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# Real exchange rate behavior in Pakistan, 1960–1990

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# REAL EXCHANGE RATE BEHAVIOR IN PAKISTAN 1960-1990

by

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# INTRODUCTION

Real exchange rate behavior in developing countries has received significant attention in recent years. It is argued that real exchange rate stability and correct alignment, are important conditions for sustained improvement in economic performance indicators for a developing country.

We review both the theoretical and empirical literature on real exchange rates in Chapter 2. We trace out the evolution of the real exchange rate concept and give emphasis to recent contributions in this area for developing countries.

In reviewing recent regression based empirical studies on real exchange rate behavior in developing counties, we observed certain shortcomings. The signs observed and the levels of significance of some coefficients in the regressions reported in these studies did not support the theoretical concepts. No satisfactory explanations have been offered for these observations in these studies. Many unsatisfactory proxies have been used to substitute for the determinants of the real exchange rate in these studies. The

time period under consideration for some of these studies was also not of sufficient length for meaningful conclusions to be drawn.

All of the studies reviewed by us were multicountry studies. The structural problems of individual countries and their influence on real exchange rate behavior were not addressed. The effects of country specific policies were not examined appropriately. A lot of the problems we observed and the lack of appropriate explanations in the studies reviewed, are quite likely as a result of a multi country approach.

We have felt that a study examining the behavior of the real exchange rate would be more meaningful for a single country. The movements of the real exchange rate in relation to the countries unique set of structural conditions and policies could be examined and meaningful conclusions drawn.

In this study we examine the behavior of real exchange rates for Pakistan from 1960-1990.

We have also tried to improve the proxies for some of the determinants of the real exchange rate. We feel that our proxies are better approximations of the real variables then have been used before.

In addition to calculating the real exchange rate and how its determinants influence its behavior, we also

determine a basis for estimating long run equilibrium real exchange rates. We construct a series for estimated equilibrium long run real exchange rates and on the basis of which we calculate an index for misalignment of the real exchange rate for Pakistan.

We examine the effects of misalignment on economic performance indicators and test the assumption that higher misalignment has to be associated with poor economic performance for a developing country.

# CHAPTER 2

## REAL EXCHANGE RATES.

### REVIEW OF THEORETICAL LITERATURE.

Unanimity in relation to the definition of the real exchange rate does not exist in the literature. Though, consensus seems to exist in defining the real exchange rate as a relative price, it disappears in the choice of the relative price.

Earlier works on exchange rates were based on the Purchasing Power Parity [PPP] theory. Simply stated, the PPP theory asserts that the exchange rate change over a period of time is determined by the change in the two countries relative price level. The strongest version of the PPP is commonly called absolute PPP, or the "law of one price". If the price of a given good or even a common basket of goods is the same across countries, when measured in the same currency, then the law of one price is said to hold.

Historically, though earlier versions of the PPP have been traced. It was the classical economists [Ricardo, Mill and Marshall in particular] who developed ideas which form

the basis of the theory. Cassel[1916] is credited with formalizing the theory and presenting the first empirical support for the view. The history of the evolution and development of the PPP theory has been reviewed by Viner[1937], Schumpeter[1954] and Officer[1984].

Substantial empirical work has been done using the Purchasing Price Parity theory. A good historical review of the empirical work is presented by Frenkel[1976]. Another good review is by Officer[1976], wherein he re-examines the PPP theory and presents its shortcomings.

On the basis of the PPP theory the real exchange rate has been defined as:

$$RER = E[P^*/P] \qquad [1]$$

RER is the real exchange rate, E is the nominal exchange rate, P* is the foreign price level and P is the domestic price level. In the literature different proxies have been used for P* and P, such as the consumer price index [CPI], the wholesale price index [WPI], or GDP deflators. Accordingly, depending on the choice of the proxies, the real exchange rate has been defined as the relative price of foreign to domestic consumption or production baskets.

Absolute PPP implies that all prices are completely equalized by trade. Therefore, the real exchange rate calculated on the basis of PPP should be identical to the "law of one price". Real overvaluation and undervaluation of a currency would be measured then, as deviation from the PPP.

Cassel had an uncompromising view about the PPP theory. He considered PPP to be the fundamental factor in the determination of exchange rates. He attributed all other factors which may influence the exchange rate, or cause a deviation from the PPP, to be mere disturbances and of secondary importance [Cassel[1928]].

Cassels[1928] classified these disturbances which could cause a deviation from the PPP as actual and expected rates of inflation, new hindrances to international trade and shifts in international movements of capital. He however remained adamant in insisting that the deviations caused by the disturbances listed, as limited and temporary.

Cassels position on strict PPP and the temporary nature of the deviations has received significant attention in the literature. We will review some of the major theoretical and empirical contributions in this area.

Keynes[1923] recognized that changes in the equation of exchange could come from movements of capital, or reparation

payments, or changes in relative efficiency of labor and other such factors. Keynes concluded that these factors could cause a permanent change in the equilibrium position of the PPP and as such in the real exchange rate.

Yeager[1958] and Haberler[1961] perceived the high price elasticities observed by them in international trade, as the factor supporting PPP. Houthakker[1962] used absolute PPP calculations based on consumer price comparisons to establish the overvaluation of the dollar.

Officer[1976], did not find empirical evidence in support of the law of one price. Only three out of sixteen empirical studies examined by him support the law. He does however find that the law of one price holds for primary products traded on international markets.

It is important to point out that, the PPP theory tends to ignore the impact of prices of nontradables. In the calculation of domestic price levels, the prices of nontradables do figure, but they do not affect nominal exchange rates. Since nontraded goods by definition are not arbitraged between countries, differences in the prices at home and abroad can generate deviations from the PPP, as demonstrated by Hseih[1982]. Officer[1988] has also examined possible reasons for divergence from the law of one price.

Harrod[1939] drew attention to the fact that divergent international productivity levels could lead to permanent deviations in absolute PPP. The deviation being caused through the effects of productivity on wages and home prices. It would be appropriate to point out that this argument was developed much earlier in Ricardo's work.

Balassa[1964] and Samuelson[1964] further elaborated the productivity bias considerations to PPP. They attributed the deviation of the real exchange [determined on PPP basis] from unity on differential rates of technological progress.

Assuming that productivity rises at a faster rate in the tradable sector than in the nontradable sector, assuming also that prices of tradables are equalized across countries, wages are also assumed to equalize between tradables and nontradables sectors. Then the wage rate and income should be higher in more productive countries. Thus, the larger the productivity differentials in the production of tradables between two countries, the larger is the difference in real wages and prices of nontradables. As such larger the deviation of PPP from unity. Balassa[1964] provided empirical support of this hypothesis, however his findings are disputed by Officer[1976].

Recent studies, in modeling dependent economies have defined the real exchange rate, as the relative price of

tradables to non tradables. Dornbusch[1974], Frenkel and Mussa[1984] and Neary and Purvis[1983] have pioneered this approach.

$$RER=E[P(T^*)]/P(N) \qquad [2]$$

$P(T^*)$= World price of tradables.

$P(N)$ = Domestic price of nontradables.

Other approaches in defining the real exchange rate have included: using the domestic relative price of tradables to nontradables, the domestic relative price of importables to nontradables and the domestic relative price of exportables.

The models presented by Dornbusch[1975] and Musa[1984] have been categorized as disequilibrium models, where basically movements in the real exchange rates, conceptually relate to the Purchasing Power Parity concept. The disequilibrium approach assumes price stickiness as temporary. Initial real exchange rate changes, due to sticky price adjustment, are reversed as nominal prices reach a new equilibrium level. The disequilibrium theory implies that nominal changes, such as changes in the nominal exchange rate can change the real exchange rate. By implication then

the relationship between nominal and real exchange rate changes are exploitable by governments.

Stockman[1987] has expressed reservations about the disequilibrium approach in real exchange rate determination. He does not see the real exchange rate as an exogenous variable, nor does he see an exploitable relationship between nominal and real exchange rates. He presents an equilibrium approach to real exchange rate behavior, that explicatively considers the endogenous character of the real exchange rate. His concept differs considerably from that of the disequilibrium approach discussed previously.

Williamson[1983] has empnasized that terms of trade and the real exchange rate are two different concepts and may move in opposite directions. However, Spencer[1983] finds that only in the extreme case, where the nontradables sector becomes infinitely small, can the real exchange rate move in a direction opposite to that of the terms of trade. As such, we can not outright reject the disequilibrium approach as Stockman suggests. We need to give attention to the hypothesis that the real exchange rate is an endogenous variable. A lot of statistical evidence has been presented suggesting that changes in the real exchange rate are more permanent than temporary as implied by the disequilibrium theory. Changes in the real exchange rate, which we cannot

blame to slow price adjustments, must then be taken to be associated to changes in real economic variables.

Bomhoff and Korteweg[1983] in a rational expectations model, use unexpected changes in money supply and government spending, as explanatory variables of real exchange rate behavior. They conclude that only unexpected changes in money affect real variables.

Neary[1988], assuming optimizing consumer and producer behavior with regard to an objective function, derives the determinants of the equilibrium exchange rate, defined as the relative price of tradables to non tradables. Neary's model, assumes a small open economy producing tradables and nontradables in the context of balance of payments equilibrium. Assuming that the price of tradables is exogenous, the price of non tradables in relation to the price of tradables will increase, if any of the following happen: Increase of foreign aid which is production neutral, sector specific boom in an isolated tradables sector[Dutch Disease], improvement of terms of trade with tradables and nontradables as substitutes, higher income in the home country relative to that in foreign countries, with international productivity differentials being smaller in the production of nontradables compared to the production of tradables.

Edward's[1988a] has presented a dynamic general equilibrium model of real exchange rate determination. He follows the tradition of defining the real exchange rate as the price ratio between tradables and nontradables. Assuming a small open economy producing import substitutes, exportables and non tradables, he further assumes perfect foresight for optimizing economic agents and that the current account balance in the long run is zero. He uses duality theory in showing how terms of trade changes or changes in import tariffs will affect the observed level of the real exchange rate. Edward's significantly distinguishes between temporary and permanent and also anticipated and unanticipated shocks. Edward's contribution here is that he finds that it is not possible to predict the direction of real exchange movements in response to exogenous shocks, without further assumptions about substitutability of demand among goods.

Musa[1985] has used a dynamic rational expectations approach for an open dependent economy. He examines how changes in government spending effect the real exchange rate. Mussa's contribution is in looking at the dynamic side of current account imbalances and at the impact of expected future liabilities of current deficit spending on the equilibrium path of the real exchange rate.

REVIEW OF EMPIRICAL STUDIES.

A detailed empirical analysis of long run behavior of the real exchange rates has been presented by Huzingar[1987]. Perhaps a more extensive explanation of long term trend in the real exchange rate of selective countries has been presented by Wood[1988]. Wood's empirical measurements of the real exchange rate are consistent with the Purchasing Power Parity concept. He has derived an econometrically testable model from the statistical measure of the real exchange rate. He explains the trend in the real exchange rate by the black market exchange rate discount ratio [an explanation for the difference between world market prices and domestic prices for traded goods, a consequence of commercial policy], the exports share in GDP [measure of openness], relative labor productivity, percapita income and the ratio of demand for nontraded goods to traded goods.

Wood ran an OLS regression for 79 countries applying alternative subsets of the explanatory variables listed in the previous paragraph. His results suggest that any increase in any of the explanatory variables results in a real exchange rate appreciation. Though Wood's estimations

achieve a respectable degree of significance, his explanatory variables do not serve as appropriate proxies for underlying real economic conditions.

Cottani, Cavallo and Khan [1986] derive a reduced form equation for the real exchange rate as a function of policy and non policy determinants. The real exchange rate is defined according to the Purchasing Power Parity concept. Estimations are made for eight countries using annual data from 1961 to 1983.. The explanatory variables are the terms of trade, an index for commercial policy, government consumption as a share in GDP, a money supply variable and a trend variable. OLS estimations, country by country, support the hypothesis that an increase in any of the explanatory variables causes a real exchange rate appreciation.

A brief summary of recent studies in determining the real exchange rate for developing countries is presented in Table[1].

Authors are cited in columns and determining variables in rows, * suggests that the variable was considered. The sign in parenthesis suggests the sign on the coefficient derived in econometric testing.

