation (depreciation). He concluded that since Argentina was mostly an agriculture-based country, the terms of trade might have a significant impact on its real exchange rate while the same will not be true for the other countries. Similarly Chinn and

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[8] Edwards, Sebastian1989. *"Real and Monetary Determinants of Real Exchange Rate: Theory and Evidences from Developing Countries"*, Journal of Development Economics 29: 311-41.

[9] DeGregerio, Josepe and Wolf, Hdger C.1994. *"Terms of Trade Productivity and Real Exchange Rate"*. NBER working Paper 4807

[10] Devereuex J. and Connelly. M. 1996. *"The Commercial Policy, the Terms of Trade and The Real Exchange Rate Revisited"*, Journal of Development Economics. 81- 99.

Johnston (1996)[11] Using co-integration technique, for a sample of OECD countries could not find any significant impact of terms of trade on real exchange rate.

4.A.3. Nominal devaluation and real exchange rate.

Nominal devaluation is one of the major factors, which can have a significant impact on the long run real exchange rate. It may happen that competitive devaluation has taken place between the developing countries in order to keep each country competitive with his trade rivals, and this would be the case when many of the developing countries have a similar export structure. The Asian countries like India, Pakistan, and Sri Lanka have, to a certain degree, a similar export structure. Likewise East Asian countries have more or less same export basket[12]. Latin American countries also have a similar export structure, mainly consisting of agricultural and light-manufacturing goods, which are also not much diversified. So it is quite possible that trade rivalry may lead to very excessive nominal devaluation. We have already mentioned that one of the main objectives of the Bretton Wood system was to prevent competitive devaluation. So in the post Bretton Wood era, the possibility of very high nominal devaluation cannot be ignored. Various policy prescriptions of IMF and World Bank have actually forced many countries to devalue, in the name of being competititive, whenever they approached these institutions for external assistance; this could well result in excessive devaluation for each of them.

[11] Chinn, Menzie and Louis, Johnston. 1996. "Real Exchange rate Levels, Productivity and demand Shocks: Evidence from a panel of 14 Countries", NBER WP 5709.
[12] Ghosh. J. and C.P.Chandrasekhar. 2001. "*Cricis and Conquest*."

Ghei and Hinkle[13] have tried to explain why nominal devaluation in the fixed exchange rate regime might have actually caused more real exchange rate depreciation than under the flexible exchange rate regime[14]. They have argued that as devaluation was discrete in the fixed exchange rate regime the expectation of inflation was much less amongst the people but in the flexible exchange rate regime, the expectation of inflation is such a common factor that the effect of nominal devaluation on real exchange rate has been reduced. In other words, what actually can happen is that, under fixed exchange rate regime, wage indexation is never done properly, but with the episodes of continuous devaluation under the flexible exchange rate regime the importance of wage indexation gets actually increased. Studies in this area are subject to serious data limitation. But still we get some support from Sebastian Edwards (1989) who in his book has written: "However, episodic evidence from countries such as Brazil, Colombia and Chile strongly suggests that the existence of strict indexation rules has historically conspired to render nominal devaluation ineffective"[15]. However the trend of real exchange rate shows that the real exchange rate in long run has actually depreciated, and this depreciation is common also in post Bretton Wood period, so that wage indexation, no matter how pervasive, has not prevented real exchange rate declines. Naturally it is conceivable that Periods of very high inflation may have made wage indexation more pervasive in several developing countries, particularly Latin American

[13] Ghei, Nita and Hinkle, Lawrence E. 1999. "A Note on nominal Devaluations, Inflation and the Real Exchange Rate", in Lawrence, Hinkle E. and Peter, Montiel J. 1999.(ed) "*Exchange Rate Misalignment: Concepts and measure for developing Countries*", Oxford University Press, World Bank Research Observer Publication

[14] In this situation flexible exchange rate can be extremely unstable and inflation devaluation vicious circles will be more and more prominent.

[15] Edwards, Sebastian. 1989. "*Real exchange Rates, Devaluation and Adjustment.*" Cambridge, Mass: MIT Press. Chapter7. Page 289.

countries, and therefore under flexible exchange rate inflation may be much higher and may reduce the effect of nominal devaluation in lowering the real exchange rate.

4.B. Data source and methodology

The real exchange rate data that we use in this chapter are the data constructed in the second chapter. So the data source and methodology for the real exchange rate series are the same for this chapter as for the two. There are no data for developing countries on government consumption expenditure on non-tradables. Therefore we have used the ratio of government consumption expenditure divided by gross domestic product, both measured in current local currencies, as the proxy for government real consumption expenditure on non-tradables. Obviously there will be difference of opinion about this proxy, as the whole of government consumption is not on non-tradables, but as there are no separate data available for government consumption on non-tradables we do not have a better proxy than this. Sebastian Edwards and many others who also tried to test this hypothesis used this proxy due to the lack of availability of proper data. The data source here is the IFS (International Financial Statistics) various issues for the period 1980-1997.

Terms of trade data for our sample of developing countries are collected form "Tentative Terms of Trade of The Developing Countries", calculated by United Nations Research Group and published in "Handbook of International Trade Development Statistics", published by United Nations. They have calculated terms of trade series from their own data in the following way.

UVX =Unit value of export = Total export in US$ / Total volume of export

UVI =Unit value of import = Total import in US$/Total volume of import

Then they have constructed separate indices for both UVX and UVI, by taking any one-year's UVX or UVI as 100. This year is called the base year. Now, Terms of trade (TOT) = (UVX/UVI)

We have used the linked index method to get the long series, as they have used different base years.

As regards data for nominal exchange rate, the annual average rate is taken from IFS, and the percentage change over the previous year is taken as nominal "devaluation".

The model we use here to test the impact of terms of trade change on real exchange rate is, $\frac{1}{R}\frac{dR}{dt} = cons\tan t + \frac{1}{TOT}\frac{dTOT}{dt} + \varepsilon_t$ ..... eq(1)

And the model that we use to test the impact of government consumption expenditure and nominal devaluation on real exchange rate change is

$$\frac{1}{R}\frac{dR}{dt} = cons\tan t + nomdev_t + \frac{1}{GC_n}\frac{dGC_n}{dt} + \varepsilon_t \qquad \text{.....eq(2)}$$

Where, R= Real exchange rate.

TOT = Terms of trade.

GC_n = government consumption/ gross domestic product.

nomdevt= $\frac{1}{E}\frac{dE}{dt}$, nominal devaluation at period "t". Here E is units of domestic currency per unit of US $.

4.C. Results and their implication

In the beginning we would like to see whether terms of trade deterioration has any significant impact on real exchange rate changes during the period 1982-1997. As we have data for 14 countries[16] for a

[16]India, Pakistan, Sri Lanka, Korea, Malaysia, Indonesia, Thailand, Philippines, Colombia, Costa Rica, Chile, Mexico, Venezuela are used in our econometric tests, because they have long time series data for the explanatory variables of this chapter.

period of 16 years we have used Generalised Least Square method for regression. Now in this case Cook-Weisberg test for heteroskedasticity

Table 3. Result of Regression Regressing real Exchange Rate on Terms of Trade for the Period 1982-97.

Model to be tested is $\frac{1}{R}\frac{dR}{dt} = cons\tan t + \beta_1 \frac{1}{TOT}\frac{dTOT}{dt} + \varepsilon_t$

Where, R= Real exchange rate, TOT = Terms of trade.

Here our null hypothesis is $\beta_1 = 0$, against the alternative hypothesis $\beta_1 \neq 0$. Period of study 1982-1997

Cross-sectional time-series FGLS regression
Coefficients: generalized least squares
Panels: homoscedastic
Correlation: panel-specific AR(1)

Estimated covariances = 1	Number of obs = 224
Estimated autocorrelations = 14	Number of groups = 14
Estimated coefficients = 2	No. of time periods=16
	Wald chi2(1)= 0.01
Log likelihood = -887.4829	Prob > chi2= 0.9366

dpreer	Coef.	Std. Err.	Z	P>|z|
dptot	-.0049582	.0623768	-0.08	0.937
cons	1.760877	1.023456	1.72	0.085

dpreer= percentage change in real exchange rate. dptot = percentage change in terms of trade

Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
chi2(1) = 0.30
Prob > chi2 = 0.5849

showed that there is no heteroskedasticity problem in the data[17]. Therefore we use GLS model with the assumption of homo-skedasticity. As we use data for 16 years the possibility of auto-correlation within a country series cannot be ignored. Therefore we use AR(1) process in this model.

From the results (Table 3), we see that terms of trade has no significant impact on real exchange rate behaviour in the last two decades, even at 10% level of significance. From this result we can say that terms of trade has no statistically significant impact on real exchange rate movements of developing countries.[18]

As already discussed, it is argued in the literature that government consumption expenditure will have a significant impact on real exchange rate. The following test is for Eq. 2 for the period 1982-1997 and for 14 developing countries as it was in the earlier test. As we have 16 years data for 14 countries we use GLS method for regression. Cook-Weisberg test for heteroskedasticity showed that there is heteroskedasticity problem in the data. Therefore we use GLS model with the assumption of heteroskedasticity. We use AR(1) process as existence of auto-correlation within a country series can not be ignored when using data for a period of 16 years.

[17] Terms of trade are defined as unit value of export divided by unit value of import, when both unit values are calculated in dollar terms. In this situation there is no reason why decrease in international prices of commodities or any other shock will affect terms of trade of one developing countries differently from other over long periods. This possibility reduces further as majority of the developing countries have very similar export and import structure. Therefore the absence of heteroskedasticity in the data is not very surprising.

[18] Even if we use a model with the assumption of heteroskedasticity and auto-correlation the result still remains insignificant.

Table 4. Regression of Real Exchange Rate on Nominal Devaluation and Government Consumption as a percentage of GDP

The model we use is (notations are explained earlier)

$$\frac{1}{R}\frac{dR}{dt} = cons\tan t + \beta_1 nomdev_t + \beta_2 \frac{1}{GC_n}\frac{dGC_n}{dt} + \varepsilon_t$$

Period of study 1982-1997
Cross-sectional time-series FGLS regression
Coefficients: generalized least squares
Panels: heteroskedastic
Correlation: panel-specific AR(1)

Estimated covariances	= 14	Number of obs	= 224
Estimated autocorrelations	= 14	Number of groups	=14
Estimated coefficients	= 3	No. of time periods	=16
		Wald chi2(2)	= 213.99
Log likelihood	= -744.715	Prob > chi2	= 0.0000

dpreer	Coef.	Std. Err.	Z	P>|z|
nomdevt	.4265676	.0297402	14.34	0.000
dpgovc	-.0079435	.0495135	-0.16	0.873
cons	-4.867709	.6155016	-7.91	0.000

dpreer= percentage change in real exchange rate, nomdevt = nominal devaluation
dpgove= percentage change in (government expenditure/gdp)

Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
chi2(1) = 512.32
Prob > chi2 = 0.0000

The result of the above regression reported in Table 4 shows that government consumption expenditure has no significant impact on real exchange rate movements. On the other hand nominal devaluation has a significant impact on real exchange rate depreciation as one would expect, and it is significant at 0% level of significance. Sebastian Edwards (1989)[19] also got very similar kinds of results. Our result shows that for

[19] Edwards, Sebastian. Edwards, Sebastian1989. "*Real and Monetary Determinants of Real Exchange Rate: Theory and Evidences from Developing Countries*", Journal of Development Economics 29: 311-41.

one percent depreciation in nominal exchange rate, there will be 0.42 percent depreciation in real exchange rate. So the exchange rate regime, which will experience high nominal devaluation, will also experience high real exchange rate depreciation. Competitive exchange rate devaluation in the 1980s can be one of the reasons for the real exchange rate depreciation of many countries in this decade. But one thing must be mentioned again that the proxy for government consumption expenditure on non-tradables may not be perfect, and this inadequate proxy may influence the result. But as no better proxy is available I have had to use this proxy, as indeed Sebastian Edwards and others have done.