TABLE 1

RESULTS OF RECENT RER EMPIRICAL STUDIES

| | EDWARD'S [1989] | COTTANI CAVALLO & KHAN [1990] | SCHAFER [1989] |
|---|---|---|---|
| TOT | *[-] | *[-][for 2/3] | *[-][for 2/3] |
| GC/GDP | *[-] | | |
| CAP/GDP | [t-1]*[-] [marginal] | *[mixed] | *[mixed] |
| TRADE RESTRICTION/ EXCHANGE CONTROL INDEX | *[-] | | |
| GDP/X+M | | *[mixed] | *[-] [for less then 1/2] |
| TECHNO PROGRESS | *[+] | *[+] | *[MIXED] |
| INV/GDP | *[+] | | |
| RER[t-1] | *[+] | | |
| $EXDC^1$ | *[-] | | |
| $EXDC^2$ | | *[-] | *[-] |
| DEH | *[-] | | |
| NOMINAL DEVALUATION | *[+] | | |

GC= Government consumption.
CAP= Capital flow.
$EXDC^1$= Growth in domestic credit- GDP growth.
$EXDC^2$= Growth in domestic credit-[GDP growth- devaluation-foreign inflation.
DEH= Ratio of fiscal deficit to high powered money.

These studies have similar variables even if they have been given different names by the authors. However, for most variables or fundamentals, the proxies used are different.

We have significant reservations about the choice, appropriateness and the method of construction of the proxies of some of the variables used by the above cited authors.

Edward's[1989b] presents a "minimal fully optimizing model" of equilibrium real exchange rates. The model is based on intertemporal expenditure for a small three good economy. Edward's estimates the real exchange rate as a function of the terms of trade, lagged capital inflows, lagged real income growth, the ratio of government consumption to GDP, excess supply of domestic credit and a proxy for foreign currency controls.

Edward's[1989b] looks at 12 developing countries [not including Pakistan] for a period of 22 years. He regresses the RER on a set of fundamentals. His choice of proxies have a lot of room for improvement. For example he uses total government expenditures as a proxy for government expenditures on nontradables. His proxy for technological change, is GDP growth rate, which includes growth that could be attributed to labour and capital, in addition to technological change. He measures "openness", by the spread

between the black market and official exchange rates. This proxy fails to capture the effects of other possible restrictions to trade. He measures excess demand for domestic credit by the difference between the rate of growth of domestic credit and the GDP growth rate. He thus ignores the effect of devaluation and foreign inflation. He has also made no assumption about the rate of change of the velocity of money. He finds that both nominal and real variables have influenced the path of the real exchange rates.

Cottani, Cavallo and Khan[1990] look at two groups of twelve low and high income developing countries for the period 1960-1983. Their model is similar to that of Edward's[1989], but they do not consider government expenditure on nontradables in their estimations. They also proxy a time trend to capture the contribution of technological change to growth. We do not think that this is a satisfactory arrangement. The residual may be picking up effects separate from that of technological change.

With regard to the results obtained by Cottani, Cavallo and Khan[1990], about a third of the coefficients have the wrong sign from the theoretical expectation, however most of these are insignificant. No attempt is made to evaluate the underlying endogenous conditions of individual countries, which contributed to some of the unexpected signs on the

coefficients of variables. The large sample of countries could be a possible reason for not doing so.

Schafer[1989] examines the real exchange rate behavior of the countries of subsaharan Africa [1970-1984]. His set of fundamentals determining the real exchange rate consist of: The terms of trade, an index for commercial policy, excess domestic credit creation, net capital inflows and long-run productivity growth [percapita growth]. He finds the coefficients for terms of trade, commercial policy and excess domestic credit creation to be negative and significant for about 60% of the coefficients. The coefficients for net capital inflow are mixed. The coefficients for productivity growth [percapita GDP growth] do not support the view that productivity growth leads to real exchange rate appreciation as suggested by Ballasa[1964] and Samuelson[1964]. We did not find Schafer's variables to have satisfactory explanatory power [Low $R^2$ and low t ratios]. He gives no explanation as to why a significantly high number of coefficients were giving results contrary to theoretical expectations. Structural conditions and domestic policies of individual countries needed to be examined. The scope of his study possibly did not allow him to do that.

Low income countries of Asia in general and South Asia in particular have not been considered in any of the studies cited. Pakistan's experience in particular has not been examined in any study reviewed. Also we have not come across any study which incorporates the period after 1985, which is a period of increased flexibility of exchange rate arrangements for developing countries. This was also a period of reduced volatility of the worlds major currencies after the Plaza accord.

We have expressed reservations about the choice of inclusion or exclusion of some variables, for all the studies reviewed. We are also not satisfied with the choice of quite a few proxies, which have been substituted in, for lack of data about specific variables.

One study is for 15 years the other two are for 22 years. The periods are short for examining long run trends. The mixed results obtained, more so in the empirical results of Schafer[1989] and Cavallo et al[1990], have not been satisfactorily explained.

We feel that to evaluate movements in the real exchange rate, it would probably be more appropriate to look at individual countries independently. The choice of proxies would then be more appropriate to the choice of country. The signs on the coefficients, then can be interpreted with the

underlying economic conditions in the country. We have chosen to examine the behavior of Pakistan's real exchange rate in such a framework.

# CHAPTER 3

## EXCHANGE RATE POLICIES AND THE REAL EXCHANGE RATE.

In the early nineteen seventies with the breakup of the gold standard, the developed economies moved from fixed exchange rate regimes to more flexible arrangements. The developing countries also moved in the same direction though relatively slowly.

Pegging the domestic currency against a single major currency was the common practice for developing currencies in the fixed exchange rate period. After the mid seventies the developing countries moved towards pegging against a basket of currencies, or followed an arrangement where the domestic currency is frequently adjusted mostly in the downward direction, often called a flexible arrangement.

Aghelvi, Khan and Monteil [1991] using the IMF International Financial Statistics found that the proportion of developing countries which pegged to a single currency declined from 63% in 1976 to 38% in 1989. Those which preferred to peg to a basket of currencies increased from 13% in 1976 to 23% in 1989. Countries following a flexible arrangement increased from 14% in 1976 to 33% in 1989.

The motivation to peg against a basket of currencies rather then a single currency, has to large a extent been due to the volatility in the exchange rates in major currencies ever since the advent of flexible exchange rates in the early seventies. Fluctuations in major currencies created problems for planners in the developing countries. Uncertainty in trade, external debt, foreign exchange reserves and management of public finance, to name a few of the difficulties cited by planners.

Flexible arrangements, in exchange rate management in developing countries, are often officially described as adjusting to market conditions independently. However in almost all cases the exchange rate is effectively set by the authorities and adjusted frequently.

Reliance on flexible arrangements has substantially increased in the developing countries, which can be attributed to a number of factors. One reason is that the domestic rates of inflation in many developing countries particularly those of Latin America substantially increased in the 1980's. These countries were forced to depreciate rapidly to maintain external competitiveness. In a number of such countries the nominal exchange rate and domestic inflation were systematically linked. Another reason has been the volatility in the exchange rates of major

currencies. Though some countries decided to peg against a basket of currencies, others were reluctant because this would involve frequent adjustments of the exchange rate according to the prearranged formula. Many countries have been reluctant to follow the movements of major currencies which they considered to be transitory. A number of countries also found significant political difficulties with devaluation under a pegged regime. They have found it more expedient to have a more flexible arrangement whereby exchange rates can be adjusted on the basis of an undisclosed basket of currencies. Thus effective devaluation can be camouflaged.

The relative merits of the fixed and flexible exchange rate regimes have received a lot of attention in the literature. As this is not the principal focus of this study, we will confine our interest to look at how the respective policies have been associated with real exchange rate movements. The appropriateness of the policy would depend upon the underlying structural conditions, source of shocks and instability and the policy makers economic objectives.

Exchange rate policies in developing countries are designed to maintain external competitiveness at a level consistent with a sustainable balance of payments position.

A nominal devaluation would increase the price of tradables. A substitution effect towards nontradables would result, reducing demand for tradables and improving the current account position. Income and wealth effects would also result from the increase in the domestic price level.

As the real exchange rate is critical in maintaining competitiveness in the external sector, it should not deviate significantly from its equilibrium level.

We will examine how different exchange rate policies have effected the behavior of real exchange rates for a developing country. We will also examine whether policy regimes directly or indirectly effect real exchange rate misalignment.

# CHAPTER 4

## DATA SOURCES AND THE CHOICE OF EMPIRICAL INVESTIGATION.

We have limited our empirical analysis to one country, Pakistan. Earlier studies analyzing the behavior of equilibrium real exchange rates, have adopted a multi country approach. We feel that in doing so, they have not been able to explain the effect of structural changes on the equilibrium real exchange rate behavior, satisfactorily, for the countries examined.

In Scherer's[1989] study the openness and the capital inflow variables are significant for less then half the countries examined, the sign on the coefficients are also mixed. The coefficient for excess domestic credit creation is only significant for slightly more then half of the sample countries.

The explanatory power of Scherer's variables were also extremely low with more then half of the countries having $R^2$ of less then .70. Scherer makes no attempt to explain the mixed signs observed in most of his explanatory variables. He does not examine each countries unique conditions, so as

to be able to offer an explanation for the role of exchange rate determinants in each country.

Cottani, Cavallo and Khan[1990] also observed mixed results with varying degrees of significance for all variables. They have not examined the structural conditions in individual countries which result in the variation in how the fundamentals effect the equilibrium real exchange rate.

The empirical studies reviewed by us, do not make an in depth examination of each country's real exchange rate behavior. The influence of different sets of domestic policies on the equilibrium real exchange rates in different countries, is not appropriately examined. The contribution of each country's set of unique conditions is not addressed.

The choice of proxies for the explanatory variables are not equally suitable for all countries examined. Possibly the induction of other explanatory variables and redefining of some of the proxies used, would have explained real exchange rate behavior better in the studies reviewed.

We also do not observe a consistent pattern for the influence of determinants of the equilibrium real exchange rate in the empirical studies we have cited. We feel that each country with its unique set of terms of trade, domestic policies, nature and extent of capital flows and

technological paths needs to be treated and examined independently and separately.

The proxies used, for some of the determinants of the equilibrium real exchange rate, have to be country specific and in some cases unique. Additional country specific variables and dummies, need to be used to improve the explanatory power, of the regression based real exchange rate estimation.

Due to many reasons, these studies have limited the number of observations considered. Scherer[1989] examines a 14 year period [1970-1984]. Scherer thus ignores the period of the international gold standard and fixed exchange rates and looks only at the period of floating exchange rates[for major currencies]. We do not get any information about how the real exchange rate behaved in his sample of countries in the fixed exchange rate period. Cottani, Cavallo and Khan[1990] examine a 23 year period [1960-1983]. Edward's[1989] examines a 22 year period from 1962-1984. No empirical study on real exchange rate behavior has considered the post 1985 period characterized by significant changes in international exchange rate arrangements. We feel that the number of observations in earlier studies were not appropriately enough as to allow significant meaning being assigned to the results obtained.

Any study of equilibrium real exchange rates for developing countries, would require an in depth examination of one country, for any significant conclusions to be drawn. Explanatory variables and proxies more suited to the country's unique set of economic structure and circumstances, would need to be defined and used. The choice of one country [Pakistan] also allows us to increase the number of observations to 30[from 1960-90]. Lack of continuous and reliable data was a reason cited for the small number of observations in earlier studies.

The choice of Pakistan was made because of familiarity with the economy and also, because its equilibrium real exchange rate behavior has not been empirically examined before. Also, the effects of substantially large foreign exchange factor inflows, on the equilibrium path of real exchange rates, would be addressed. Such a developing country has not been analyzed before. We would try and identify the specific domestic policies, which result in changing the path and direction of the real exchange rate, both temporarily and permanently.

The choice of Pakistan, allows us to examine the path of the equilibrium real exchange rate, for a developing country over thirty years. Something which has not been done before. The country has experienced both net factor income

outflows as well as inflows, significant changes in foreign aid and major changes in domestic policies for the period under examination. It would, as such, be interesting to examine the path of the equilibrium real exchange rate for this country.

The principal data sources for this study are the IMF International Financial Statistics and the Pakistan Economic Surveys, issued by the Government of Pakistan.

We use the tables computed by Siddique[1991], for growth attributed to technological change in Pakistan. Siddique used the multifactor productivity growth method, whereby growth attributed to technological change is measured as a residual from growth attributable to other factors. The other factors being capital and labor. This measure for technological change is superior to the GDP growth rates and the per capita GDP growth rates which have been used previously.

Price statistics available for Pakistan do not distinguish between the price of tradables and nontradables. In empirical research however, different price indices are used with reference to the relative proportion of tradables and nontradables present in them. Edward's[1988b] presents a discussion of the relative advantages of different price indices. For purposes of this research we proxy the price of

tradables with the wholesale price index of the United States. The WPI is heavily weighted with tradables and excludes services, which in general are considered nontradables. We use the United States WPI because of the role of the US$ as the key foreign exchange currency for Pakistan and also for most developing countries. We proxy the price of nontradables with Pakistan's consumer price index [CPI]. The choice of the CPI though not perfect, has been used, because from all price indices available it contains the highest proportion of nontradables in its computation.