After trade liberalization in the 90s almost all the developing countries have tried to export primary products and light manufactured goods. Therefore the influx of primary products in the international market has forced the prices of these commodities to fall drastically. This has led to a severe deterioration of the terms of trade for the developing countries. So it would also be interesting to see whether terms of trade movements (worsening), in the 1990s in particular, has any impact on real exchange rate behaviour (deterioration) of these developing countries.

However, for this test of eq(1), (i.e. to test whether terms of trade decline has any significant impact on real exchange rate depreciation in 90s) we do not have a long time series data. Breusch and Pagan Lagrangian multiplier test for random effects shows that there is no constant part in error term, which implies that there is neither random effect nor fixed effect. In this case we have used pooled OLS regression with White heteroskedasticity consistent standard error.

Here again, for the post liberalization period when terms of trade for almost all the countries declined, results show that the impact of terms of

Table 5. Results of Regression Regressing Real Exchange Rate on Terms of Trade for the Period 1990-97

Model to be tested is $\frac{1}{R}\frac{dR}{dt} = cons\tan t + \beta_1 \frac{1}{TOT}\frac{dTOT}{dt} + \varepsilon_t$. All the symbols have been defined earlier.
For the period 1990-1997

Number of obs = 112
F(1, 102) = 0.07
R-squared = 0.0005
Prob > F = 0.7963
Root MSE= 8.0351
Prob > F = 0.7963

dpreer	Coef.	White heteroskedasticity Consistent Std. Err.	Z	P>|z|
ddptot	-.0213586	.0942941	-0.23	0.821
Cons	-1.791226	.788278	-2.27	0.023

Now Breusch and Pagan Lagrangian multiplier test for random effects shows
Test: Var(u) = 0 where, u= constant part of the error term.
chi2(1) = 0.21
Prob > chi2 = 0.6462
dpreer= percentage change in real exchange rate.
dptot = percentage change in terms of trade.

trade on real exchange rate is insignificant (from Table 5). Here also we fail to reject the null hypothesis $\beta_1 = 0$, and we have found no significant impact of terms of trade deterioration on real exchange rate depreciation during the period 1990-97.

From this result we can come to the conclusion that terms of trade deterioration can hardly explain real exchange rate deterioration for developing countries and there would be other factors, which would explain real exchange rate behaviour of these countries.

Chapter V

Current Balance, Capital flow and Real Exchange Rate

5.1. Does current balance matter?

Like the productivity bias theory of Balassa-Samuelson or the terms of trade decline argument there is another popular argument that persistent current account deficit is one of the major reasons for real exchange rate to decline in the long run for developing countries. As Rogoff (1996)[1] has mentioned in his survey article, "Another popular theory of real exchange rate holds that sustained current account deficits are associated with long run real exchange rate depreciation". An early example is Hooper and Morton (1982)[2], who posited that countries with sustained current account deficits will see their real exchange rate to depreciate. In this section we would like to examine whether current account deficit has any significant impact on real exchange rate. We have made this exercise for both developing and developed countries and separately for both the 80s and the 90s.

Methodology and data sources

The model that we are using here is

$$\frac{1}{R}\frac{dR}{dt} = cons\tan t + \frac{CA}{EXP} + \varepsilon_t$$

Where, R=real exchange rate

$$\frac{CA}{EXP} = \frac{CurrentBalance}{Export} = \frac{X - M + F}{X}$$

Where *X*= Export, *M*= import, *F* = net factor income.

The period of study will be 1982-1997

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[1] Rogoff, Kennth. 1996."*The Purchasing Power Parity Puzzle*", Journal of Economic Literature.34: 647-668.

[2] Hooper, Peter and Morton, John. 1982." *Fluctuations in the dollar: A model of nominal and real exchange rate Determination,*" Journal of International Money and Finance.

The real exchange rate index constructed in the first chapter is used here also. Current account and export data are collected from IFS (International Financial Statistics, published by IMF). We have then used (current balance/export)×100, as the index of external imbalance. All the data are annual data and are collected over the period 1980-1997. Current balance data before that period are not available for the sample of developing countries we have taken.

According to our discussion as current balance/export improves (worsens) real exchange rate should appreciate (depreciate). We are using the GLS

Table 6. Regression of Real Exchange Rate on Current Balance as a Percentage of Exports during 1982-1997.

Period of study 1982-1997

Model: $\frac{1}{R}\frac{dR}{dt} = cons\tan t + \beta_1 \frac{CA}{EXP} + \varepsilon_t$, all these symbols has been defined earlier.

Cross-sectional time-series FGLS regression
Coefficients: generalized least squares
Panels: heteroskedastic
Correlation: panel-specific AR(1)

Estimated covariances	= 13	Number of obs	= 208
Estimated autocorrelations	= 13	Number of groups	=13
Estimated coefficients	= 2	No. of time periods	= 16
		Wald chi2(1)	= 0.75
Log likelihood	= -747.9371	Prob > chi	= 0.3867

dpreer	Coef.	Std. Err.	z	P>|z|
Caexp	-.0262928	.0303741	-0.87	0.387
Cons	.353854	.8917795	0.40	0.692

dpreer = % change in real exchange rate, caexp= (current account/export) in percentage

Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
chi2(1) = 4.57
Prob > chi2 = 0.03

regression as we have 17 years long data for 13 countries[3]. Result of Cook-Weisberg test for heteroskedasticity shows the presence of heteroskedasticity. The cause of heteroskedasticity may be due to the fact that some countries for long period of time have higher CA/EXP than others. Also, as we have long time series data for each country we have also assumed the existence of autocorrelation within a country series. The possibility of correlation between country series is not assumed. So we use GLS model with the assumption of heteroskedasticity and AR(1) process to take care of both heteroskedasticity and autocorrelation within a country series.

This above result (Table 6) clearly shows that there is no significant impact of current account on real exchange rate depreciation at 5% level of significance. From here we can say that current balance does not have any significant impact on real exchange rate.

We have tested this model separately for the period 1982-1989 and1990-1997 [table 7] and even then we did not find any significant impact of current balance on the real exchange rate[4]. (For the detailed result of the test see Appendix Table AD.1 and Table AD.2)

[3] India, Pakistan, Sri Lanka, Korea, Malaysia, Indonesia, Philippines, Colombia, Costa Rica, Chile, Mexico and Venezuela. Only these countries of our sample have data for all explanatory variables of this section, both for 80s and 90s.

[4] In both the cases the Breusch and Pagan Lagrangian multiplier test for random effects has shown that there is no fixed or random effect. So, in both the cases we have used pooled regression with white heteroksedasticity consistent standard error, which will take care of heteroskedasticity problem.

Table 7. Regression of Real Exchange Rate on Current Balance as a Percentage of Exports in 80s and 90s

Period of Study	Country group	Dependent variable	Dpreer	Coef	Std. Err	Z	P>|z|
1982-1989	Developing Countries	Independent variable	Caexp	-.01	.06	-0.14	0.88
			Constant	4.56	2.30	1.98	0.05
1990-1997	Developing countries	Independent variable	Caexp	.052	.054	0.98	0.33
			Constant	-1.08	1.26	-0.85	0.396
dpreer = % change in real exchange rate, caexp= (current account/export) in percentage							

Thus, even though current account deficit is mentioned as the major reason for long-run real exchange rate depreciation, statistically it has no significant impact on the real exchange rate movements of developing countries.

5.2.How does capital account matter?

5.2.A.Growing importance of capital flow in international transactions

The most important development in international economic relations since the World War II is the exponential growth of international capital flow transactions. By any standard, such transactions are now the most numerous of all those that take place across national boundaries. Despite attempts to control such flows in the Bretwon Woods system, the Eurodollar market flourished in the late 1950s (Israd 1995, Gandaldfo 1995)[5]. By the early 1970s, Euro currency markets were a large enough

[5] Giancarlo, Gandalfo. 1995 "*International Economics II: International Monetary Theory and Open Economy Macro Economics*". Springer- Verlag

factor in determination of exchange rates to play a major role in the collapse of the Bretton Woods system. Since 1973, various factors have played a role in continuing and accelerating the growth of capital markets until they have become the dominant force in the exchange rate determination. Even the last two decades, and the 90's in particular, have observed phenomenal growth in private capital transactions to the developing countries. Andrew Walter gives a striking description of the state of the international economy today:

> " The value of world trade in 1988 amounted to more than $ 3 trillion, compared with US GDP in that year $ 4.8 trillion. Though accurate figures are difficult to obtain, in 1986 the London Eurodollar market virtually unregulated by public authorities, was reckoned to turn over the equivalent of $300 billion per day, or about 475 trillion per year...
>
> Another indication of the extent to which capital flows have come to dominate and become increasingly separated from trade-related payments is the size of foreign exchange market transactions. An April 1989 study estimated that daily turnover in London, New York, Tokyo was $ 187 billion, $129 billion, and $115 billion respectively. The great majority of these transactions, perhaps 90 percent or more, were unrelated to current account flows...
>
> Since the total foreign exchange reserves of the central banks were almost $ 800 billion by mid-1990, it is clear that the international interbank market easily dominates the official sector. Central bank reserves are less than the equivalent of two days' turnover in the world foreign exchange market."[6] [Walter, 1991, pp: 196-198].

The undeniable fact is that Central Banks can no longer fully or even significantly control the movements in the exchange rates. From the Walter's and other rough estimates since 1985, it appears that more than 90% of the daily foreign exchange transactions in major industrial countries are private capital transactions not related to trade transaction. The short term, mostly speculative transactions in the foreign exchange market, makes it rather pointless to discuss deliberate manipulation of the

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Peter, Isard. 1995. "*Exchange Rate Economics*", Cambridge University Press.

[6]Walter, Andrew.1991 "World Power and World Money: The Role of Hegemony of International Monetary Order" New York Martin's Press. Also quoted in, Harvey John T.1996. "*A Post Keynesian View of Exchange Rate Determination*", Journal of Post Keynesian Economics. 14: 61-71

exchange rate by any one country or its central bank to suit its demand management policy at home. It simply does not have this power and at most it can usually do is to manipulate the domestic interest rate in the hope of influencing exchange rate movements.

This phenomenal increase in international capital transactions has forced researchers of exchange rate determination to focus increasingly on capital account. Particularly in the 90s when the developing countries have been experiencing autonomous capital flow, independent of current account balance position, economists have become more and more conscious about the importance of capital account in exchange rate determination.

Now when in the 90s given developing countries were experiencing high net capital flow independent of their current balance position, it would be extremely interesting to examine whether capital flow has any significant impact on the real exchange rate in this period.

5.2.A.1.Developing country Scenario

a. Real exchange rate and capital flow

In this section we are going to examine whether net capital flow and foreign exchange reserve as defined earlier have any significant impact on the real exchange rate movements of the developing countries.
The model that we are going to test in this section is

$$\frac{1}{R}\frac{dR}{dt} = cons\tan t + \frac{fa}{GDP} + reserve_{t-1}$$

We are using the real exchange rate data we have already constructed in chapter two. International Financial Statistics provides an aggregate data

consist of net foreign direct investment (foreign direct investment in country A from other countries – foreign direct investment from country A to rest of the world), net portfolio investment (portfolio investment in country A from other countries – portfolio investment from country A to rest of the world), and net other investments[7]. We have used this final data provided by the IFS as net capital flow[8]. This net capital flow data only excludes exceptional financing from international institutions and reserve assets.

fa= net capital flow, as defined above.

All data are collected on annual basis for the period 1980-1999, from IFS.

All the data are in current million US dollars.

GDP = Gross Domestic Product at constant million US dollars.

This data is collected from World Development Indicators CD-ROM, 2001. World Bank.

$Reserve_{t-1}$ = (reserve equivalent to months of imports)$_{t-1}$[9]

This data is collected from Global Development Finance CD-ROM, 2001. World Bank.

We have divided the study period in two parts, one for the 80s and the other for the 90s. The reason to break the entire period into two periods and test separately is that the character of capital flow to developing

[7] This other investment includes net investment by monetary authorities, general government, banks and other sectors. This data only exclude exceptional financing from international institutions and reserve assets.

[8] In their other publication IMF, World Economic Outlook, from 1999 onwards they are publishing data on aggregate net capital flow, where they are using this net financial account as net capital flow. This final data are collected from IFS on annual basis for the above period.

[9] Here data on reserves relate to the end of a financial year. And dividing these data by imports of that year we get reserves equivalent to months of imports. So the reserve equivalent months of import in 1998-99 will be the reserves at the end of the financial year 1998-99,(or same to say reserve at the beginning of the next year) will be divided by the average imports during 1998-99.

countries has changed drastically during this period. While in the 80s official flows were a major source of capital flow, in the 90s it is the private capital flow, which is the major part of capital flow, and official capital flow has almost dried up[10] Another important reason for testing the regression for two separate periods is that most of the countries had shifted to a flexible exchange rate regime during the 90s from officially managed ones earlier.

Table 8. Regression of Real Exchange Rate on Net Capital Flow and Reserves for Developing Countries During 1990-97

Model: $\frac{1}{R}\frac{dR}{dt} = cons\tan t + \frac{fa}{GDP} + reserve_{t-1}$, all the symbols of the model has been defined earlier in the text.

Regression with robust standard errors
Number of obs = 104
F(2, 101) = 4.73
Prob > F = 0.0109
R-squared = 0.1610
Root MSE = 7.3983

dpreer	Coef.	White heteroskedasticity consistent Std. Err.	T	P>|t|
remonth1	-.9791475	.3532535	-2.77	0.00
fagdp	-.6326004	.2810564	-2.25	0.02
_cons	4.733241	2.46073	1.92	0.05

dpreer = % change in real exchange rate, remonth1= reserve equivalent to months of import at the end of the period(t-1) , fagdp = net capital flow as a percentage of GDP

Breusch and Pagan Lagrangian multiplier test for random effects
Test: Var(u) = 0
chi2(1) = 0.12 , u is the constant part of the error term,
Prob > chi2 = 0.7296

First we would like to examine whether net capital flow has any impact on

[10] *Global Development Finance*, 2001.World Bank

real exchange rate movements of the developing countries[11] for the period 1990-1997.

Model : $\frac{1}{R}\frac{dR}{dt} = cons\tan t + \frac{fa}{GDP} + reserve_{t-1}$

As we have small time series data we cannot use GLS model. Here the Breusch and Pagan Lagrangian multiplier test shows that at 5% level we cannot reject the null hypothesis that there does not exist any constant part in the error terms. Therefore we use pooled OLS regression model with White heteroskedasticity consistent standard error.

The above result (Table 8) clearly shows that net capital flows and reserves have significant impact on real exchange rate for developing countries in 90s at 5% level of significance and an increase of either of them leads to real exchange rate appreciation, while decrease will cause the real exchange rate to depreciate. So in the 90s, the autonomous capital flow that the developing countries were experiencing independent of their current balance position has started to have significant impact on their real exchange rate movements. This has serious implication for the long-run real exchange rate movements of the developing countries, which we will discuss in the next chapter.

At this juncture of our discussion it will be interesting to examine whether net capital flow had any significant impact on real exchange rate movements of the developing countries in the 80s (1982-1989). Here, we use the same model we used for the earlier test.

Model: $\frac{1}{R}\frac{dR}{dt} = cons\tan t + \frac{fa}{GDP} + reserve_{t-1}$

[11] India, Pakistan, Sri Lanka, Korea, Malaysia, Indonesia, Philippines, Colombia, Costa Rica, Chile, Mexico and Venezuela. Only these countries of our sample have data for all explanatory variables of this section, both for 80s and 90s.

Here also the Breusch and Pagan Lagrangian multiplier test shows that at 5% level we cannot reject the null hypothesis that there does not exist any constant part in the error terms. Therefore we use pooled OLS regression model with White heteroskedasticity consistent standard error.

Table 9. Regression of Real Exchange Rate on Net Capital Flow and Reserves for Developing Countries During 1982-1989

Model : $\frac{1}{R}\frac{dR}{dt} = cons\tan t + \frac{fa}{GDP} + reserve_{t-1}$,all the symbols of the model has been defined earlie in the text. Perod of study 1982-89.

Regression with robust standard errors

Number of obs = 104
F(2, 101) = 0.21
Prob > F = 0.8071
R-squared = 0.0075
Root MSE = 18.02

dpreer	Coef.	White heteroskedasticity consistent Std. Err.	t	P>|t|
remonth1	.5324347	.9376068	0.57	0.571
fagdp	-.0581582	.4045258	-0.14	0.886
_cons	2.492083	3.865891	0.64	0.521

dpreer = % change in real exchange rate, remonth1= reserve equivalent to months of import at the end of the period(t-1)., fagdp = net capital flow as a percentage of GDP

Breusch and Pagan Lagrangian multiplier test for random effects

Test: Var(u) = 0 , u is the constant part in the error term.

chi2(1) = 2.79
Prob > chi2 = 0.0951

The result (Table 9.) shows that in the 80s, net capital flow and reserves had no significant impact on real exchange rate movements of the developing countries. So, here we get an interesting picture. In contrast to the 80s, net capital flow has significant impact on real exchange rate movements of the developing countries in the 90s.

b. Nominal devaluation and real exchange rate

Now let us see what is the impact of net capital flow on nominal exchange rate during 90s. We would use the same model, which was used for real exchange rate.

Model: $\frac{1}{E}\frac{dE}{dt} = cons\tan t + \frac{fa}{GDP} + reserve_{t-1} + \varepsilon_t$

Nominal exchange rate data are collected from IFS, which is the annual average of the market exchange rate. Sources and definition of other data that are used in this regression is same, as we have mentioned earlier.

Table 10. Regression of Nominal Exchange Rate on Net Capital Flow and Reserves for Developing Countries During 1990-97.

Regression with robust standard errors			Number of obs = 104 F(14, 89) = 3.73 Prob > F = 0.0001 R-squared = 0.5472 Root MSE = 14.993	
Nomdevt	Coef.	White heteroskedasticity consistent Std. Err.	t	P>|t|
remonth1	-3.482605	2.73911	-1.27	0.207
Fagdp	-2.193756	.6869733	-3.19	0.002
_cons	73.73809	34.34544	2.15	0.035
nomdevt= % change in nominal exchange rate, remonth1= reserve equivalent to months of import at the end of the period(t-1)., fagdp= net capital flow as a percentage of GDP				
Breusch and Pagan Lagrangian multiplier test for random effects: Test: Var(u) = 0 , u is the constant part of the error term. chi2(1) = 5.27 Prob > chi2 = 0.0217				
Test: Ho: difference in coefficients not systematic chi2(2) = 14.12 Prob>chi2 = 0.0009				

In this regression model, the Breusch and Pagan Lagrangian multiplier test shows that there is a constant part in the error term, and this result is significant at 5% level of significance. Next, Hausman specification test result shows that there is country specific fixed effect. Here we have regressed a fixed effect model (taking country specific dummies) with White heteroskedasticity consistent standard errors.

This result clearly shows (Table 10.) that net capital flow has a significant impact on the nominal exchange rate movements at 5% level of significance. However foreign exchange reserve is found to play no significant role in the movements of the nominal exchange rate.

From the above results we see that in the 90s autonomous capital flow to developing countries, which is independent of their current balance position has had a significant impact on the both the nominal and the real exchange rate movements of the developing countries. This result has serious implication for long-run real exchange rate movements of the developing countries, which we will discuss in detail in the next chapter.

5.2.B.Developed country scenario

We have mentioned in the beginning of this section that large capital flow, mainly private capital flow between developed countries is a very common phenomenon for a long period of time, although it is a new phenomenon for most of the developing countries. Now at this juncture of our discussion, it would be important and necessary to investigate whether there is any asymmetry in the impact of capital flow on real exchange rate movements between developed and developing countries. Using the same model like the earlier section we are going to examine whether net capital

flow and reserve has any significant impact on the real exchange rate movements of the developed countries.

Model : $\frac{1}{R}\frac{dR}{dt} = cons\tan t + \frac{fa}{GDP} + reserve_{t-1}$

Where, fa = (net capital flow)

We have constructed a series of real exchange rate vis-à-vis US for developed countries of our sample, for the period 1985-1998. In construction of this real exchange rate index we have used exactly the same methodology, we used for construction of real exchange rate data for developing countries in chapter II. By the construction of the real exchange rate data any increase in real exchange rate will be depreciation (Definition used for Real Exchange Rate = R = E P*/P, Where E is domestic currency per unit of dollar i.e. like RS/$. Here, P is the CPI of home country and P* is WPI of US).

We have constructed Real Exchange rate series for 11 developed countries[12] for the period 1985-1998. Then like the chapter II we have made real exchange rate index taking real exchange rate of 1990 as 100.

Though Global Development Finance CD-Rom (2001), World Bank provides data for reserve equivalent to months of import for developing countries, it does not provide this data for developed countries. Data for reserve equivalent to months[13] are constructed by

(Total Reserve minus Gold/ Imports of Goods and Services)×12.

All the required data for calculation are collected from IFS.

Here, we have used GLS method for regression as we have 14 years time series data for 11 countries. Result of Cook-Weisberg test for

[12] France, Italy, Denmark, Sweden, Switzerland, Netherlands, Norway, Belgium, Japan, Canada, Spain. Net capital flow data for Austria and Germany is not available in IFS. Therefore we have left out Germany and Australia.

[13] In total reserve we have not taken gold as it is almost at the same level with a declining trend as gold reserve lost its high importance in post Bretton Wood period (except for US and U.K.). U.K. and US still hold a very high proportion of gold in their reserve in comparison to holding of foreign exchange.

heteroskedasticity showed that there is no heteroskedasticity problem in the data. Therefore here we have used GLS model with homoskedasticity assumption. As we have long time series data, possibility of auto-correlation cannot be ruled out and therefore we have used AR (1) process.

Table 11. Regression of Real Exchange rate on Net Capital Flow and Reserves for a Group of Developed Countries During 1985-1998

Cross-sectional time-series FGLS regression

Model: $\frac{1}{R}\frac{dR}{dt} = cons\tan t + \beta_1 \frac{fa}{GDP} + reserve_{t-1}$. All symbols are defined in the text.