In empirical studies, nominal exchange rates are measured both bilaterally and multilaterally. However, for purposes of our research because of the dominance of the US$ as the principal foreign currency for Pakistan, we will measure and use the bilateral exchange rate between the Pakistani Rupee and the US$.

Time series for most of the variables computed, as defined in Chapter 7 are taken from the International Financial Statistics [IFS]. Data for some of the missing years from IFS and also data used to compute government expenditure on nontradables, are taken from different issues of the Pakistan Economic Survey, published by the Government of Pakistan.

# CHAPTER 5

## NOMINAL AND REAL EXCHANGE RATE BEHAVIOR IN PAKISTAN.

### NOMINAL EXCHANGE RATE [1960-1990].

For the period under consideration [1960-1990], Pakistan's time series for bilateral nominal exchange rates are presented in Table[A-1] in the appendix. The nominal exchange rates are expressed as Pakistani Rupees per United States Dollar.

In 1960, at the start of the period under review, the Pakistani economy was working with a fixed exchange rate regime. The nominal exchange rate was officially fixed at Pakistani Rupee 4.762 against one US Dollar. This official rate of exchange remained unchanged till 1972. In 1972/73 the Rupee was devalued settling at Rupee 9.90 against the US Dollar. A total devaluation of 130%. This new rate of exchange continued within the context of a fixed exchange rate regime till 1982.

In 1982 policy makers in Pakistan announced a break from the Rupee's peg against the US Dollar. A more flexible arrangement was announced whereby the Rupee was to be pegged

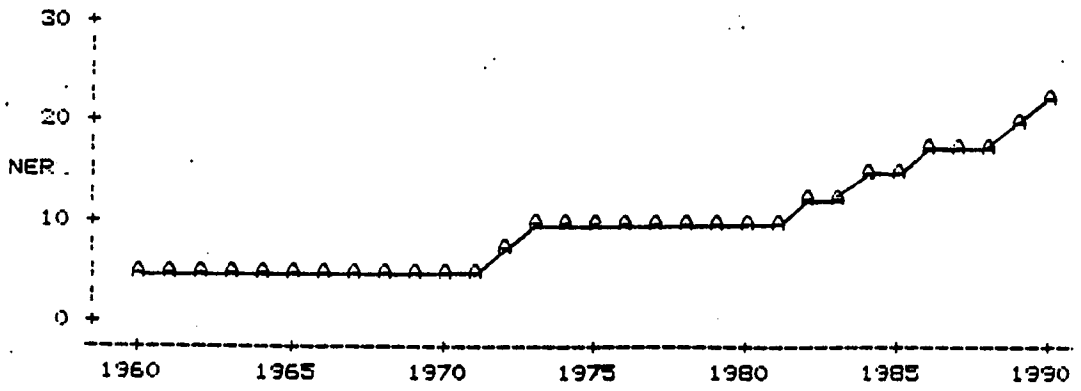
to a basket of major currencies rather then the existing bilateral peg with the US dollar. The official flexible arrangement seems to be no more then a cover for regular devaluations. As the data shows the Rupee has been devalued consistently since 1982. However, in no year has the devaluation been as much as the 1972/73 experience.

Fig[1] shows us the path of the nominal exchange rate in Pakistan for the period 1960-1990.

FIGURE 1

PATH OF NOMINAL EXCHANGE RATE IN PAKISTAN

[1960-1990]




Source: *International Financial Statistics*. International Monetary Fund. [Various issues]

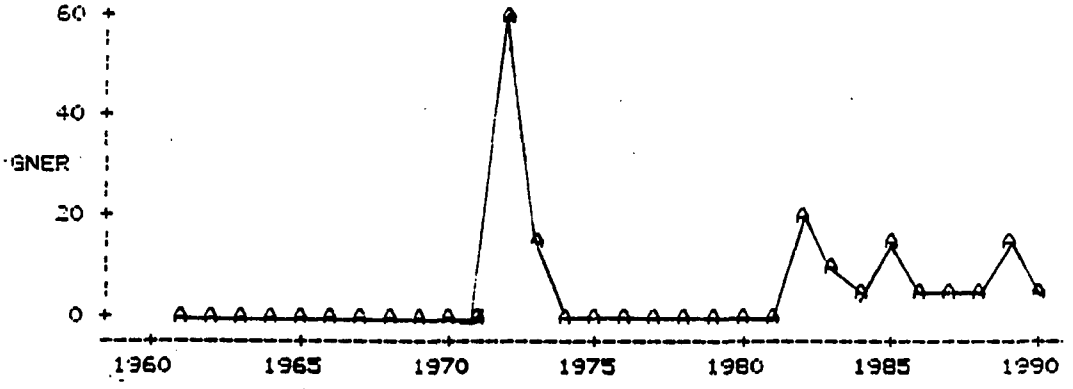
From Figure[1] we can see that from 1960-71 the nominal exchange rate was fixed in Pakistan. In 1972/73 the nominal exchange rate increased substantially as a result of devaluations. From 1974-1981 the nominal exchange rate remained constant. However from 1982 onwards it has been steadily increasing, as a result of regular persistent devaluations

Figure[2] shows us the rate of change of the nominal exchange rate [in other words nominal devaluation/ revaluation], in Pakistan from 1960-1990.

FIGURE[2]

RATE OF CHANGE OF THE NOMINAL EXCHANGE RATE IN PAKISTAN.

[1960-1990]




Source: *International Financial Statistics.*

International Monetary Fund.[Various issues]

As we can see from Figure[2], for the period under consideration, the first devaluation episode took place in 1972/73. This was a very large devaluation by any standards. From its level in 1971 the Rupee had devalued a 130% by 1973. From 1974-1981 the authorities maintained a fixed exchange regime, by maintaining a peg against the US $. However from 1982 onwards we can see the Rupee has been depreciating every year. It would seem that the authorities in Pakistan are making full use of the pretext of announced flexible arrangements, to make regular devaluations. Whether, such policies have given positive results for the real economy, will be one of the issues we will look into empirically in this study.

REAL EXCHANGE RATE [1960-1990].

We have defined the real exchange rate, as the nominal exchange rate times the ratio of the price of tradables to nontradables.

$$RER = E[PT^*/PN]$$

Published price statistics do not explicitly distinguish between tradables and nontradables. Empirical

research in this area has proxied various price indices, depending upon relative content of tradables and non tradables. Some of the indices used, have included wholesale prices, cost of living indices, export and import price indices and GDP deflators.

Edward's[1988] presents a review of the relative merits of different price indices used.

We would follow the convention of using the wholesale price index [WPI] of a large economy as, a proxy for the price of tradable variable, in our definition of the real exchange rate. The assumption here is, that the WPI has a significantly higher proportional content of tradables as against nontradables. The WPI of choice is that of the United States. This can be justified by the size of the US economy and the bilateral exchange rate arrangements made with the US dollar by most small economies. Khan[1986] found that the aggregate WPI of major industrialized countries and that of the US had a correlation of close to unity.

The price of nontradables will be proxied by the domestic consumer price index [CPI]. The assumption being that, the CPI is weighted heavily by nontradable goods and services.

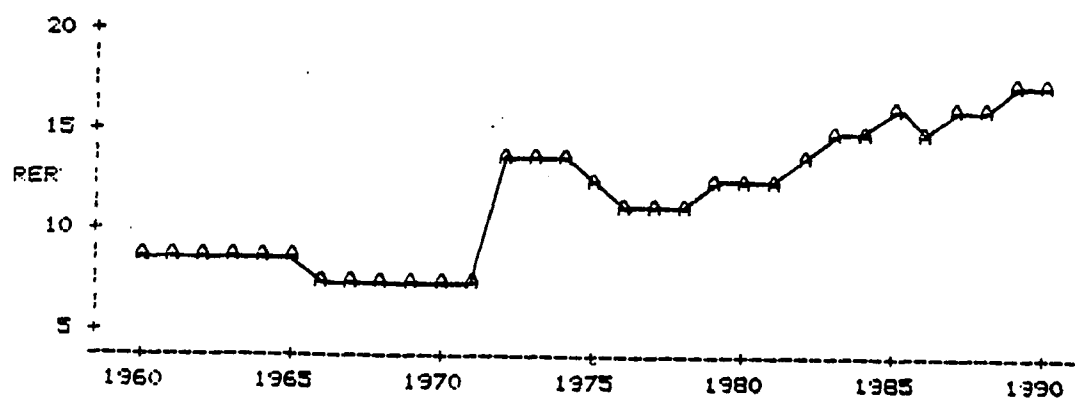
We can thus rewrite our RER relationship as:

RER=E[WPI(US)/CPI]. [3]

Figure [3] shows the pattern of real exchange rate behavior in Pakistan from 1960-1990.

FIGURE 3

REAL EXCHANGE RATES FOR PAKISTAN 1960-1990.




Source: *International Financial Statistics*. International Monetary fund. [Various issues]

We find it appropriate to look at the real exchange rate for Pakistan in three distinct periods. The periods 1960-72, 1973-1982 and 1983-1990. The first two periods have been associated with fixed exchange rate regimes, they are separated, because of a major devaluation. In the first period, the political government favoured development through the private sector, in the second the public sector was exphasized as the instrument of development. The third period was associated, with a so called flexible regime, the political government also shifted emphasis again towards the private sector.

In 1960 Pakistan was following a fixed exchange rate regime. Figure [3] shows that from 1960-1971 the real exchange rate was appreciating. This period was characterized by significant increases in foreign aid and foreign investment, specially for the period 1960-1965. It is worthwhile to point out that changes in inflows of foreign aid, foreign capital and investment to Pakistan have been more associated with changes in the geopolitical situation rather then changes in economic conditions.

The consistent appreciation of the Pakistani Rupee against the US$ from, 1960-1971 would have resulted in a significant overvaluation of the domestic currency . Planners have felt that this overvaluation had a negative

effect on the competitiveness of traditional exports on the international market and also on the rate of investment, Pakistan Economic Survey[1975].

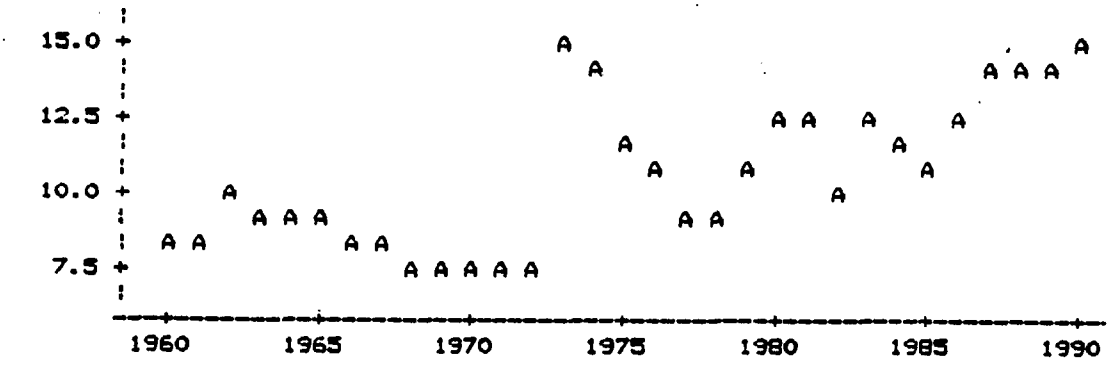
After the devaluation of 1972/1973 the authorities continued with a fixed exchange rate regime at the post devaluation rate of exchange. Figure [3] shows that after 1973 the real exchange rate started appreciating again. This trend continues till the end of the 1970's.

In 1982 the government announced a change of regime, from a fixed exchange rate to a flexible exchange rate regime. The period from 1982-1990 has witnessed depreciating real exchange rates. This period has witnessed many regular devaluations, though each episode individually has not been large enough to invite political backlash.

Figure [4] shows a steady increase of the share of exports in GDP, till 1967 and thereafter a decline till 1972. An overvalued exchange rate was blamed for the lack of growth in exports, Pakistan Economic Survey[1975]. Comparing Figure[4] with Figure[3], shows that falling share of exports in GDP is associated with appreciating real exchange rates.

FIGURE 4

EXPORTS/GDP FOR PAKISTAN 1960-1990.