Coefficients: generalized least squares
Panels: homoscedastic
Correlation: panel-specific AR(1)

Estimated covariances	= 1	Number of obs	= 154
Estimated autocorrelations	= 11	Number of groups	= 11
Estimated coefficients	= 3	No. of time periods	= 14
		Wald chi2(2)	= 2.21
Log likelihood	= -578.6746	Prob > chi2	= 0.3307

dpreer	Coef.	Std. Err	z	P>|z|
remonth1	.163168	.5736332	0.28	0.78
fagdp	-.5197796	.3502693	-1.48	0.14
Cons	-3.940064	1.9886	-1.98	0.05

dpreer= percentage change in real exchange rate of developed countries, fagdp= net capital flow as a percentage to GDP, remonth1= reserve equivalent to months of import at the end of the period(t-1).

Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
chi2(1) = 1.52
Prob > chi2 = 0.2171

From the above Table 11 we see that neither net capital flow nor reserves has any significant impact on the real exchange rate of developed countries even at 10% level of significance.

The above results for the developed and the developing countries makes it clear that though in 90s exogenous capital flow has significant impact

on the real exchange rate movements of developing countries it has hardly any impact on the real exchange rate of developed countries.[14]

So fall in net capital flow causes depreciation in real exchange rate for developing countries but it would have no such impact on real exchange rate for developed nations, even though they enjoy the bulk of the private capital flow[15]. So there exists an asymmetry in the impact of capital flow on real exchange rate between developed and developing countries. This will have serious implication for the long run real exchange rate movements of developing countries, which we will discuss in the next chapter. From here we can say that developed countries have been able to insulate their real exchange rate from capital flow volatility, which the developing countries have failed to do.

5.3.Interest rate differential and capital flow

In recent years the issue of interest rate manipulation has got a lot of attention particularly in the context of attracting higher capital flow. In fact, the idea of the Mundell-Fleming model of infinitely elastic foreign exchange supply curve with respect to interest rate, also supports the

[14] We have also tested this model with the assumption of heteroskedasticity. Results are similar and in this case also we found no impact of net capital flow and reserves on real exchange rate movements even at 10% level of significance. See appendix of chapter V. Table AD.V.3.

[15] For Developed countries IFS provides data for real effective exchange rate. But the methodology they used is different from us. They have constructed RERj= α_i P/E P* where, α_i = trade share of the country with its partner i where $i \neq j$. E = domestic currency per unit of foreign currency for country j, P= domestic consumer price index, P*= consumer price index of trading partner. Earlier when we constructed real exchange rate for both developing and developed countries we used the definition R = E P*/P. So any increase in real exchange rate series will be depreciation. But the way IFS has constructed real effective exchange rate any increase in real exchange index will be an appreciation. Using this definition of exchange rate also we did not get any significant impact of net capital flow on real exchange rate movements of developed countries. See Appendix of chapter V. Table. AD.V.4.

view that if one country's interest rate increases over that of the others it can get infinitely large amounts of capital. Here in this section we would like to see whether higher interest rate actually has any significant impact on net private capital flow, for both developed and developing countries. All the empirical tests of this chapter are done for the period 1990-1997 for the developing countries[16] and 1990-1998 for the developed countries[17]. We have chosen this period quite deliberately as capital flow and opening up of the economy has gathered momentum in this period for developing countries. All the data used in this section is collected from World Development Indicators CD-ROM, 2001, World Bank.

The model that we are testing for developed countries is

$$\frac{fa}{gdp} = \text{constant} + \beta_1(\text{interest rate of developed country i} - \text{LIBOR})_t + \varepsilon_t \quad \text{...eq(1)}$$

$\frac{fa}{gdp}$ is net capital flow as percentage of GDP (Gross domestic product at constant US million dollar) The spread over LIBOR (London Inter-bank Offer Rate) is defined by the interest rate charged by banks on loans to prime customers minus LIBOR. LIBOR is the most commonly recognized international interest rate and is quoted in several currencies. The average three-month LIBOR on U.S. dollar deposits is used here. The assumption behind the equation (1) is that for investors the expectation of nominal devaluation of developed countries is zero or insignificant.

[16] India, Sri Lanka, Korea, Malaysia, Indonesia, Philippines, Colombia, Costa Rica, Chile, and Venezuela.

[17] France, Italy, Denmark, Sweden, Switzerland, Netherlands, Norway, Belgium, Japan, Canada, Spain.

Table 12 . Regression of Net Capital Flow on Interest Rate Differentials for Both Developed and Developing countries.[18]

Fa_i/gdp = constant + β(interest rate of developed country i – LIBOR)$_t$+ ε_t eq(1)

*eq(1)**

Fa_i/gdp = constant +[(interest rate of developing country i – LIBOR)$_t$ - nominal devaluation]+ ε_t eq(2)

*Fa_i/gdp = constant + (real interest rate differential of developing countries with US)$_t$+ ε_t (2)**

Fa_i/gdp = constant + nominal devaluation +ε_t eq(3)

Period of Study	Country Group	Dependent variable	Fa/gdp	Coef.	Std. Err	Z	P>|z|
Eq1 1990-1998	Developed Countries	Independent variable	Liintdi	.18	.09	2.06	0.042
			Cons	-8.16	1.27	-6.40	0.000
Eq1* 1990-1997	Developing countries	Independent variable	Litrd	-.05	.021	-2.27	0.023
			Cons	4.97	.89	5.60	0.000
Eq2 1990-1997	Developing countries	Independent variable	litrdom	.02	.024	0.75	0.454
			Cons	3.64	.87	4.17	0.000
Eq2 1990-1997	Developing countries	Independent variable	drirusa	.06	.048	1.32	0.19
			Cons	3.57	.87	4.12	0.00
Eq3 1990-1997	Developing countries	Independent variable	nomdet	-.05	.02	-2.49	0.02
			Cons	1.62	1.72	0.94	0.35

Liintdi : nomial interest differential of developed countries with LIBOR
Litrd: nomial interest differential of developing countries with LIBOR
litrdom: (nomial interest differential of developing countries with LIBOR- nominal devaluation)
nomdevt: nominal devaluation at period t.
drirusa= real interest rate differential with us

Note. In all cases Hausman specification test showed that the models are random effect models.

[18] Developed countries. France, Germany, Italy, Denmark, Sweden, Switzerland, Netherlands, Norway, Belgium, Japan, Canada, Austria, Spain.
Developing countries. India, Sri Lanka, Korea, Malaysia, Indonesia, Thailand, Philippines, Colombia, Costa Rica, Chile, Venezuela.

Now from the result of Table 12 we see that equation (1) shows that nominal interest differential between developed countries and LIBOR has significant impact on net capital flow for developed countries during the period 1990-1998. So the assumption of Mundell-Fleming theory is correct for developed countries. This result shows that even if there is shortage of capital developed can attract capital flows simply by increasing nominal interest rate over LIBOR.

But running the same regression for developing countries

$$\frac{fa}{gdp} = \text{constant} + (\text{interest rate of developing country i} - \text{LIBOR})_t + \varepsilon_t$$

.....eq(1)*

Shows (Table 12) a somewhat different and odd result. Higher the interest rate of the country from LIBOR higher will be the outflow of capital. This model is actually a miss specified model for developing countries and the assumption that the expectation of devaluation is zero for developing countries is actually wrong. Developing countries keep their interest rate higher than developed nations or LIBOR, mainly to assure the investors that they will not loose due to devaluation of currency of developing nations. So, developing countries are supposed to keep their interest rate higher than the developed countries interest rate (say that of US interest rate or LIBOR) to cover the loss of investors, due to possible devaluation. It is obviously the expected devaluation that will come to investors mind that matters most. Now we are assuming two plausible alternative cases.

A. What the investors expect is actually met, i.e. the actual devaluation is equal to expected devaluation.

$$\frac{fa}{gdp} = \text{constant} + \beta_t[(\text{interest rate of developing country i} - \text{LIBOR})_t - \text{nominal devaluation}_t] + \varepsilon_t \quad \text{.....eq(2).}$$

Where expected nominal devaluation = Actual nominal devaluation.

B. Investors are expecting purchasing power parity to hold. i.e. nominal devaluation will be exactly the same as that of inflation differential of two countries. In this case that model will be.

$\frac{fa}{gdp}$ = *constant* + β_t *[(interest rate of developing country i –US nominal interest rate)*$_t$ *–inflation rate differential between US and the country i]+* ε_t

or, $\frac{fa}{gdp}$ = *constant* + β_t *[(real interest rate differential with US)*$_t$ *- nominal devaluation*$_t$*]+* ε_t .....eq(3)

From regression of eq(2), and eq(3) (Table 12) we see for the above cases we can not reject the null hypothesis $\beta = 0$ at 5% level of significance i.e. in both cases even if the developing countries put their interest rate much higher than developed countries still they will not be able either to attract much capital flow or stop outflow of capital by keeping interest rate higher than US rate or LIBOR.(Real interest rate is the lending interest rate[19] adjusted for inflation as measured by the GDP deflator. All these data relating nominal or real interest rate are collected from World Development Indicators).

Now the idea that higher nominal devaluation of developing countries may lead to higher net capital outflow is actually supported by the result of the regression of eq.(4) as mentioned in Table 12

$Fa/gdp=constant+\beta_1(nominaldevaluation_t)+\varepsilon_t$ eq(4)

[19] Lending rate is the interest rate charged by banks on loans to prime customers. This definition of lending rate will be applicable to all cases where we have mentioned lending rate.

Where we see that higher nominal devaluation leads to higher outflow capital. And this shows that expectation of higher future devaluation for developing country's exchange rate will ultimately lead to higher capital outflow. Again this result gives support to building up the model of eq(2) and eq(3), where we have introduced expectation of inflation.

This tells us two things. The first is that capital flow is exogenous for developing countries. This implies that developing countries have no control over the capital flow and as we start depending on private capital flow, no policy action can be taken in the interest of the nation state if it is frowned upon by international interest. And any such action like demand management policy to reduce unemployment or poverty that can shake the confidence of international financiers will result in a capital flight and both real and nominal exchange rate will depreciate by large margins. Secondly, there exist large risk premia for developing countries (which includes currency risk and other risks), that is, developing countries will have to put their interest rate much higher than the developed nations to attract the capital covering risk factors relating to devaluation and other uncertainty. In this situation any exogenous increase in interest rate in developed countries will cause ceteris-paribus capital outflow and real and nominal exchange rate devaluation in the developing countries. If developing countries keep high interest rates then their domestic investment will get curtailed and at the same time repayment obligations will be correspondingly high. The assumption of the Mundell-Fleming model says that there is an infinitely elastic supply of foreign exchange at the prevailing interest rates, and from this follows the conclusion that that a country can never be foreign exchange constrained as long as it maintains the interest rate. Now from our above results we see that this is a valid assumption for the developed countries but it is a questionable assumption for developing countries. We have found that even if,

Interest rate of a developing country i equals [interest rate of LIBOR (or, US) + nominal devaluation of its currency]
it would be unsuccessful in attracting foreign capital.

This shows that there is certain country risk factor in developing countries, and for this reason even if they are successful in bringing capital; still it will be a limited or finite one. From here, it follows that for developing countries, if the currencies are on a down ward slide, then raising the interest rates will not be effective to check the slide through capital account effects, while this will be true for developed countries.

Appendix of chapter V

Table AD.V.1. Regression of Real Exchange Rate on Current Balance for Developing Countries During 1990-97.

Model: $\frac{1}{R}\frac{dR}{dt} = cons\tan t + \beta_1 \frac{CA}{EXP} + \varepsilon_t$, all these symbols has been defined earlier in the text. Period of study 1990-1997

Regression with robust standard errors Number of obs = 104
F(1, 102) = 0.95
Prob > F = 0.3309
R-squared = 0.0126
Root MSE = 7.9862

Dpreer	Coef	White heteroskedasticity consistent Std. Err	t	P>|t|
Cadexp	.052194	.053421	0.98	0.331
Cons	-1.076517	1.263027	-0.85	0.396

Breusch and Pagan Lagrangian multiplier test for random effects: 1990-97
Test: Var(u) = 0
chi2(1) = 0.38
Prob > chi2 = 0.5394

dpreer = % change in real exchange rate, caexp= (current account/export) in percentage

Table AD.V.2. Regression of Real Exchange Rate on Current Balance for Developing Countries During 1982-89

Model: $\frac{1}{R}\frac{dR}{dt} = cons\tan t + \beta_1 \frac{CA}{EXP} + \varepsilon_{t,}$ all these symbols has been defined earlier in the text. Period of study 1982-1989

Regression with robust standard errors Number of obs = 104

F(1, 102) = 0.02

Prob > F = 0.8877

R-squared = 0.0001

Root MSE = 17.998

dpreer	Coef	White heteroskedasticity consistent Std. Err	t	P>|t|
cadexp	-.0085346	.0602855	-0.14	0.888
cons	4.560404	2.308721	1.98	0.051

Beusch and Pagan Lagrangian multiplier test for random effects:1982-89

Test: Var(u) = 0

chi2(1) = 1.42

Prob > chi2 = 0.2332

dpreer = % change in real exchange rate, caexp= (current account/export) in percentage

AD.V.3. Regressing of Real Exchange Rate on Net Capital Flow and Reserves for Developed Countries During 1985-98

Cross-sectional time-series FGLS regression

Model: $\frac{1}{R}\frac{dR}{dt} = cons\tan t + \frac{fa}{GDP} + reserve_{t-1}$. All symbols are defined in the text.

Coefficients: generalized least squares
Panels: heteroskedastic
Correlation: panel-specific AR(1)

Estimated covariances = 11 Number of obs = 154
Estimated autocorrelations = 11 Number of groups = 11
Estimated coefficients = 3 No. of time periods= 14
Wald chi2(2) = 2.24
Log likelihood = -570.175 Prob > chi2 = 0.3257

dpreer	Coef.	Std. Err	z	P>|z|
remonth1	-.12	.53	-0.23	0.81
Fagdp	-.48	.33	-1.46	0.15
Cons	-2.79	1.81	-1.54	0.13

Sdpreer= percentage change in real exchange rate (vis-à-vis US) of developed countries, fagdp= parentage of net capital flow to GDP, remonth1= reserve equivalent to months of import at the end of the period (t-1)

AD.4. Regressing of Real Effective Exchange Rate on Net Capital Flow and Reserves for Developed Countries During 1985-98

Model : $\frac{1}{RER}\frac{dRER}{dt} = cons\tan t + \frac{fa}{GDP} + reserve_{t-1}$. , All the symbols of this model has been defined in the text.
Period of study 1985-1998

Cross-sectional time-series FGLS regression

Coefficients: generalized least squares
Panels: homoscedastic
Correlation: panel-specific AR(1)

Estimated covariances = 1 Number of obs = 154
Estimated autocorrelations = 11 Number of groups = 11
Estimated coefficients = 3 No. of time periods=14
Wald chi2(2)= 0.32
Log likelihood = -468.8313 Prob > chi2 = 0.8519

sdpreer	Coef	Std. Err	Z	P>|z
remonth1	-.0941785	.2900144	-0.32	0.745
fagdp	-.0797217	.1701064	-0.47	0.639
_cons	.5885877	.9195006	0.64	0.522

sdpreer = % change in real effective exchange rate, remonth1= reserve equivalent to months of import at the end of the period(t-1)., fagdp= net capital flow as a percentage of GDP.

Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
chi2(1) = 0.11
Prob > chi2 = 0.7347

Chapter VI

Implications of Capital Flow for Developing Countries

In the last chapter we got an interesting result, that is, in the 90s real exchange rate movements in developing countries are governed by capital flows while for the developed countries they are not. In this chapter we would like to analyse the implications this can have for long run real exchange rate trend for developing countries.
There are serious implications when autonomous capital account transactions start influencing real exchange rate.

a) Although capital inflow gives cheap finance in the short run, in the long run it increases the country's indebtedness and vulnerability to sudden capital outflow, given the fact of the high return they have earned in the country. So with larger capital inflow, in the long run there is always the possibility of larger repayment problems and larger outflow. Once capital flow starts influencing real exchange rate for developing countries and not for developed countries, this larger repayment problem may lead the real exchange rates of developing countries to deteriorate in the long run. Only high reserves can come to the rescue if there is government intervention for restoring stability.

b) At the same time portfolio capital flow, which is the substantial part of capital flow in the 90s (World Bank, Global Development Finance, 2001), which is extremely volatile in nature, and can cause large volatility in real exchange rate. And therefore volatility of the real exchange rate is one of the most serious consequences, once capital flow starts influencing the real exchange rate of developing countries. In recent years severe volatility of the real exchange rate in the East Asian countries that were large recipients of portfolio capital came through this route.

c) Obviously countries can go on taking deflationary policies in order to keep their currency on par with the dollar and not allow real exchange

rate to depreciate. However there is a certain limit to this as far as developing countries are concerned, beyond which it is not possible for them to adopt deflationary policy. Huge unemployment and poverty problems of these countries will actually become a constraint to the adoption of deflationary policy beyond a limit.

Enormous economic power has thus been accumulated in the hands of private banks and financial institutions that can transfer large volumes of funds from one country to other. Any policy of demand management by a single country has become increasingly subject to this constraint. An economic programme of demand expansion through large public investment can be paralyzed through such capital flights in so far as banks and financial institutions move funds at the initiation of such demand expansion. This would precipitate severe balance of payment difficulties, which have little to do with the current account implications of the expansion in demand. In this situation the policy of the developing countries will be governed to a large extent by the interest, of the international financial interests and national sovereignty in the matter of pursuing economic policy in the interest of the domestic population will be under threat.

Though many of the developing countries are facing various degrees of foreign exchange shortage, still, a relatively large inflow of short-term external capital flow need not be an unmixed blessing in a liberalised trade regime, particularly in the long run. The reason is that, such capital flows may sustain artificially for some times an import surplus that has a contractionary impact on the size of the domestic market and activity level. At the same time, sustaining import surplus in this manner builds up external debt and makes the economy more vulnerable to capital flight

and hence to high nominal and real exchange rate devaluation in the long run.

As the experience of the 90s shows most of the capital flows are in the form of short-term capital. And even if some capital comes in the form of Foreign Direct Investment, a large chunk of that is in the form of the purchase of public sector units, or private domestic firms, or collaboration with local firms, or in real estate business[1]. So the possibility of an increase in export from investment by FDI is minimal since it either substitutes domestic investment or goes into non-tradables like real estate. Even from the reports of Global Development Finance, 2001, (A World Bank Publication) it is evident that most of the FDI in developing countries came in the form of purchasing public sector units of developing countries.

Now, for a foreign exchange constrained developing country, short-term capital flow in the form of portfolio investment, in various financial assets, increases the imports due to cheap availability of foreign exchange in a situation of import starvation. If short-term capital inflow exceeds trade (or current account) deficit at the prevailing exchange rate then, it may lead to increasing foreign exchange reserves held by the central bank and other institutions in the country if government policy is to maintain the exchange rate. But if there is no intervention for exchange rate stability, then such inflow would lead to an appreciation of the market determined domestic currency, generating a larger trade (or current account) deficit. Thus, on the one hand the trade deficit widens due to appreciation of the domestic currency, while domestic demand and activity levels contract. On the other hand, the show is kept going temporarily through capital

[1] "*Global Development Finance*," Volume I. 2001,World Bank

inflows, which entail a higher burden of external debt and servicing requirement. After some time, this high current account deficit, which may after crossing a critical limit or any other exogenous shock shakes the confidence of investors and capital flight, takes place. Once the capital flight takes place, it gives rise to further and further capital flight due to loss of confidence, and countries face drastic decline in currency values. All this is the recipe for financial disaster that sooner or later hits the developing country with a liberalized trade and financial regime, where excessive inflow of external short-term finance can ultimately play havoc. The above analysis shows that in a liberalized trade and financial regime, there always exists a possibility of decline in both nominal and real exchange rate of developing countries when net exogenous capital flow starts having significant impact on real exchange rates; but this danger appears to be much less for developed countries. The experience of Latin American and East Asian crisis indicates that this type of scenario is not implausible, even though detailed process may differ among countries.

d) Capitalism cannot operate without a stable medium of exchange in which wealth can be held. Now here by stability we imply that the value of the relevant currency should not decline and thereby is not expected to decline relative to the world of other commodities. In this context of capitalist world economy this means that there will be one dominant currency out of the multiple national currencies whose value vis-à-vis the world of commodities does not tend to decline rapidly, which in other words is "as good as gold". The very objective of the Bretton Woods system was to find a stable medium in international market in which wealth could be held along with the motive to resist competitive devaluations and trade wars. During the whole Bretton –Woods period the US dollar performed this role.

However even after the breakdown of the Bretton - Wood system unofficially the dollar is still the most stable medium of exchange and therefore still enjoys the role of a dominant currency. But after Bretton Woods the dollar gold parity is broken and the US does not have any responsibility of paying gold for dollar at any gold parity rate. It is the interest of the wealth-holders, belonging to many countries and holding their wealth in dollar assets, to keep dollar stable, which also actually contributes towards its stability.

But there are certain currencies, notably the third world currencies, which have a continuous tendency to decline and do not constitute a safe medium of holding wealth. In a world characterised by free capital movements, there always exists a secular tendency for capital to move out of these currencies. The secular tendency for capital outflow from the third world, no matter what the level of activity, gives rise in turn to another secular tendency, a secular tendency for both the nominal and real exchange rate to depreciate, not just at any given level of activity but even despite reductions in the level of activity through deliberate deflation. This possibility is strongly confirmed results of the earlier chapter, namely that for developing countries the net capital flow has a statistically significant impact on the real exchange rate in the 90s when financial liberalisation process is going (in contrast to 80s). The fact that capital flow does not have any significant impact on real exchange rate movements of the developed countries either in 80s or in 90s, only shows that their exchange rates are not subject to any similar downward pressure, and have constitute, taken as a whole, a safer medium of holding wealth than the developing country's currencies.

Now, one may argue the existence of a tendency of the real exchange rate towards a secular decline from a current account perspective. If the Marshall-Lerner condition is not fulfilled, then the excess demand curve for foreign

exchange with respect to its price would not be downward sloping even on current account transactions. In such a situation, with flexible exchange rates, there would be a tendency of secular decline in real exchange rate due to current account that may not be nullified by capital account balance. As I have mentioned earlier, most of the exports of third world countries are primary products or light manufacturing goods and their elasticity of demand is very low. On the other hand imports of these countries are mainly necessary manufactured goods; the elasticity of demand for them are also very low. Under these circumstance8s tendency of a secular decline in real exchange rate is not unlikely. But our result that the real exchange rate movements are not influenced significantly by the current balance shows that the weight of this explanation is not very considerable.