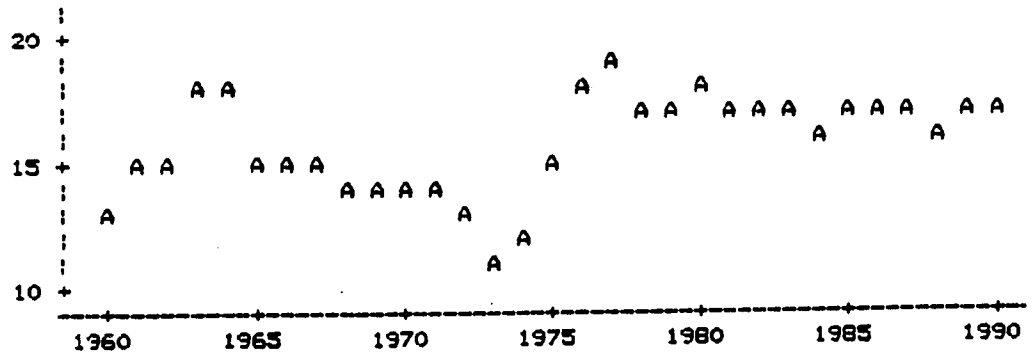



Source: *International Financial Statistics.* International Monetary Fund.[Various issues]

Figures [5] shows the path of investment rate in Pakistan.

FIGURE 5

RATE OF INVESTMENT IN PAKISTAN 1960-1990




Source: *International Financial Statistics.* International Monetary Fund.

The investment rate substantially increased from 1960-1964. This was the period associated with most significant inflow of foreign aid and investment. From 1965 onwards the investment rate substantially declined. Improvements in the investment rate has been observed since the late seventies and has been steady in the period of flexible exchange rate regimes since 1982. An overvalued exchange rate was the

cause assigned by planners to the negative trend in investment from 1965-1972, Pakistan Economic Survey[1975]. Comparing Figure[3] with Figure[5] shows us that appreciating real exchange rates have been associated with declining rates of investment.

With falling exports and investment the authorities in Pakistan devalued the nominal exchange rate by 130% in 1972/1973.

It would seem that fixed exchange rate regimes in Pakistan have resulted in an appreciation of the domestic currency. The adverse effects of these possible overvaluation have prompted significant devaluations. However devaluations seem to have been only a temporary cure, with the real exchange rate again moving in the direction of being overvalued.

The flexible exchange rate regime in place since 1982 seems to have overcome the problem of real exchange rate overvaluation, by a steady stream of nominal devaluations. But this method does not address the structural problems in the economy which are causing the trend towards overvaluation in the first place. We need to look at changes in the determinants of the equilibrium real exchange rate, to understand where the pressures towards overvaluation are coming from.

# CHAPTER 6

## EQUILIBRIUM REAL EXCHANGE RATE.

Mundell[1971] did not specifically define the equilibrium real exchange rate, nevertheless his analysis rigorously describes the equilibrium relative price of tradables to nontradables. Mundell's analysis uses a small open economy which faces given terms of trade. The equilibrium real exchange rate is explained as the relative price of international to domestic goods that simultaneously equilibrates the money market, the domestic goods market and the international goods market.

Dornbusch[1974] presented a formal analysis for the determination of the equilibrium real exchange rate in the context of an open dependent economy. Dornbusch modelled an economy with a tradables and a nontradables sector. He assumed that the production of tradables depends positively

on the real exchange rate, while the production of nontradables depends negatively on the real exchange rate. He further assumed that the demand functions for tradables and nontradables depend upon real exchange rates and real expenditures. Dornbusch thus formally defines the equilibrium real exchange rate as the relative price of tradables to nontradables at which income is equal to expenditure and both tradable and nontradable markets are in equilibrium.

Dornbusch[1980] also looked at the characteristics of disequilibrium with reference to an overvalued or an undervalued exchange rate. He also looked at effects of disturbances on the real exchange rate given full employment and price flexibility.

Issues of permanent and temporary changes to the determination of the equilibrium real exchange rate have been addressed by Williamson[1983], Harberger[1983], Edward's[1984], Frenkel and Musa[1984]. These studies make a distinction between short run equilibrium positions and the long run equilibrium. These studies in determining the long run equilibrium real rate of exchange find it consistent in the long run with a balanced current account.

Edward's[1988] has presented a comprehensive overview of equilibrium real exchange rate concepts. The equilibrium

real exchange rate being that relative price of tradables to nontradables, which given that other explanatory variables are in long run equilibrium, results in internal and external equilibrium simultaneously. Other explanatory variables may include capital and aid flows, a measure of technology, international prices and trade taxes etc.

Internal equilibrium implies that the nontraded sector clears in the present and is also expected to clear in the future. External equilibrium here means that the current account in the present and in future periods satisfies the intertemporal budget constraint. The discounted current account balance equals zero. As such external equilibrium implies that current account balances, present and future are compatible with long run capital flows.

It implies then, that, if any of the explanatory variables which can effect a countries internal and external equilibriums change, then the equilibrium real exchange rate will also change. As such then we can state that the equilibrium real exchange rate is itself a function of the determining variables such as trade taxes, real interest rates, capital controls, government spending, technology etc. Edward's[1988b] calls these variables the real exchange rate fundamentals.

The above discussion would also imply that there is no single equilibrium real exchange rate, but paths of equilibrium real exchange rates through time. Note that not only are the paths of equilibrium real exchange rates affected by the current value of the explanatory variables but also by their future expected values.

It is also important to emphasize that permanent and temporary changes in the explanatory variables will affect the equilibrium real exchange rates differently. It would be interesting to look at some of the explanatory variable which are significant in the determination of long run internal and external equilibrium of a country.

Terms of trade is a significant explanatory variable in the determination of the equilibrium real exchange rate. It is conventionally believed that a deterioration in the terms of trade, in other words the world relative price of exportables to importables, results in a depreciation of the equilibrium real exchange rate. It is argued that the terms of trade deteriorates, because of a decline in the relative price of exportables. This deterioration creates an excess supply of nontradables and excess demand for exportables, leading to a worsening of the current account balance. The current account imbalance is corrected by a reduction in the relative price of nontradables in other words a depreciation

of the real exchange rate, which would shift domestic supply from nontradables, to exportables and importables. The worsening of the terms of trade has negative effects on income and wealth, which causes a real depreciation.

A permanent increase in an existing or a new permanent imposition of tariff would increase the domestic price of importables. Intratemporal and intertemporal income and substitution effects would be generated. There would be a reduction in both the demand for and the volume of imports. A higher demand and a higher price for nontradables would result. This would cause the equilibrium real exchange rate to appreciate. On the other hand a tariff reduction or a reduction in exchange restrictions cause a fall in the relative price of importables, creating an excess demand for importables and excess supply of nontradables and exportables. To restore equilibrium the relative price of nontradables must fall thus causing a depreciation in the equilibrium real exchange rate.

Balassa[1964] and Samuelson[1964] have shown that differential rates of technological progress have significant implications for the equilibrium real exchange rate. If productivity rises faster in the tradable goods sector in relation to the nontradables sector, and if wage increases are uniform in both sectors, then the relative

price of nontradables will rise. The price of tradable goods is exogenous and established by the world market, as such the equilibrium real exchange rate will appreciate. We can then infer that countries experiencing higher rates of productivity growth in their traded goods sector, would tend to have appreciating equilibrium real exchange rates, as against countries, with low rates of productivity growth in the relevant sector.

Changes in the controls on capital movement affect intertemporal consumption in so much as to change relative prices, as such equilibrium real exchange rates will change. An imposition of capital controls perceived to be permanent will reduce capital inflows and foreign borrowing in the current period. As a result expenditures on all goods including nontradables will fall. To maintain internal equilibrium the price of nontradables will fall and the equilibrium real exchange rate will depreciate.

Changes in international interest rates will also affect the equilibrium real exchange rate. If the foreign interest rate falls it will have two separable effects. If the exchange rate is pegged, then domestic interest rates would fall to maintain parity with foreign rates. The domestic investments savings gap would increase. The resulting negative impact on the current account would cause

a depreciation for the equilibrium real exchange rate. The other effect would be from assuming that most developing countries are net debtors, the current account would change reflecting the changes in net factor income. The effects of interest rates also depends on the fiscal behavior of the government.

International transfers are an important explanatory variable for the path of equilibrium exchange rates. If the developing country receives transfers from rest of the world such as foreign aid, then current and future domestic real income and expenditure will increase, resulting in an increase in the relative price of nontradables, causing an appreciation in the equilibrium real exchange rates. Thus foreign aid would reduce the degree of international competitiveness in the recipient country by making exports less competitive due to an appreciating equilibrium exchange rate.

Khan and Lizondo[1987]. Khan and Monteil[1987], Frenkel and Razin[1987] and Edward's[1989] have shown how different fiscal measures would affect the equilibrium real exchange rate. They have shown that even with unchanged fiscal deficit, changing the composition of government expenditure would affect the equilibrium real exchange rate. If the composition of government expenditure shifts towards a

greater proportion of tradables, then the price of nontradables falls and the real exchange rate depreciates.

Changes in the structure of taxes changes the investment and savings pattern which would affect the equilibrium real exchange rate. Thus the overall fiscal position and the composition of government spending and taxes influences the level of the equilibrium real exchange rate.

The concept of equilibrium real exchange rate is a long run trend depending upon the nature and dynamics of the on going structural changes in the economy.

# CHAPTER 7

## FRAMEWORK FOR DERIVING THE REAL EXCHANGE RATE EQUATION.

For the purposes of estimating the real exchange rate, its equilibrium path and implications from changes in its determinants, we would make the following assumptions.

We are looking at a small open economy producing both tradable and non tradable goods. The tradable goods consist of exportables and importables[import substitutes]. So we have a small open economy producing three goods.

Any changes in the small country's demand for imports and supply of exports, would have no effect on the international market price of tradable goods. As such, if the market price of tradable goods is exogenous to the small open economy, then its terms of trade will also be exogenous.

For the small open economy, the demand for imports is price elastic.

Domestic supply and demand conditions alone determine the price of nontradables. The nontradable sector is always in a state of equilibrium.

Given the above assumptions we can now proceed with developing a framework for determining the real exchange rate and empirically analyzing its determinants.

REAL EXCHANGE RATE.

We have defined earlier the real exchange rate as:

$$RER=E[PT^*/PN] \qquad [2]$$

$$RER=E[WPI[US]/CPI] \qquad [3]$$

EQUILIBRIUM REAL EXCHANGE RATE.

We would define the equilibrium real exchange rate as the relative price of tradables to nontradables, which for a given set of determinants/fundamentals, clears both the external and internal sectors simultaneously.

The path of the small open economy's real exchange rate can be influenced by the following determinants/fundamentals, both temporarily and permanently.

1. External terms of trade.

2. Government consumption.

3. Capital movements.

4. Commercial policy.

5. Supply of domestic credit.

6. Technological change.

7. Fiscal deficit ratio.

EXTERNAL TERMS OF TRADE.

Terms of trade can be represented by the external relative price of exportables to importables.

$$TOT = P[X^*]/P[M^*] \qquad [4]$$

TOT= Terms of trade.

P[X*]= Foreign price of exportables.

P[M*]= Foreign price of importables.

It is important to point out that changes in terms of trade will have both income and substitution effects on the real exchange rate.

The income effect which has traditionally received more attention in the literature, suggests, that a deterioration in the terms of trade [such as a fall in export prices],

would reduce real income. The demand for nontradables would also decline. The price of nontradables will decline and the real exchange rate would depreciate.

The substitution effect from deteriorating terms of trade in the case of falling export prices, would move resources into the nontradable sector. Increased supply of nontradables would reduce the price of nontradables and as such, cause a depreciation in the real exchange rate.

In the case of importables, an increase in price, would cause a deterioration in the terms of trade, resulting in a reduction in quantity demanded. From the substitution effect an increase in the demand for nontradables, would increase the price of nontradables, which would cause an appreciation of the real exchange rate. The income effect would reduce income and cause demand for nontradables to fall and also its price would fall causing an exchange rate depreciation. Thus income and substitution effects from a price decline of imports are offsetting each other.

It would seem then, from the argument presented in the previous paragraph, that it is not a foregone conclusion, that terms of trade depreciation would always cause an exchange rate depreciation. The result would depend upon the relative importance of income and substitution effects. Also on the composition of the deterioration in trade. Whether it

is coming from increases in the price of importables or decreases in the price of exportables.

GOVERNMENT CONSUMPTION.

Change in the level of government consumption as well as its composition would have effects on the path of equilibrium real exchange rate.

An increase in the consumption of nontradables would lead to an increase in its demand and price. Causing both income and substitution effects.

Increases in the demand for tradables, though having no direct effect on the market for nontradables, would nevertheless, have indirect effects through changes in private sector disposable income. If the government's increase in demand for importables is financed by borrowing then the increase in disposable income would increase the demand for nontradables and cause an equilibrium real exchange rate depreciation.

Changes in the composition of government expenditure towards a greater proportion of nontradables would increase the demand and price of nontradables.

Data on government consumption of nontradables is not easily available. The proxy of ratio of total government consumption, to the gross domestic product, is commonly used, to substitute for government consumption of non tradables [Edward's(1989)].

$GC_1$=GC/GDP [5]

GC= Government expenditure.