Prabhat Patnaik(2002)[2] has argued that this 'capital account' based explanation is more powerful than the 'current account' based explanation to understand why the secular decline in real exchange rate may continue for developing countries (particularly , when capital flow starts influencing real for developing countries exchange rate in the era of high capital movements of 90s.). He has argued that

> "If we look at the current account transactions, it would appear that deflation of an appropriate order of magnitude can always do the trick of stabilizing the foreign currency market. Consider any single period. Since demand for foreign exchange depends upon the level of activity, an appropriate reduction in the latter through deflation can always eliminate any excess demand for foreign exchange, whatever be its price. Whenever we consider the capital account, however, the pitfalls of deflation..... become obvious. There is, as mentioned above, a certain limit to the extent to which the economy can be deflated in any particular period if this much of deflation is insufficient to arrest a capital flight that has begun on account of, say, some external shock, then the decline in the exchange rate triggered by the shock would continue. In other words, it is only when we take into consideration the

[2] Patnaik. P. 2002. "*Globalisation of Capital and Terms of Trade Movements*", in Ramachandran. V. K. & Swaminathan Madhura (ed). "Agrarian Studies". 2002. 94-110.

> capital account transactions that we can understand why a secular decline in real exchange-rate may continue, despite reduction in the level of domestic capacity utilization."

That is why even when the developing countries are going through a period of significant deflation, even in the midst of a reduction in economic activity, a capital account based explanation becomes more and more appropriate than only the current account based explanation. In the earlier chapter we have found that current account deficit does not have any significant impact on the real exchange rate in the 90s, while capital flow has a significant impact on the real exchange rate of developing countries. In this situation the capital account based explanation to understand the tendency of secular decline in both nominal and real exchange rates of developing countries is much more appropriate than other explanations.

Chapter VII

Conclusion

1. Summary and analysis of earlier chapters

In chapter two we have defined real exchange rate and constructed real exchange rate series with US as the foreign country for some major developing countries for a long period of time. In this chapter we have found that most of the countries except Thailand have experienced a long run secular decline in real exchange rate.

In chapter three we have discussed in detail the Balassa-Samuelson productivity bias theory, which is the most widely discussed theory in the literature on real exchange rate determination. But here the econometric test gives a result that is exactly the opposite of what Balassa had predicted. Our result is exactly of the same kind as that of Officer (1976), when he made the test with tradable-nontradable productivity ratio, which is the most precise test of the theorem.

Similarly in the fourth chapter we have examined the other two factors, terms of trade and government consumption expenditure on non-tradables that are often seen as determinants of real exchange rates. The result is also disappointing, like the earlier one. Here we have found that for both terms of trade and government consumption expenditure there is no significant impact on real exchange rate. Again here we have found that nominal devaluation has a significant impact on real exchange rate, which is very much expected. In many studies we have found that both nominal exchange rate and terms of trade are used simultaneously. Here, however, we have also shown through a test that nominal devaluation has a significant impact on terms of trade decline. Thus nominal devaluation has a significant impact on real exchange rate and terms of trade simultaneously and it is better not to use the two variables in the same equation for econometric testing.

There is a wide spread notion among the economists that large, persistent current account deficits of the developing countries are the cause of the secular decline of real exchange rate for many developing countries. On the other hand large capital account transactions and capital flows have over shadowed the trade related transactions for the last two decades, and, for the developing countries particularly, the 90s have witnessed increased capital account transactions and private capital flows. With the introduction of liberalized trade and financial regime private capital inflows and out flows have dominated the capital account transactions. In chapter five we have examined whether current account (as a percentage of export) has any impact on the real exchange rate for the period 1982-1997, and we did not get any significant result. This says that current account (as a percentage of export) has no such significant impact on real exchange rate change. The result is insignificant even if we check it for 1990-1997. In this chapter we have also done the above exercise for a group of developed countries and in that case too, we did not get any significant result. This says that current balance (as a percentage of exports) has no such significant impact on real exchange rate movements, for both developing and developed countries.

In this chapter we have also found that for developing countries, in the 90s, net capital flow and the level of reserve (equivalent to months of imports), have significant impact on real exchange rate. That is, in the 90s, the autonomous capital flow to developing countries which is independent of their current balance position have started influencing real exchange rate significantly. But while this is true for developing countries, it is not true for developed countries. For developed countries we did not find any statistically significant impact of net capital flow on real exchange rate movements. So there exists an asymmetry in the impact of capital flow on real exchange rate between developing and developed countries.

This has serious implications for the long-run real exchange rate movements, which we have discussed in detail in chapter six. In chapter five we also found that nominal interest rate differential between developed nations and LIBOR has significant impact on net capital flow. So they can attract capital if they want to, just by putting their nominal interest rate higher than LIBOR. But for developing countries even interest rate differential with LIBOR minus nominal devaluation does not have any significant impact on net capital flow. From here it follows that if the currency is on a down ward slide, then, raising the interest rate will not be effective to check the side through capital account effects.

In chapter five we found that though capital outflow would result in real exchange rate depreciation for developing countries, it has no statistically significant impact on real exchange rate movements of developed countries. In chapter six we have analysed the implications of this result

a. Highly volatile capital flows, in the era of freely mobile capital would increase volatility in the real exchange rates of developing countries.

b. Higher repayment obligations generated from current high inflows of private capital may cause decline in long-term real exchange rates for developing countries, when capital outflow will cause exchange rates of developing countries to decline and not developed countries.

c. For foreign exchange constrained economies high capital inflows increase the imports due to cheap availability of foreign exchange, even when export does not increase. This widens the current account deficits for these countries. Now, after some time, when current account deficits cross a critical limit or any exogenous shock occurs, then the confidence of investors is shaken. Once the capital flight takes place, further and further capital flight due to loss of confidence brings financial disaster and high decline in currency values of developing countries.

d. Capitalism can not operate without a stable medium of exchange in which wealth can be held. There is a hierarchy of the currencies of the world. At the apex there is a dominant currency which is treated "as good as gold" and constitute as the safest medium of holding wealth. Then there are currencies of major capitalist nations, which are also regarded as safe medium of holding wealth. At the bottom there are currencies of third world, which do not constitute a safe medium of holding wealth. Now, in a world charecterised by free movements of capital, there always exists a secular tendency for capital to move out, which simultaneously gives rise another secular tendency for both nominal and real exchange rate to depreciate, irrespective of the level of activity in the economy. In this context Prabhat Patnaik (2002)[1] has argued that,

> " In their case deflation does not necessarily work in stabilizing currency values and hence the secular tendency is for a capital outflow as well as a decline in real exchange-rates, no matter what the level of activity."

In this chapter we have seen that, even when the developing countries are going through a period of significant deflation, resulting in reduction in economic activity, a capital account based explanation becomes more and more appropriate than the current account based explanation to understand the tendency of secular decline in long-run real exchange rate for a large number of developing countries.

[1] Patnaik. P. 2002. "*Globalisation of Capital and Terms of Trade Movements*", in Ramachandran. V. K. & Swaminathan Madhura (ed). "Agrarian Studies," 2002. 94-110.

2.POLICY IMPLICATION

2.A. CAPITAL CONTROL

The issue of capital control should be an integral part of stabilization and structural adjustment programme, particularly when high inflow and capital flight can destabilize the economic position of a country. The objective should be to put certain restrictions on short-term capital flow, or, to put restriction on outflow and thus discouraging short-term portfolio investment and encourage long-term capital inflow. And by changing composition it can reduce the sudden inflow and outflow of capital, which puts very large pressure on both real exchange rate, and performance of the economy. This attempt is made to reduce volatility of capital flow and short-run payment problem by reducing the level of portfolio investment. The major success instance of capital control is Chile. Sebastian Edwards[2] has shown that after capital restriction was imposed in Chile the composition of capital has changed drastically and short-term flow has reduced while long-term flow has increased. Edwards (1998) has mentioned "The fact that this change in composition happened immediately after the time when the capital restrictions were imposed supports the view that the control policy has indeed affected the composition of inflows". In fact many of the developing countries of Latin America have imposed further restrictions on capital flow, while the Asian countries did not go for capital restriction. Although some 119 out of the 155 developing countries surveyed in 1995 IMF[3] reports, have some form of capital control in place, the main thrust of the IMF and World Bank Official policy has been to press for currency convertibility on capital

[2] Edwards Sebastian. 1998. "Capital Flows, real Exchange Rates, and Capital Controls: Some Latin American Experiences," NBER WP. 6800

[3] International Monetary Fund. 1995."Annual Report on Exchange Restrictions". Washington, D.C.: IMF

account of developing countries. This requires that their currency be freely convertible for all types of international capital transactions, thereby exposing them even further to the mercy of short-term international capital flow. And, although article VI of the IMF[4] permits member states to impose capital controls, the IMF has virtually no responsibility in helping developing countries devise and enforce these controls. Under these circumstances when short-term portfolio inflow and outflow is a regular phenomenon, national authority will have to be more and more vigilant rather than throwing the economy in to the vagaries of portfolio investment. The imposition of capital control in the era of high volatile capital flow is urgently needed because it is always easier to control inflow rather than outflow.

2.B. TRANSACTION TAX

Transaction tax (Tobin Tax) is another option through which the national authority can put a check on capital flow. As we have mentioned earlier, regulating the outflow of short-term capital is always more difficult than regulating its inflow, and developing countries must learn to be prudent when they receive these flows. The so-called ' Chilean model' is always a useful pointer in this respect. Currently in Chile, local firms borrowing abroad are required to keep 30% of their loan as deposit with the central bank without interest for a year, irrespective of the duration of the loan. This is designed to encourage foreign borrowing with a longer –term perspective, while also raising its cost (Sebastian Edwards)[5]. A discretionary national tax policy, putting higher tax rate on income from profit on real estate investment, can also be an alternative.

[4] International Monetary Fund.1997." International Capital Markets: Developments, Prospects and Key Policy Issues". Washington, D.C.: IMF

[5]Edwards Sebastian. 1998. "Capital Flows, Real Exchange rates and Capital Controls: Some Latin American Experiences", NBER WP. 6800. Table 2. "Restrictions on Capital Inflow in Chile."

2.C. IMPORT CONTROL

From our earlier discussion we have seen that imports may actually go up for a foreign exchange constrained developing country when it gets a lot of foreign exchange from capital inflow. And this may actually cause a high trade deficit and current account deficit, which can erode the confidence of investors. For this reason it would be important for any developing country to put some degree of import control. The idea that import control is always bad for a country is merely an article of faith and not a reasoned basis for policy formulation.