Where $GC_1$ is the ratio of government consumption to the gross domestic product, a proxy for government consumption of nontradables.

We do concede, that $GC_1$ is not a very good proxy for government consumption of nontradables. We have mentioned earlier the difficulty associated with availability of data on government consumption of nontradables, for most developing countries.

We would like to point out here, that Asikoglu and Uctum[1991], have computed a series for tradable and nontradables components of government expenditure for Turkey. Their series for nontraded goods consist of education, housing, health and transportation and communication. The series for traded goods consist of

agriculture, mining and quarrying, manufacturing, energy and tourism.

Following Asikoglu and Uctum,[1991], we aggregate government expenditure on education, health, transport and communications, housing, rural development and social welfare. This aggregate we use as a measure of government expenditure on nontradables. We define a new variable.

$GC_N$=GCNT/GDP [6]

GCNT= Government expenditures on nontradables.

Where $GC_N$ is defined as the ratio of government expenditure on nontradables, to the gross domestic product. The aggregate of government development expenditure on education, health, transport and communications, housing, rural development and social welfare. We would like to point out that in no earlier study estimating the real exchange rate equation has a series for $GC_N$ been used. Only unsatisfactory proxies have been used earlier.

CAPITAL MOVEMENTS.

Changes in the extent of capital movements would affect the flow of capital. An increase in capital controls would

reduce capital inflows and would appreciate the equilibrium real exchange rate. It is important to point out, that the extent of the effect on the equilibrium real exchange rate would depend on whether more of capital inflows is spent upon nontradables as against importables or vice versa.

Net capital inflows, which are spent on importables would have no effect on the real exchange rate directly. If capital inflows are spent on nontradables, then foreign currency must be converted into local currency. The resulting increase in domestic money supply would cause an increase in the price of nontradables, causing an appreciation of the real exchange rate.

A perfect proxy for capital controls is difficult to establish. In the literature different ratios of capital flows to GDP have been used. Edward's[1989], uses lagged ratio of net capital flows to GDP. Schafer[1989], defines net capital flows as net borrowing and uses its proportion to GDP as a proxy for capital control.

We would define the following variables for capital control for our purposes.

$$CAP1=[NFB+TRAN+AID+NFIFA]/GDP \qquad [7]$$

$$CAP2=[NTP+NTO+NDFI+NPI+LTCI+STCI]/GDP \qquad [8]$$

CAP= Net capital inflow as a proportion of GDP

NFB= Net foreign borrowing.

TRAN= Transfers

Aid= Disbursement of foreign aid- debt servicing.

NFIA= Net factor income from abroad.

NTP= Net transfers private.

NTO= Net transfers official.

NDFI= Net direct foreign investment.

NPI= Net portfolio investment.

LTCI= Long term capital inflow.

STCI= Short term capital inflow.

Though we have constructed series for both equations [7] and [8], we do most of our estimations with equation [8] and its lagged value.

COMMERCIAL POLICY.

This variable will be used to proxy the degree of "openness" in the domestic economy. Cavallo Cottani and Khan [1986], have used the openness variable to measure distortions in trade policy. Kravis and Lipsey[1986] approximate the discrepancy between world market prices and

domestic prices resulting from commercial policy with the openness variable.

The openness being measured by the ratio of GDP to the sum of exports and imports.

Trade policy restrictions such as tariffs, taxes, subsidies and quotas reduce the degree of openness. Reduction in openness increases the gap between the free trade domestic price for tradables and the actual domestic price for tradables.

We will use two variables to measure the degree of openness in the economy. The ratio of GDP to the sum of exports and imports [trade] will be one such measure. The ratio of tariff on international trade to the sum of exports and imports will be the other measure.

$$CP_1 = GDP/X+M \qquad [9]$$

$$CP_2 = \overline{TINT}/X+M \qquad [10]$$

CP= Commercial policy.

X= Exports.

M= Imports.

TINT= Tariff on international trade.

A reduction in openness, would imply an increase in the value of both CP variables defined above.

If the economy follows a significant import restricting policy, by the way of increase in import tariffs, then we would have a reduction in imports. In the case of both $CP_1$ and $CP_2$, an increase of value will take place implying a reduction in openness. Higher resulting price of imports would cause the price of nontradables to increase [via the mechanism described earlier]. As the price of tradables is exogenous, the real exchange rate would appreciate.

If a reduction in openness takes place via an increase in export tariffs, then production of exports will fall. With factors of production moving to the nontradables sector, the price of nontradables would fall. The real exchange rate would depreciate. However as a result of the decrease in exports, a deficit would occur on the current account balance. This would result in import restrictions and or foreign exchange rationing. The price of imports would increase and as a result, the price of nontradables would also increase. The new equilibrium price of nontradables, would depend upon the elasticities of demand for imports and nontradables and the supply elasticity of nontradables. From an increase in export tariff, we cannot predict the effects on the real exchange rate. Increase in

import tariffs would however unambiguously appreciate the real exchange rate as we have discussed earlier.

SUPPLY OF DOMESTIC CREDIT.

We would define excess supply of domestic credit [EXDC], as domestic credit creation in excess of devaluation, foreign inflation and real GDP growth. We assume here that the velocity of money is constant. EXDC has an inflationary impact, because if it is positive , then the increase in domestic credit or money supply is out of proportion to real output and the prevailing price level. The excess money is spent on both nontradables and tradables. With the price of tradables being exogenous to the system, the price of non tradables is driven up. The real exchange rate appreciates. Higher prices of nontradables discourages the production of non tradables and cause a movement of factors of production to the tradables sector.

Most developing countries exercise significant control over the nominal exchange rate. Even when they profess to have flexible exchange rates. Usually expansion of domestic credit is the instrument of choice to finance fiscal

deficits. With a consistent increase in domestic credit, it is not possible to sustain a constant level of RER, over the long run, because consistent high EXDC would lead to a fall in reserves and create pressure for a devaluation of the domestic currency. However, if the exchange rate is fixed, an appreciation could be observed for the real exchange rate in the short run.

EXDC= [GDC- TECH1 -INFL*-DEV] [12]

EXDC= Excess demand for domestic credit.

GDC= Growth in domestic credit.

Tech1= Real growth of GDP.

INFL*= Foreign inflation.

DEV= Devaluation.

TECHNOLOGICAL CHANGE.

Ballasa[1964] provided a formal framework to examine the relationship between economic growth and the equilibrium relative price of tradables to nontradables. Though Ricardo, Pigou[1922] and others had postulated a negative relationship explicitly earlier, between economic growth and the relative price of tradables to nontradables.

Ballasa made the case, that the rate of productivity growth is higher in countries experiencing a higher rate of growth, than in those countries experiencing a somewhat slower rate of growth. Also, that the improvements in productivity are greater in the tradable goods sector, as against the nontradable goods sector. The implication being, that the equilibrium relative price of tradables to non tradables will be declining over time, assuming that we are experiencing positive growth. The real exchange rate would in such a case be appreciating.

Improvements in technology, can be product augmenting or factor augmenting. Technological change will also be different across sectors. Depending on the above, we can have different effects on the equilibrium real exchange rate. Improvements in productivity have positive income effects generating increase in the demand for nontradables. The resulting increase in the price of nontradables would appreciate the real exchange rate.

Supply effects also result from technological progress. If the change is factor augmenting, then the Rybczynski theorem would apply, as in the case of exogenous increase in factor availability. In the case of product augmenting technological change, it is possible that the supply effects dominate the demand effects of technological improvement.

Improvements in the supply of nontradables to the extent of excess supply would cause a fall in the price of nontradables and cause a depreciation of the real exchange rate.

Measuring technological change is not easy. Edward's[1989] uses GDP growth rate as a measure of technological change. Implicit is the assumption that growth is taking place in the tradables sector. Edward's does however mention the shortcomings of this proxy.

Schafer[1989] uses percapita growth rate as a measure of technological change.

Cavallo, Cottani and Khan[1990], use a time variable in their regressions to capture the residual trend and attribute that, to technological change in the tradables sector.

We are not satisfied with each of the proxies used, in the studies reviewed by us, to represent growth attributable to technological change. None of them exclusively captures the path of technological change, as the effects of other factors are not eliminated in the computation.

We would introduce another measure for technological change in the real exchange rate equation for developing countries. We would measure technological change from the Solow residual method, also called multifactor productivity

growth, or that part of growth that cannot be explained by growth of capital or growth of labor.

We define the following variables which we have discussed in the paragraphs above.

TECH1 = GDP growth rate. [13]

TECH2 = Growth rate attributed to technological change from measuring multifactor productivity growth. [14]

TECH3 = Percapita growth. [15]

T = Time trend to capture the residual from the real exchange rate equation. The residual being attributed to technological change. [16]

For purposes of our estimation we will basically use Tech 2, however we will also estimate with the other proxies for purposes of comparison.

FISCAL DEFICIT RATIO.

As a measure of fiscal policies we would use the ratio of fiscal deficit to lagged high powered money. We would expect this variable to negatively effect the real exchange rate. An increase in the ratio would cause appreciation of

the real exchange rate, given that all other variables are stationary. An overvaluation of the real exchange rate would be the outcome and pressures for devaluation would increase. Given our old assumption of exogenous terms of trade, price of tradables and rigidity of the nominal exchange rate.

DEH=DEF/HM [17]

DEH= Ratio of fiscal deficit to high powered money.

DEF = Fiscal deficit.

HM= High powered money.

OTHER VARIABLES WHICH COULD INFLUENCE THE PATH OF EQUILIBRIUM REAL EXCHANGE RATES.

We will also look at the effects of the following variables being incorporated in the real exchange rate equation.

INVGDP= INV/GDP. [17]

RGDC= Real growth in domestic cred it. [18]

GNER= Devaluation of the nominal exchange rate. [19]

PCGDP= PC/GDP. [20]

Where INV= Investment, PC= Private consumption.

# CHAPTER 8

## ESTIMATING THE REAL EXCHANGE RATE EQUATION FOR PAKISTAN.

We have described the theoretical framework for estimating the real exchange rate equation in chapter 7.

We estimate first the following equation:

$$RER = a_0 + a_1 TOT + a_2 CAP_2 + a_3 [CP_1] + a_4 EXDC + a_5 Tech_2 + a_6 GC_N + D_5 \qquad [21]$$

The variables have all been defined and explained in Chapter 7. For convenience we list them again.

RER= Real exchange rate.

TOT= Terms of trade.

$CAP_2$= Capital flows as a proportion of GDP.

$CP_1$= Openness variable, a measure of commercial policy. Ratio of GDP to the sum of exports and imports.

EXDC= Excess demand for domestic credit.

$Tech_2$ = That part of growth which is attributable to technological change.

$GC_N$ = Government consumption of nontradables/GDP

$D_5$= Dummy variable for different exchange rate regimes.

Equation 21 represents the basic fundamentals which determine the path of the equilibrium real exchange rate. In chapter 7 we have suggested other variables which could also influence the equilibrium real exchange rate. Also we have suggested alternative proxies for measuring our openness, technological change and government consumption of nontradables variables.

The results of the basic equation[21] and also those of other equations, where more determining variables are added and alternative proxies are incorporated are presented in Table[2]. We have made estimations considering both the real and monetary variables together and separately. We have also estimated with different proxies for the basic variables as defined in Chapter 7.

The results suggest that the basic model has satisfactory explanatory powers. The $R^2$ are satisfactory. The Durbin _Watson statistics though not very strong, still do not indicate a degree of autocorrelation which would be of concern.

In all our estimations the terms of trade variable[TOT] is insignificant. The sign of the coefficient is mixed though more often positive. This is a surprising result. However if we look at Figure 6, we can see that the terms of

TABLE 2

REGRESSION RESULTS OF THE REAL EXCHANGE RATE EQUATION.

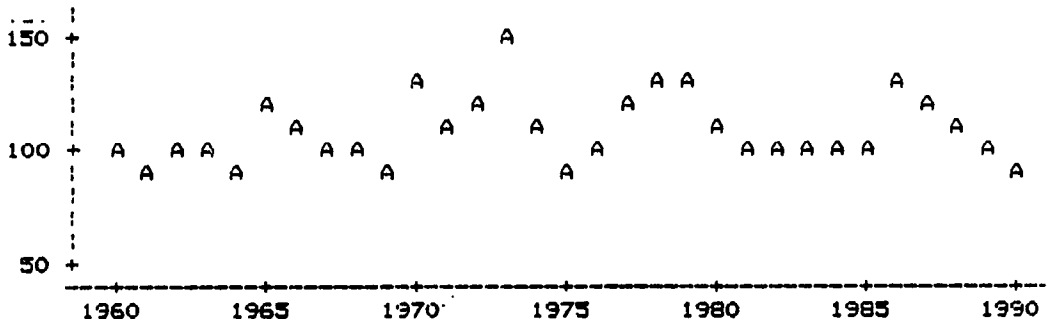
| | 21a | 21b | 21c |
|---|---|---|---|
| INTERCEPT | 15.13[7.34] | 3.52[1.71] | 3.95[5.55] |
| TOT | 0.002[0.19] | 0.007[1.29] | 0.007[.79] |
| CAP/GDP | -0.17[-2.01] | -0.003[-0.06] | |
| [CAP/GDP]t-1 | | | -0.245[-2.10] |
| EXDC | -0.05[-4.18] | -0.023[-2.30] | -0.062[-3.62] |
| $CP_1$ | -0.014[-5.82] | -0.006[-2.03] | |
| $CP_2$ | | | -0.173[-2.03] |
| $GC_{NT}$ | 0.90[3.61] | | |
| $GC_1$ | | 0.153[2.61] | 0.423[4.79] |
| INV/GDP | | | 0.140[1.42] |
| $TECH_2$ | -0.041[-1.01] | 0.04[.02] | -0.061[-1.69] |
| DEH | | -0.004[-0.66] | -0.023[-3.87] |
| [RER]t-1 | | 0.626[5.40] | 0.751[7.85] |
| NOMDEV | | 0.081[7.39] | 0.08[6.42] |
| $D_S$ | 3.61[9.26] | 0.726[1.96] | .303[1.98] |
| $R^2$ | .96 | .99 | .99 |
| ROOT MSE | .715 | .314 | .313 |
| DW | 1.45 | 1.92 | 1.85 |

t statistics are given in parenthesis.
Further estimations of the RER equation are given in table[] in the appendix.

trade variable in Pakistan has not shown any significant clear trend over the past thirty years.

FIGURE 6

TERMS OF TRADE INDEX FOR PAKISTAN 1960-1990




Source: *International Financial Statistics*. International Monetary Fund.[Various issues]

Though the TOT variable was not significant in any of our regressions, however the positive sign observed requires an explanation,

We were expecting an unambiguous negative sign for the coefficient of the TOT variable, which would have lent support to the popular view that deteriorating terms of trade cause a depreciation of the real exchange rate [see

our discussion of the terms of trade variable in Chapter 7]. As we pointed out, the argument is true only if the income effect dominates. If the substitution effect of deteriorating terms of trade dominates the income effect, as in the case of increase in the price of importables. Then a reduction in quantity demanded of importables would result. The substitution effect would increase the demand for nontradables, increasing the price of nontradables and causing an appreciation of the real exchange rate.

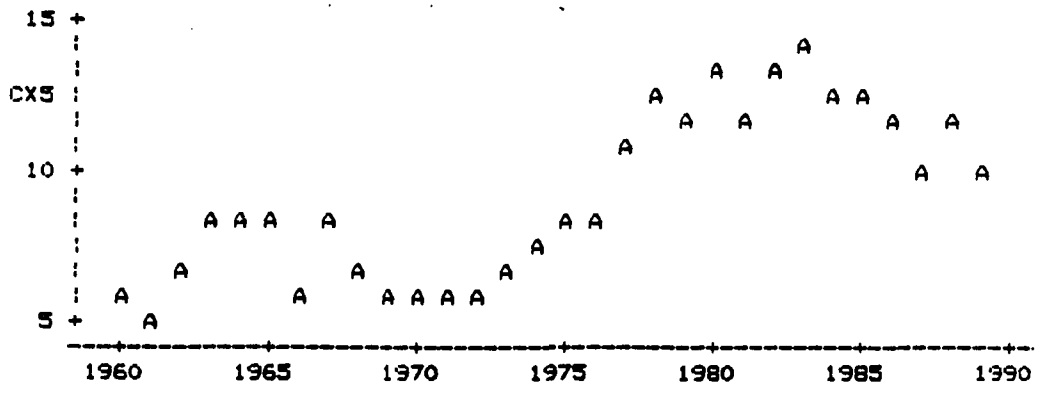
In Pakistan from 1960-1990 though terms of trade have not displayed a very clear or significant trend, however it seems that the substitution effect from the change in price of importables has dominated the income effect.

The coefficient for CAP[both current and lagged] variable was found to be negative and significant in most estimations. This implies that an increase in capital flow would result in an appreciation of the real exchange rate.

The path of the CAP variable is shown in Figure 7. Notice that increased ratio of capital flows to GDP in periods of fixed exchange rate regimes have been associated with appreciating real exchange rates. The flexible exchange rate period from 1982-1990 has been associated with declining CAP/GDP ratios and also depreciating real exchange rates.

FIGURE 7

RATIO OF CAPITAL FLOWS TO GDP IN PAKISTAN 1960-1990.



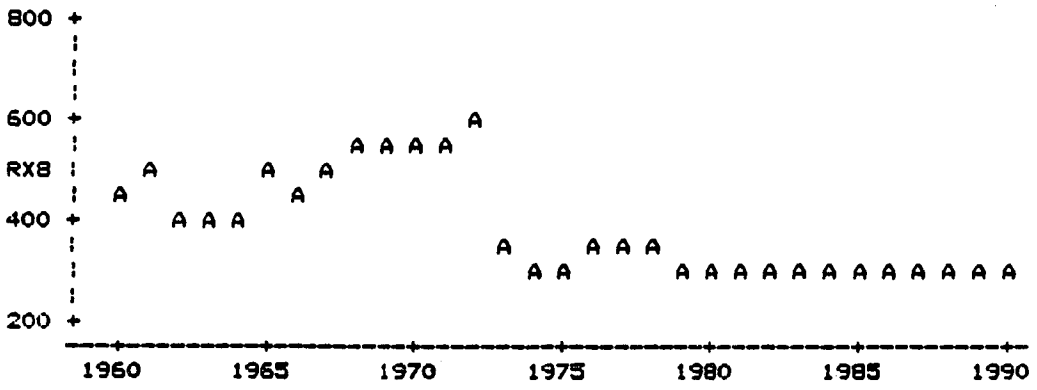

Source: *International Financial Statistics*: International Monetary Fund. [Various issues]

Both of our openness variables $CP_1$ and $CP_2$ were found to be significantly negative in all estimations. An increase in the GDP to total trade ratio is associated with appreciating real exchange rates. Notice in Figure 8 that the share of total trade in the openness variable has been proportionately higher in the flexible exchange rate period than in the earlier fixed exchange rate period.

FIGURE 8

RATIO OF GDP TO TOTAL TRADE [OPENNESS] 1960-1990.

GDP/X+M




YEAR

Source: *International Financial Statistics*. International Monetary Fund. [Various issues]

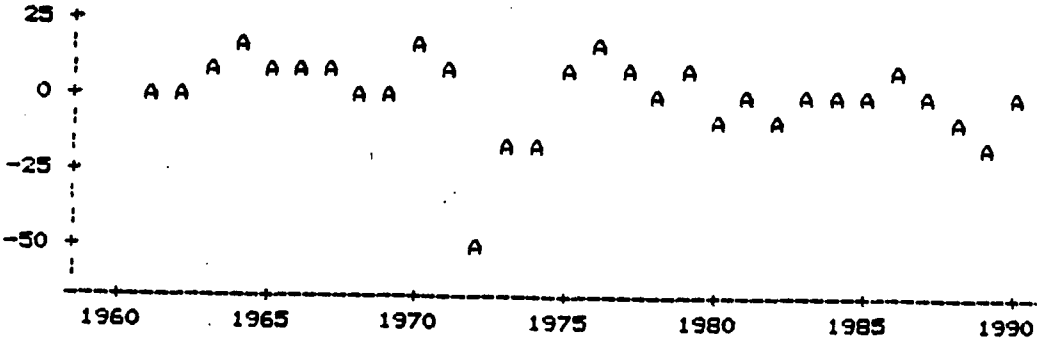
The variable for excess supply of domestic credit was negative and significant for all regressions. Increased supply of domestic credit appreciates the real exchange rate. This variable suggests the pattern of macroeconomic policies for the country under consideration. Excess supply

of domestic credit in any amount greater then zero would cause a disequilibrium situation and would contribute towards an overvaluation of the real exchange rate.

FIGURE 9

EXCESS SUPPLY OF DOMESTIC CREDIT IN PAKISTAN 1960-1990

EXDC




YEAR

Source: *International Financial Statistics*. International Monetary Fund. [Various issues]

For the growth variable we did most of our regressions with our $Tech_2$ variable, which measures only growth attributable to technological change. The sign of the coefficient is negative though in most cases insignificant.

We have also tried other proxies for technological change, such as GDP growth rate, percapita GDP growth rate and a time trend, used in earlier studies. With the other proxies the sign of the coefficients in most cases was positive, though still mostly insignificant. The negative sign which we observed with our Tech2 variable gives some support to the Balassa effect. Earlier studies which examined real exchange rates found contradictions to the Ballasa effect. The blame can be assigned to the choice of proxies. We believe that GDP growth, per capita GDP growth and a time trend are not very good proxies of technological change.

We have also estimated government expenditures on nontradables. Earlier studies proxied this variable with total government expenditure. The sign on this variable was found to be positive and significant for all estimations. Changes in government expenditures will effect the equilibrium real exchange rate through two channels. Assuming first that an increase in government expenditure on nontradables is financed through an increase in public debt.

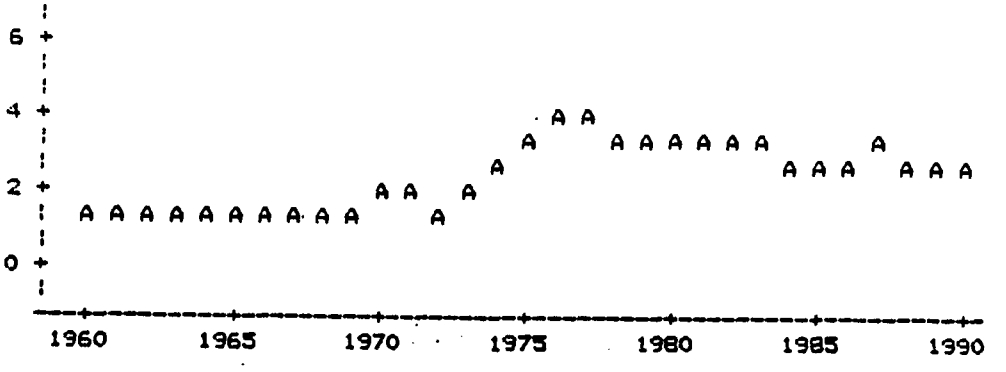
Then the first effect of the increase in government expenditure would increase the price of nontradables leading to an appreciation of the real exchange rate. However the financing of the increased spending would require increased government borrowing. This would reduce income, causing a reduction in the demand for nontradables in the private sector, reducing its price and causing a depreciation of the real exchange rate. The overall effect would depend on the relative dominance of the income or substitution effects. In our estimations the income effect seems to dominate.

Figure [10] shows the path of government expenditures on non tradables as a proportion of GDP. We aggregate government expenditure on education, health, transport and communications, housing, rural development and social welfare, as government expenditure on nontradables. It is important to look at the source of financing of government expenditure. Whether increases in expenditure are financed by increased borrowing or by more taxes. Since 1981 the government of Pakistan has imposed a special zakat tax [2.5% annually on wealth]. Revenues from this tax are earmarked exclusively to be spent on what we have aggregated as expenditures on nontradable goods. It is important to note that such a tax would reduce income on a broad base.

FIGURE 10

INDEX OF RATIO OF GOVERNMENT EXPENDITURES ON NONTRADABLES TO GDP.

$GC_N$




Year

Source: *Pakistan Economic Survey*. Government of Pakistan. [Various issues].

Since 1984 the government of Pakistan has also imposed a 5% education surcharge on all imports and exports. All revenue from this surcharge is earmarked for expenditure on public education[a nontradable good].

From Figure[10] notice that the ratio of government expenditure to GDP has been constant or declining from 1980 onwards and at the same time increased proportion of financing of these expenditures can be attributable to new taxes. The fact that new taxes were imposed specifically for the purpose of financing of these expenditures provides credibility to the sign observed on the coefficient of government expenditures on nontradables. A similar sign was also observed when we substituted in total government expenditure as a proxy for government expenditure on nontradables[this proxy was used by Edward's[1989]], though he observed a negative sign on this variable on all but one of his regressions.

The coefficient for the fiscal deficit ratio[DEH], when included, was negative and in some cases significantly so. This suggests that when the ratio of fiscal deficit to high powered money increases the real exchange rate appreciates. In the case of a fixed exchange rate this would result in an overvaluation of the real exchange rate.