Annexure

Table An1. Real Exchange Rate vis-à-vis US Developing Countries

Year	India	Pakistan	Sri Lanka	Korea	Malaysia	Indonesia	Thailand	Philippines	China	Mexico	Chile	Colombia	Costa Rica	Uruguay	Venezuela
1950	75.83							47.90							
1951	81.21		28.84		81.13			49.29					57.74		
1952	80.51		28.22	20.47	77.74			51.27					57.74		
1953	77.04		27.38	49.08	78.93		107.23	52.40				44.78	56.94		
1954	81.16		27.57	38.30	84.14		103.52	53.15				41.43	55.47		
1955	85.67		27.85	59.20	87.18		115.06	53.99		86.71	12.80	41.57	53.67		58.11
1956	80.81	64.39	28.84	46.20	89.28		114.81	54.17		89.51	17.56	39.85	54.92		59.32
1957	78.74	60.73	28.93	40.94	87.96		107.11	54.87		92.13	42.43	54.33	54.59		64.96
1958	76.13	59.49	28.72	44.24	90.43		102.41	53.92		74.71	34.19	82.44	53.95		62.23
1959	73.03	61.78	28.69	43.37	92.43		109.01	55.08		74.85	24.64	78.25	54.06		59.90
1960	71.78	57.81	29.17	49.46	92.44		110.91	52.98		74.91	22.11	77.19	53.65		57.67
1961	70.26	56.60	28.75	85.94	92.30		102.95	50.54		74.65	20.53	70.55	55.23		58.96
1962	68.03	57.07	28.37	82.08	92.42		98.97	90.64		74.82	18.03	72.83	60.23		58.34
1963	65.88	56.09	27.69	67.83	89.39		97.86	87.51		74.62	24.93	71.87	58.23		57.44
1964	58.25	53.97	26.90	83.07	89.95		98.62	80.77	30.90	74.79	17.33	59.69	56.64	70.49	74.68
1965	54.26	52.15	27.35	95.96	91.81		100.25	79.79	32.17	76.27	20.43	68.91	58.19	78.87	75.14
1966	67.60	50.19	28.29	92.79	93.93		99.55	78.42	33.93	65.65	22.88	76.76	59.66	87.07	76.67
1967	70.66	47.16	28.34	87.11	90.07		95.66	74.39	34.02	65.82	24.16	75.68	59.37	88.65	76.87
1968	70.37	48.23	33.59	84.44	92.46	87.84	96.33	74.72	34.15	67.46	28.06	83.53	58.29	90.24	77.86
1969	72.67	48.56	32.48	85.62	96.45	86.96	97.72	76.66	34.75	70.09	28.04	83.73	58.90	83.15	79.01
1970	71.62	47.78	31.81	87.61	98.13	89.33	101.30	104.37	37.54	72.63	29.09	85.99	58.62	73.98	80.00
1971	71.76	47.15	31.89	93.18	99.47	95.54	104.23	96.71	38.80	64.34	25.05	88.43	58.65	61.67	79.96
1972	71.29	85.01	31.54	96.73	93.01	99.07	103.76	96.83	36.27	67.16	23.67	88.64	58.70	78.14	79.89

Table An1. Real Exchange Rate vis-à-vis US Developing Countries

Year	India	Pakistan	Sri Lanka	Korea	Malaysia	Indonesia	Thailand	Philippines	China	Mexico	Chile	Colombia	Costa Rica	Uruguay	Venezuela
1973	70.31	89.92	34.88	103.72	82.36	85.59	101.62	95.26	35.56	66.49	32.15	89.71	57.72	72.59	84.74
1974	68.02	83.48	38.37	88.10	82.39	72.34	96.31	84.73	40.78	63.20	52.07	94.66	62.83	62.97	92.87
1975	72.68	75.43	41.43	90.99	85.42	66.38	98.71	92.53	41.45	62.77	68.39	100.42	63.14	64.78	91.91
1976	88.07	73.66	51.34	84.94	92.56	57.97	99.20	90.98	45.24	111.17	60.43	97.86	63.87	101.70	90.04
1977	84.15	70.98	56.76	82.68	90.79	55.40	97.93	87.40	46.95	90.21	55.15	82.55	64.96	75.22	88.47
1978	82.91	72.09	96.01	79.86	88.02	58.83	97.81	87.46	44.81	82.65	62.36	80.54	66.20	117.51	88.79
1979	87.18	74.92	97.30	75.63	90.19	80.27	99.86	83.79	46.83	80.87	61.95	78.98	68.09	79.33	88.87
1980	86.36	76.37	93.46	77.98	96.05	78.09	95.58	82.37	50.40	70.76	54.78	79.26	65.86	56.59	83.50
1981	91.81	74.53	100.68	79.25	100.82	76.53	92.85	83.60	60.03	60.97	49.96	78.21	133.12	44.92	78.80
1982	94.83	85.91	100.19	82.92	98.89	74.65	95.89	84.60	65.65	118.18	60.50	75.33	122.72	38.77	73.04
1983	91.63	90.60	100.65	88.93	95.71	92.95	98.65	105.88	66.09	118.66	74.51	78.29	102.94	80.58	69.70
1984	97.41	93.59	95.52	93.94	95.15	97.23	100.14	111.10	77.97	103.62	79.68	88.33	102.03	104.50	104.78
1985	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1986	91.06	98.08	92.79	99.89	100.29	105.98	109.56	106.75	112.06	122.41	96.47	111.45	96.35	83.24	93.62
1987	88.28	100.51	92.91	95.21	100.25	127.58	106.23	107.26	118.11	122.59	93.95	115.90	94.91	80.01	134.69
1988	90.16	99.39	91.59	85.72	105.71	125.94	104.11	101.92	110.57	97.93	95.11	116.03	98.63	80.20	108.21
1989	103.95	110.34	97.65	81.40	111.62	130.43	101.97	99.02	112.78	92.83	93.00	123.79	95.55	80.46	147.18
1990	106.51	110.76	92.50	85.30	112.23	130.45	101.26	101.29	140.38	86.70	87.25	130.31	93.39	74.04	146.59
1991	121.82	108.86	85.34	84.61	109.79	126.47	95.57	96.85	138.60	76.12	82.19	126.25	97.22	63.41	132.62
1992	124.92	105.34	81.64	88.65	97.72	123.10	92.11	83.26	132.20	67.82	74.35	119.87	88.20	56.59	122.13
1993	140.20	108.93	81.73	91.13	96.55	117.10	90.01	84.05	133.25	63.32	74.62	112.78	86.19	48.63	119.21
1994	132.56	106.78	78.06	89.92	96.09	113.14	86.50	76.53	188.73	64.95	70.50	90.29	84.93	43.52	122.72
1995	128.80	101.93	77.89	85.41	90.21	111.47	84.14	71.42	176.24	94.67	63.72	83.55	81.74	39.94	94.68
1996	132.06	107.72	74.11	88.29	89.87	110.00	80.59	68.34	156.29	85.30	63.08	80.72	82.21	39.95	114.33
1997	126.27	110.19	72.17	100.49	97.60	127.98	77.58	72.48	130.23	73.68	60.43	74.72	81.29	39.48	89.21
1998	123.58	111.09	70.47	128.71	126.13	272.53	86.64	89.40		71.53	61.56	75.68	78.51	38.54	71.80
1999	124.26	117.58	73.98	112.42	120.01	178.87	114.87	80.79		64.72	66.40	84.51	79.90	39.84	64.82

Table **An.2. Labour productivity of Tradable Sector f Some Countries, 1980-1999**

	India	USA	Malaysia	Thailand	Pakistan	Philippines	Indonesia	Korea	Chile	Costa Rica	Colombia	Uruguay	Venezuela
1980	68.80	83.76	63.38	62.91	68.99	104.11	77.22	43.62	106.13	110.02	94.37	199.70	103.75
1981	71.06	81.24	64.82	78.47	71.85	104.92	78.17	48.44	112.35	113.17	87.32	190.21	93.83
1982	69.82	79.07	73.38	79.67	73.47	100.40	73.55	51.96	114.44	93.49	103.36	195.26	92.90
1983	76.96	80.02	74.15	80.91	76.82	96.06	77.38	58.91	107.76	96.02	98.92	147.47	90.78
1984	79.22	87.81	77.88	80.34	75.84	93.06	84.86	67.65	107.61	95.77	102.71	119.75	100.56
1985	80.40	91.12	76.20	71.31	84.85	85.00	89.75	71.55	88.55	101.04	120.64	115.94	99.26
1986	79.76	90.46	79.00	74.69	86.25	85.11	87.35	79.15	89.05	102.06	121.72	117.23	103.73
1987	81.07	96.11	82.49	80.08	90.46	91.26	89.75	82.79	87.65	96.28	118.20	111.11	99.93
1988	92.41	100.78	86.39	84.50	93.62	95.85	92.84	91.38	90.46	97.96	116.25	110.74	104.61
1989	96.89	100.90	94.34	91.22	98.18	100.20	95.92	92.15	94.75	98.36	117.31	103.93	95.86
1990	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1991	97.03	96.42	105.64	113.31	117.22	97.10	108.76	109.41	101.44	103.96	93.66	96.53	103.26
1992	100.53	96.94	112.10	118.13	121.54	91.93	114.20	119.02	109.59	112.12	89.96	98.93	103.41
1993	106.34	99.68	117.06	133.10	121.22	91.62	126.62	128.34	111.02	119.42	74.12	94.10	105.35
1994	114.20	109.66	118.57	146.66	121.38	93.90	143.81	141.07	118.52	122.61	69.26	101.72	91.96
1995	118.76	117.78	133.37	163.74	133.70	97.18	149.34	158.20	128.24	129.72	73.70	104.09	104.22
1996	123.88	122.82	142.63	180.81	138.02	99.57	159.87	172.92	126.22	133.57	72.90	117.72	102.80
1997	122.86		156.09	177.71	134.52	104.68	170.69	190.50	132.87	138.45	77.15	16.54	109.91
1998	130.76		137.24	165.27	129.09	100.99	150.73	190.14	135.28		81.37	143.09	
1999	138.79			187.02	129.78	103.46	152.64	226.93					

Table. An.3. Labour Productivity of Non-tradable Sector for Some Countries, 1980-1999.

	India	USA	Malaysia	Thailand	Pakistan	Philippines	Indonesia	Korea	Chile	Costa Rica	Colombia	Uruguay	Venezuela
1980	64.277	85.448	92.558	76.772	69.255	114.68	70.431	73.599	97.737	107.69	103.76	233.87	153.89
1981	66.061	86.294	96.882	71.569	72.089	107.4	75.056	73.213	99.745	101.07	97.432	236.15	138.2
1982	67.37	84.505	85.792	68.589	75.446	111.85	75.333	72.303	92.741	94.376	101.82	208.4	133.05
1983	72.421	89.209	89.319	68.922	80.138	111.82	67.659	76.112	78.51	92.508	103.54	121.06	120.93
1984	73.576	90.864	90.349	73.377	83.864	100.48	67.786	80.651	84.71	89.807	107.44	91.016	116.7
1985	77.56	92.202	87.386	73.889	85.91	91.294	78.626	79.616	82.47	90.52	111.38	89.838	113.08
1986	81.932	95.14	81.397	73.947	97.119	91.696	66.987	84.689	84.902	95.478	110.52	95.757	117.82
1987	85.451	95.697	81.011	74.573	87.722	95.246	68.656	90.308	91.168	98.329	110.43	100.55	113.07
1988	90.021	99.044	88.591	83.969	94.764	96.89	85.902	96.357	92.528	97.621	111.42	99.741	115.26
1989	96.716	100.71	95.135	91.873	98.175	99.914	93.434	97.746	99.702	100.34	110.67	99.558	100.54
1990	100	100	100	100	100	100	100	100	100	100	100	100	100
1991	102.27	98.57	129.41	95.397	96.765	100.87	104.59	103.04	108.5	102.98	90.591	105.45	102.21
1992	106.69	100.67	117.23	102.45	101.81	98.275	110.87	104.03	115.07	103.96	97.82	115.01	103.07
1993	114.31	102.28	125.64	102.36	99.023	98.271	108.18	103.69	116.7	102.1	95.231	122.11	97.856
1994	120.76	104.89	167.36	110.33	103.99	97.282	102.19	106.49	119.77	101.3	98.033	126.66	90.581
1995	132.41	106.86	143.22	109.57	101.71	98.165	115.31	109.58	129.91	98	101.3	120.52	89.371
1996	141.2	110.55	137.59	112.34	104.19	94.592	108.93	111.89	133.18	100.84	106.18	129.6	83.768
1997	151.67		144.48	104.8	95.423	95.174	107.74	112.32	141	97.601	104.02	140.57	79.708
1998	163.94		136.18	94.419	94.504	94.002	91.867	107.11	142.51	96.827	104.22	148.73	
1999	175.83		136.72	88.897	96.202	93.386	76.986	113.23		98.722		150.9	