In some regressions we have also included the nominal devaluation variable. The coefficient for this variable has been observed as significantly positive. The size of the coefficient is large suggesting that nominal devaluations can be used as a useful tool for correcting overvaluation

from equilibrium real exchange rate temporarily. For long run equilibrium it would require elimination of the original sources of disequilibrium. In terms of our model, EXDC and DEH would need to be equal to or less then zero.

In the regressions where they have been included the coefficients of lagged real exchange rate have been found to be positive and significant. The high values of these coefficients suggest that with other things constant real exchange rates converge rather slowly to their long run equilibrium.

Our study and some of the results and conclusions drawn are different from earlier empirical studies on real exchange rates for developing countries. We have provided better proxies for government expenditure on non tradables and technological change, then have been used previously.

We have described earlier the expenditures we aggregated to proxy for government expenditures on nontradables. We have also looked at the financing of these expenditures, which has allowed us to explain the sign observed on the coefficient.

All empirical studies reviewed by us have either used GDP growth rate[Edward's[1989], or percapita GDP growth rate Schafer[1989], or a time trend Cottani et al[1990] as a proxy for technological change. We have suggested that these

proxies have shortcomings. The variable we have used for measuring technological change represents that part of growth that cannot be explained by either growth of capital or by growth of labor. This measure of technological change allows us to get results which give some support, albeit weak, to the Ballasa effect discussed earlier. A significant negative coefficient would have been a clear support fort the Ballasa effect. Though we did get a negative coefficient, it was rarely upto the required level of significance. The earlier studies reviewed had positive coefficients for this variable which in some cases were significant. When we tried the proxies used by earlier studies we obtained similar results to them. The result which we have obtained with our $Tech_2$ variable is probably due to a better approximation of growth attributable to technological change.

Edward's[1989] uses the spread between the black market and official exchange rates as a measure of openness. We felt that this specification does not represent all the pressures on trade. We find that the openness variable used by Cavallo Cottani and Khan[1986] and Kravis and Lipsey[1988]more appropriate. These studies measure openness, as the ratio between GDP and the sum of exports and imports.

# CHAPTER 9

## REAL EXCHANGE RATE MISALIGNMENT.

Real exchange rate misalignment can be defined as the deviation of the actual real exchange rate from a sustainable equilibrium level. We have shown that the equilibrium real exchange rate is a function of real variables earlier. The actual real exchange rate however responds to both real and monetary variables. The actual real exchange rate is not expected to be permanently at the level of the equilibrium rate. Short rum deviations as a result of temporary changes in the real variables are to be expected. However more serious and permanent changes in the variables can cause substantial differences between the actual and equilibrium exchange rates, which is misalignment of the real exchange rate.

In any period the value of the observed or actual real exchange rate will depend on the values of the explanatory variables and on monetary and fiscal pressures.

Theoretically the affects will also depend to a large extent on the type of exchange rate regime. Edward's[1988]

in this context looks at three regimes, predetermined nominal, flexible and multiple exchange rates.

For an open economy a sustainable macroeconomic equilibrium needs to have monetary and fiscal policies consistent with the nominal exchange rate regime. If policies are not consistent then disequilibrium will result which would cause misalignment in the real exchange rate.

A frequent inconsistency between macroeconomic and exchange rate policies is when fixed nominal exchange rates are associated with large fiscal deficits. In most developing countries the ever present large fiscal deficits are financed wholly or in part by money creation. The resulting inflation would cause an inconsistency between the fiscal deficit and the maintenance of the fixed exchange rate. The domestic price of nontradables will increase at about the rate of inflation, the price of tradables being external, the real exchange rate would appreciate.

Monetary policy is another source of causing a deviation of the actual real exchange rate from its equilibrium path. In a fixed exchange rate regime increases in domestic credit which are in excess of the growth in demand for domestic money will cause a deviation between actual and equilibrium real exchange rate. Excess domestic credit will cause an excess demand for both tradable and

nontradable goods and financial assets. Higher demand for tradables will cause higher trade deficits, loss in international reserves and an increase in foreign borrowing, Higher demand for nontradables will increase their prices and will lead to real exchange rate appreciation, causing the actual real exchange rate to depart from its equilibrium path, in other words misalignment will occur.

Appreciation of the real exchange rate as against its equilibrium value would have negative effect on real growth, competitiveness in exports and the rate of investment. Sustained pressures from the negative trend in economic indicators would force authorities to devalue the nominal exchange rate. This of course would be a temporary measure and would not address the source of the disequilibrium, which are high fiscal deficit and positive excess supply of domestic credit.

Under flexible or floating regimes, exchange rates are free to fluctuate in response to changing macroeconomic policies. Dornbusch[1976] shows that a monetary expansion would result in an immediate jump for the nominal exchange rate. Though prices of nontradables will be sticky in the short run, they would however increase toward the new equilibrium level, keeping in mind the increase in the stock of money. The nominal exchange rate will decrease to a new

equilibrium level. In so much as no real variable is disturbed the real exchange will return to its equilibrium path. The short run departure of the actual real exchange rate from its equilibrium path is termed as exchange rate misalignment. It would also be correct to assume that changes in the nominal exchange rate would cause a movement for the actual rate of exchange, away from its equilibrium path.

Earlier studies on real exchange rate misalignment, Edward's[1988], Schafer[1989] and Cottani, Cavallo and Khan[1990], have all averaged out the misalignment for the entire time period under consideration for the countries in their sample. On the basis of the average misalignment observed in a country over 15-20 years, they have based their conclusions. This averaging out does not allow us to make any conclusions about how different domestic policies and exchange rate regimes have been associated with different levels of misalignment over time.

In our study we first estimate a series for long run equilibrium real exchange rates, on the basis of the real variables outlined earlier. We then construct an index for misalignment from 1960-1990 for Pakistan. We can then look at the levels of real exchange rate misalignment during fixed and flexible regimes. We have also looked at how real

exchange rate misalignment may have effected GDP growth, exports and the rate of investment.

# CHAPTER 10

## EQUILIBRIUM REAL EXCHANGE RATES AND MISALIGNMENT

### ESTIMATING LONG RUN EQUILIBRIUM REAL EXCHANGE RATES FOR PAKISTAN 1960-1990.

In the regressions we showed in the Chapter 9, we did not make any distinction between temporary and permanent effects on the equilibrium real exchange rate, from changes in the determinants. We recognize that the long run equilibrium paths would be distinct from short run deviations.

In order to generate equilibrium estimated series for long run equilibrium exchange rates, we would need to have the monetary sector in equilibrium. This would imply that the EXDC and DEH variables would need to be equal to zero. Only the real variables defined in Chapter 7 would be used to determine the paths of equilibrium real exchange rates.

Once we have computed the coefficients of the equilibrium real exchange rate, then we can estimate the

long run equilibrium real exchange rates over time. We have to first decide which and what values of fundamentals to use. Edward's[1988] uses the fitted values of the real exchange rate regression as a proxy for the equilibrium real exchange rate. We should note however that the concept of equilibrium real exchange rate refers to a sustainable value of the determinants, rather then the actual levels which include short run temporary deviations. A solution would be to develop some form of an averaging procedure for the real determinants of the equilibrium real exchange rate. The smoothning out would eliminate temporary deviations.

For the purpose of smoothning out the temporary deviations we computed three year moving averages of the real determinants of the equilibrium real exchange rate. Based on these values we regressed the real exchange rate equation. After obtaining the values of coefficients of the sustainable determinants/fundamentals, we estimated the long run equilibrium real exchange rate.

$$ERER_t = 7.485 + 0.068\ TOT_t - 0.182\ CAP/GDP_t - 0.012\ CPI_t + .935\ GCN_t - 0.242\ TECH2_t + 4.40\ D5_t \qquad [22]$$

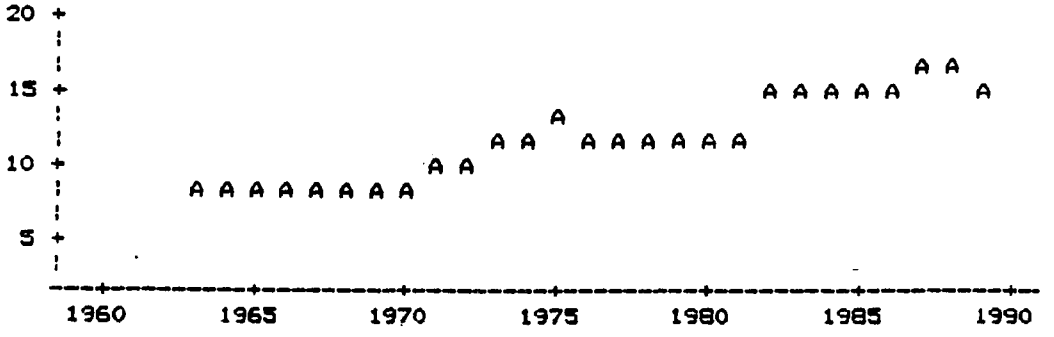
All variables in equation [22] were three year moving averages. Temporary deviations are as such assumed to be

smoothned out. The long run equilibrium real exchange rate can be estimated from the coefficients of the variables in equation [22].

Figure [11] gives the path of the equilibrium real exchange rate.

FIGURE 11

EQUILIBRIUM REAL EXCHANGE RATE FOR PAKISTAN 1960-1990




Source: Equation [22]

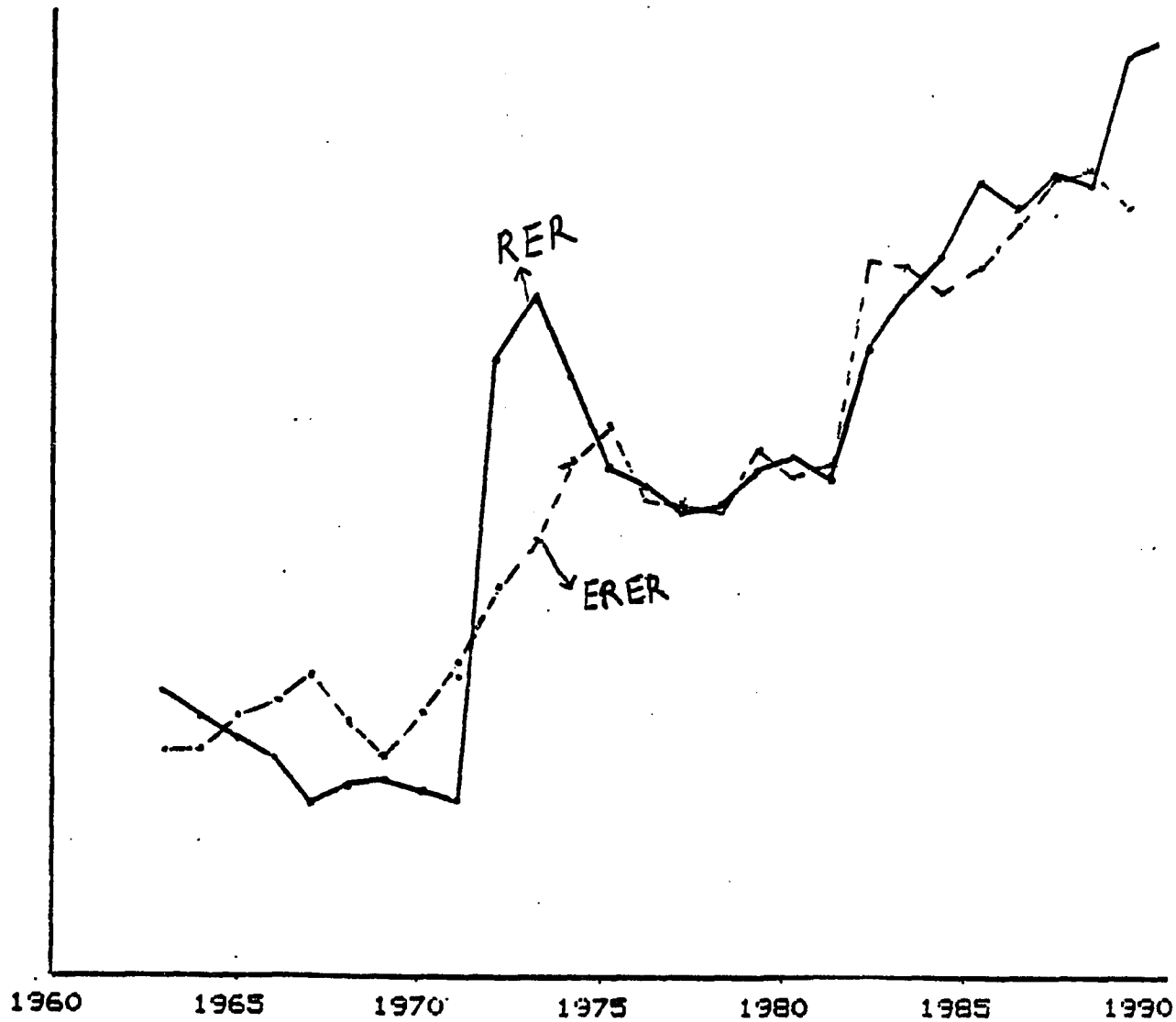
It is important to point out that the variations observed in the path of the equilibrium real exchange rate are not temporary movements. These movements represent the structural changes in the economy and should not be taken to represent a disequilibrium situation.