Table An.4. Real Exchange Rate of Developed Countries vis-à-vis US

Year	France	Denmark	Japan	Italy	Norway	Sweden	Switzerland	Canada	Belgium	Spain	Netherland
1980	110.46	124.91	148.20	138.41	127.14	114.69	130.39	137.43	105.42	132.37	107.46
1981	136.56	154.03	149.95	170.20	141.90	133.58	155.91	136.82	135.76	162.37	138.04
1982	150.52	166.91	168.16	177.53	146.04	155.77	155.89	129.11	156.73	172.27	142.06
1983	161.47	173.46	159.33	176.10	154.37	176.85	158.58	123.53	164.93	203.02	149.30
1984	176.13	189.41	159.56	188.14	166.25	180.76	176.56	128.11	179.46	209.35	166.73
1985	170.34	184.23	156.29	186.33	165.02	174.23	177.80	129.26	175.01	202.53	167.87
1986	124.36	131.70	106.56	133.54	128.46	134.37	125.39	122.26	126.22	148.89	120.18
1987	107.17	109.90	93.77	113.78	110.61	117.85	105.02	115.05	106.61	128.03	102.94
1988	107.64	107.57	85.83	113.07	104.31	112.03	105.08	106.39	107.98	119.83	103.66
1989	116.85	117.04	94.82	117.78	110.81	116.23	120.11	102.03	117.78	119.69	115.25
1990	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1991	100.48	101.19	90.30	97.63	100.32	93.68	97.42	93.27	99.23	96.45	99.86
1992	92.59	94.08	83.93	92.82	94.46	88.61	92.84	97.23	91.72	90.23	91.59
1993	98.47	101.16	73.85	115.14	107.03	114.88	95.72	103.30	97.49	108.85	95.77
1994	96.19	98.58	68.27	114.84	106.44	112.96	88.99	110.89	93.27	110.81	92.32
1995	88.03	88.10	65.15	114.22	96.66	105.42	77.99	112.46	83.90	102.08	83.01
1996	90.56	91.38	76.97	106.43	99.33	101.00	83.16	112.40	88.31	102.41	87.36
1997	102.06	101.74	84.15	115.11	106.12	114.23	96.76	112.22	100.37	116.07	98.65
1998	99.88	98.91	88.23	112.24	108.07	116.24	94.31	116.23	98.40	113.43	95.80
1999		101.37	77.67		110.03	121.23	97.58	116.00			

Bibliography

Asea, Patrick k. and Mendoza, Enrique G. "the Balassa-Samuelson model: A general Equilibrium Appraisal" Review of international Economics. 2, 3: 244-267.

Baffes J., Elbadawi and O'Connell, Stephen A. 1997. "*Single Equation Estimation of the Equilibrium Real Exchange Rate*", World Bank, Macro Economic Adjustment and Growth Division. Washington D.C. Processed.

Balassa, Bela. 1964. "*The Purchasing Power Parity Doctrine: A Reappraisal*", Journal of Political Economy .72: 584-596.

Bhaduri, Amit. 1986. "*Macro Economics: The Dynamics of Commodity Production*", Macmillan Education.

Bhaduri, Amit. 1988. "*Implications of Globalisation for Macro economic Theory and Policy in Developing Countries*" in Baker, Epstein, Pollin (eds) "*Globalisation and Progressive Economic Policy*". 194-158. Cambridge.

Bordo, Michel and James, Harold 2000. "*The International Monetary Fund: Its Present Role in Historical Perspective*", NBER Working Paper 7224

Calvo, Guillermo 1991."*The perils of Sterilisation*", IMF Staff Papers. 38: 921-927

Chinn M. 1997."*Sectoral Productivity, Government Spending and Real exchange Rate: Empirical Evidence for OECD countries*", NBER Working Paper 6017.

Chinn, David M. 1997. "*The Usual Suspects: Productivity and Demand Shocks and Asia- Pacific Real Exchange Rate*", NBER Working Paper 5709.

Chinn, Menzie and Louis, Johnston. 1996. "*Real Exchange rate Levels, Productivity and demand Shocks: Evidence from a panel of 14 Countries*", NBER WP 5709.

Darnell, Adrian C. 1994. "*A Dictionary of Econometrics*". Edward Elgar Publishing Limited.

DeGregerio, Josepe and Wolf, Hdger C. 1994. "*Terms of Trade Productivity and Real Exchange Rate*". NBER working Paper 4807

.

Devereuex J. , Connelly. M. 1996. "*The Commercial Policy, the Terms of Trade and The Real Exchange Rate Revisited*", Journal of Development Economics. 81- 99.

Edison, Hali J. 1987. "*Purchasing Power Parity in Long-run*: A Test for the Dollar Pound Exchange Rate (1890-1978)", Journal of Monet Credit and Banking. 19,3: 376-87

Edwards, Sebastian. 1987. "*Tariff, Terms of Trade and the Real Exchange Rate in An International Optimizing Model of the Current Account*", NBER working Paper 2175.

Edwards, Sebastian. 1989. "*Real exchange Rates, Devaluation and Adjustment.*" Cambridge, Mass: MIT Press

Edwards, Sebastian. 1989. "*Temporary Terms of Trade Disturbance, Real Exchange Rate and Current Account*", Economica 29: 311-41.

Edwards, Sebastian 1987. "*Real Exchange Rate Variabilty: An Emperical Analysis of Developing Countries Case*", International Economic Journal. 91-106

Edwards, Sebastian and L. Ahamed (eds) 1986. "*Economic Adjustment and Real Exchange Rate in Developing Countries*", University of Chicago Press for NBER Annual

Edwards, Sebastian and Savastano, Minguel. 1999. "*Exchange Rates in the Emerging Economies. What Do WE Know, What Do We Need to Know*", NBER Working Paper 7228

Edwards, Sebastian and Wijnbergen S.V. 1986. " *Welfare Effects of Capital and Trade Account Liberalization*", International Economic Review. 141-148

Edwards, Sebastian1989. "*Real and Monetary Determinants of Real Exchange Rate: Theory and Evidences from Developing Countries*", Journal of Development Economics 29: 311-41.

Engel, Charls. 1996."*Long-Run PPP May not Hold After All* ", NBER Working Paper 5646.

Faruquee, Hamid.1995. "*Long-run Determinants of the Real Exchange Rate: A Stock Flow Perspective*", IMF Staff Papers. 42: 80-107

Froot, Kenneth A. and Rogoff, Kenneth, "*The EMS and EMU and the Transition to a common Currency*", in NBER Macro Economic Annual. Eds by Stanley Fischer and Oliver Blanchard. Cambridge. MA.MIT Press, 1991. 269-317.

Giancarlo, Gandalfo. 1995 "*International Economics II: International Monetary Theory and Open Economy Macro Economics*" Springer- Verlag

Green, William. H. 1997. "*Econometric Analysis*", Prentice- Hall International, INC.

Gujrati, Damodar N. 1999. "*Basic Econometrics*", 3rd Edition. Mc-Graw-Hill Book Company.

Harvey, John T. 1996."*A Post Keynesian View of Exchange Rate Determination*", Journal of Post Keynesian Economics. 14: 61-71

Heish, David. 1982. "*The Determinants of the Real Exchange rate: The Productivity Approach*", Journal Of International Economics. 12, 2: 355-362

Heston, Alan and Summers, Robert. 1997. "*PPPS and Price Parities in Benchmark Studies and the Penn World Tables : Uses.*" CICUP 97-1

Hooper, Peter and Morton, John. 1982. " *Fluctuations in the dollar: A model of nominal and real exchange rate Determination,*" Journal of International Money and Finance. 39-56.

Hsiao, Cheng. 1998."*Analysis of Panel Data*", Cambridge University Press.
ILO. "Year Book of Labour Statistics", International Labour Office, Geneva. various issues

IMF. "*International Financial Statistics*", Washington D.C. Various issues.

Ito, Takatoshi and Israd, Peter and Symansky, Steven. 1997. "*Economic Growth and Real Exchange Rate: An Overview of Balassa-Samuelson Hypothesis in Asia*" NBER working Paper 5979.

Johnston J. and DoNardo j. 1997. "*Econometric Methods*", 14th Edition. The Mc Graw-Hill Companies.

Krugman, Paul. 1994."*Competitiveness a Dangerous Obsession*", Foreign Affairs. 73,2:28-44

Lawrence, Hinkle E. and Peter, Montiel J. 1999. "*Exchange Rate Misalignment: Concepts and measure for developing Countries*", Oxford University Press, World Bank Research Observer Publication.

Leonard and Stockman. 2001."*Current Account Exchange Rates: A new Look At the Evidence*". NBER Working Paper. 8361.

Lucas, Robert E. 1990. "*Why Capital Does not Flow from Rich to poor Countries*". American Economic Review. 80,2: 92-96

MacDonald and Taylor. 1992. "*Exchange Rate Economics: A Survey*", IMF Staff Papers. 39: 1-57.

Marston, Richard c. 1987. "*Real Exchange Rate and Productivity Growth in United States and Japan*", in Real-financial linkages among open economies. Eds. : Sven W. Arndt and J. David Richardson. Cambridge, MA: MIT Press, 1987, 71-96.

Neary, Peter. 1988. "*Determinants of Equilibrium Real Exchange Rate*", American Economic Review.78: 80-107

Obstfeld, Maurice. 1980. "*Intermediate Imports, the Terms of Trade and the Dynamics of the Exchange Rate of Current Account*", Journal of International Economics.10. 461-480.

Officer, L. H. 1976 a. "*The Purchasing Power Parity Theory of Exchange Rates*", A Review Article in IMF Staff Papers. 23: 1 -60.

Officer, L. H. 1976 b. "*Productivity Bias and Purchasing Power Parity: An Econometric Investigation*". IMF Staff Papers. 23: 545-579

Palma, Gabriel 2000. "*The Magical Realism of Brazilian Economics : How to Create A Financial Crisis By Trying to Avoid One*", CEPA Working Paper 17

Patnaik, Prabhat. 1997. "*Accumulation and Stability Under Capitalism*", Clarendon Press, Oxford

Patnaik, Prabhat. 2002. "*Globalisation of Capital and Terms of Trade Movements*", in Ramachandran, V. K. & Swaminathan, Madhura (ed). "Agrarian Studies". 2002. 94-110.

Patnaik, Prabhat. 2002 "*Money Finance and contradiction of Capitalism*", collected from www. macroscan .com

Peter, Isard. 1995. "*Exchange Rate Economics*", Cambridge University Press.

Razin, Ofair and Collins, Susan M.1997."*Real Exchange Rate Misalignment and Growth*", NBER Working Paper 6174.

Rogoff, Kennth. 1996. "*The Purchasing Power Parity Puzzle*", Journal of Economic Literature.34: 647-668.

Samuelson, Paul. 1964. "*Theoretical Notes on Trade Problems*" Review of Economics and Statistics. 46: 145-154.

Strauss J. 1995. "*Real Exchange Rate PPP and the Relative Price of Nontraded Goods*", Southern Economic Journal.61, 4: 991-1005.

Wijnbergen, V.S. 1990. "*Capital Control and Real Exchange Rate*", Economica. 57: 15-28.

World Bank. 2001. World Development Indicators, CD-ROM.

World Bank. 2001. Global Development Finance, CD-ROM.