If we compare the paths of the estimated long run equilibrium real exchange rates with the actual paths, we observe that only a small part of the actual RER variations can be explained by the movements of the estimated long run equilibrium real exchange rates, for the years under consideration. This would suggest that financial and macroeconomic instability has significantly effected real exchange rate movements.

Figure [12] compares the actual path of RER with its long run equilibrium path. Notice that the period of fixed exchange rates before the devaluation of 1972 seems to be a period of maximum deviation of the actual real exchange rate from its long run equilibrium path. From 1964 onwards the real exchange rate was overvalued from its long run equilibrium path till 1971. The devaluations of 1972/73 caused an undervaluation of the actual real exchange rate. But by 1975 the actual rate had appreciated again enough to be close to its long run equilibrium path. From 1982 onwards sustained significant deviations are not observed.

FIGURE 12

ACTUAL AND LONG RUN EQUILIBRIUM REAL EXCHANGE RATES FOR PAKISTAN 1960-1990.




Source: Equation [22]

## MEASURING MISALIGNMENT OF THE REAL EXCHANGE RATE

We have constructed a series for long run equilibrium real exchange rates [ERER] for Pakistan. Using these series we were able to construct an index of misalignment for Pakistan for the period under consideration.

The deviation of actual RER'S from the ERER were deemed to be a measure of misalignment.

$$MIS=\{[ERER-RER]/ERER\}100 \quad [23]$$

MIS= Index of misalignment.

RER= Real exchange rate [actual].

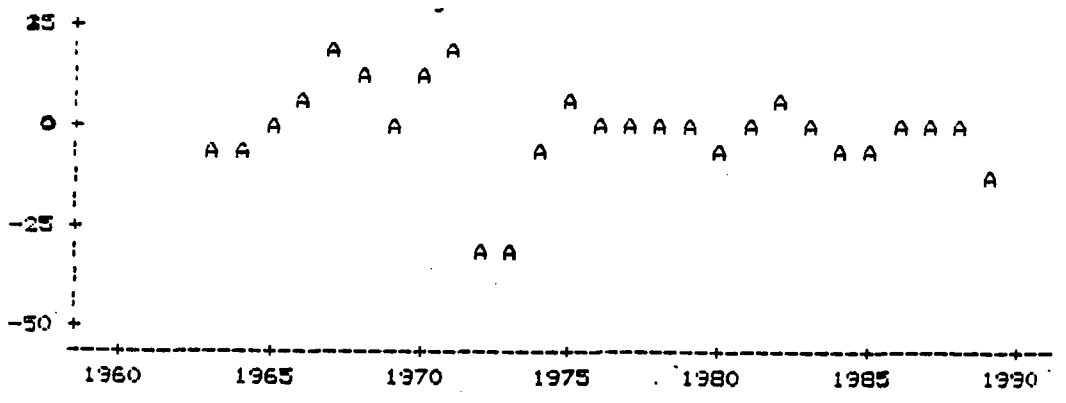
ERER= Estimated long run equilibrium real exchange rate.

A fitted value computed from the coefficients of the regression equation using three year moving averages of the real variables. Monetary variables are assumed to be equal to zero.

FIGURE 13

MISALIGNMENT OF THE REAL EXCHANGE RATE FOR PAKISTAN 1960-1990.

MIS




YEAR

Source: Table[3]

Table [3] presents the computations of real exchange rates, equilibrium real exchange rates and real exchange rate misalignment. Misalignment is presented in both its actual and absolute values.

TABLE[3]

REAL EXCHANGE RATES, EQUILIBRIUM REAL EXCHANGE RATES, MISALIGNMENT AND ABSOLUTE MISALIGNMENT OF REAL EXCHANGE RATES FOR PAKISTAN 1960-1990.

| OBS | YEAR | RER | ERER | MIS | AMIS |
|---|---|---|---|---|---|
| 1 | 1960 | 9.1371 | . | . | . |
| 2 | 1961 | 8.9949 | . | . | . |
| 3 | 1962 | 9.0803 | . | . | . |
| 4 | 1963 | 8.8852 | 8.1404 | -9.1492 | 9.1492 |
| 5 | 1964 | 8.5493 | 8.1984 | -4.2808 | 4.2808 |
| 6 | 1965 | 8.2806 | 8.5400 | 3.0374 | 3.0374 |
| 7 | 1966 | 7.9696 | 8.7635 | 9.0594 | 9.0594 |
| 8 | 1967 | 7.4897 | 9.1442 | 18.0934 | 18.0934 |
| 9 | 1968 | 7.6376 | 8.5449 | 10.6181 | 10.6181 |
| 10 | 1969 | 7.7131 | 7.7506 | 0.4841 | 0.4841 |
| 11 | 1970 | 7.5557 | 8.6679 | 12.8313 | 12.8313 |
| 12 | 1971 | 7.4774 | 9.3327 | 19.8798 | 19.8798 |
| 13 | 1972 | 13.5116 | 10.3528 | -30.5114 | 30.5114 |
| 14 | 1973 | 14.2865 | 11.0793 | -28.9472 | 28.9472 |
| 15 | 1974 | 13.2855 | 12.1844 | -9.0371 | 9.0371 |
| 16 | 1975 | 11.9987 | 12.5680 | 4.5294 | 4.5294 |
| 17 | 1976 | 11.7414 | 11.5653 | -1.5223 | 1.5223 |
| 18 | 1977 | 11.3015 | 11.4484 | 1.2837 | 1.2837 |
| 19 | 1978 | 11.4935 | 11.3902 | -0.9070 | 0.9070 |
| 20 | 1979 | 11.9332 | 12.2379 | 2.4899 | 2.4899 |
| 21 | 1980 | 12.1792 | 11.7999 | -3.2148 | 3.2148 |
| 22 | 1981 | 11.8750 | 11.9712 | 0.8034 | 0.8034 |
| 23 | 1982 | 13.6826 | 14.8732 | 8.0047 | 8.0047 |
| 24 | 1983 | 14.4096 | 14.7803 | 2.5082 | 2.5082 |
| 25 | 1984 | 14.9063 | 14.4113 | -3.4346 | 3.4346 |
| 26 | 1985 | 15.9280 | 14.7529 | -7.9652 | 7.9652 |
| 27 | 1986 | 15.6186 | 15.3427 | -1.7981 | 1.7981 |
| 28 | 1987 | 16.0026 | 16.0646 | 0.3857 | 0.3857 |
| 29 | 1988 | 15.8347 | 16.1065 | 1.6877 | 1.6877 |
| 30 | 1989 | 17.5697 | 15.4529 | -13.6983 | 13.6983 |
| 31 | 1990 | 17.7162 | . | . | . |

Source: Equations [2],[22] and [23]

Time series of the real exchange rate, equilibrium real exchange rate and an index of misalignment are presented in Table [3]. The index for misalignment is presented in both actual and absolute terms.

Figure[13] presents the index for misalignment over time for Pakistan. Notice that the periods of fixed exchange rates 1960-1982, have witnessed far greater misalignment then the period of flexible arrangements 1983-1990. It would seem that the authorities have resorted to the devaluation instrument quite frequently to correct for misalignment in Pakistans real exchange rate from 1982 onwards. But as we have pointed earlier that these are short run solutions and do not address the structural problems in the economy which are causing the misalignment in the first place.

EFFECTS OF REAL EXCHANGE RATE MISALIGNMENT IN PAKISTAN FROM 1960-1990.

Table[3] shows us that Pakistan for the years under consideration has experienced both real exchange rate over and undervaluations, from the equilibrium path. It would be interesting to examine the effects of this misalignment on economic indicators. We should expect that this misalignment has adverse effect on economic efficiency and resource

allocation. In other words misalignment and economic performance indicators would be inversely related. We would test this hypothesis by observing the relationship between misalignment and GDP growth, percapita GDP growth, export growth rate and the rate of investment.

GDP GROWTH RATES AND REAL EXCHANGE RATE MISALIGNMENT.

We used our time series on GDP growth rates as the dependent variable. As overvaluation and undervaluation of the real exchange rate both have negative effects on the economy, we calculated the absolute values of our misalignment series.

The results of a simple regression of the GDP growth rate on absolute misalignment and a time trend showed a significant negative relationship between the growth rate and absolute misalignment.

GROWTH= 2.59[1.56] - 0.23AMIS[-3.2] + 0.07T[1.0] [24]

$R^2$=.41

[Numbers in parenthesis are t statistics]

AMIS= Absolute misalignment.

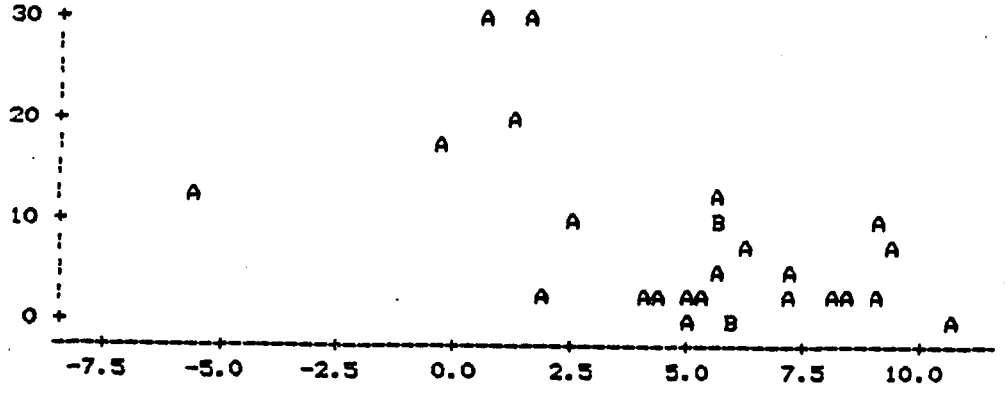
T= Time trend.

FIGURE 14

ABSOLUTE MISALIGNMENT AND THE RATE OF GROWTH FOR PAKISTAN

1960-1990

AMIS




GDP GROWTH

Figure[14]shows us the negative relationship between absolute misalignment and GDP growth rate.

We also did a regression by substituting in the index for misalignment for its absolute value. The relationship between growth and misalignment remained significantly negative.

PERCAPITA GROWTH RATE AND REAL EXCHANGE RATE MISALIGNMENT.

We also regressed percapita GDP growth on absolute misalignment and a time trend.

PERCAPITA GROWTH= 2.59[1.6] - 0.23 AMIS[-3.21] + .08T[1.00]

$R^{2}$= .39 [25]

The results show a significant negative relationship between percapita growth and absolute misalignment. Similar results were also obtained when we substituted in the actual value of misalignment for its absolute value.

Figures [15] and[16] show the relationship between percapita growth rates and the absolute and actual values of misalignment respectively. A clear negative relationship can be observed.

Our results show that for Pakistan from 1960-1990 real exchange rate misalignment has had detrimental effect on the growth rate, both actual and percapita.

FIGURE 15

ABSOLUTE MISALIGNMENT AND PERCAPITA GROWTH RATE

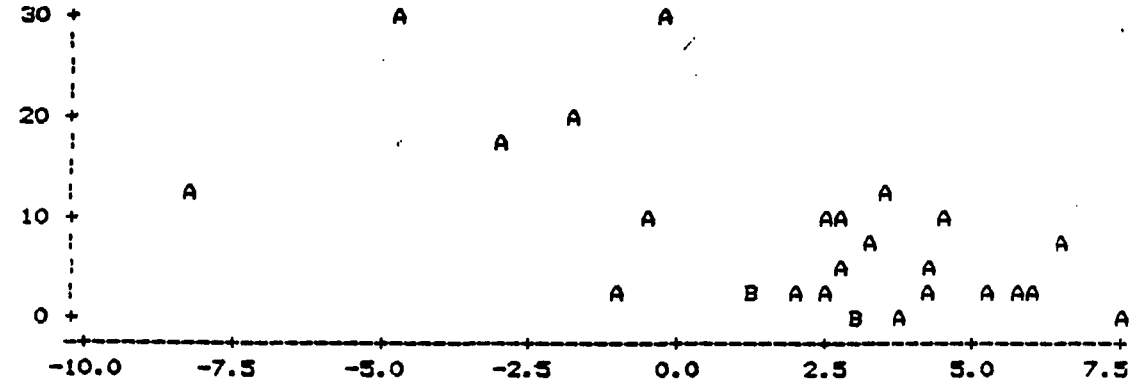
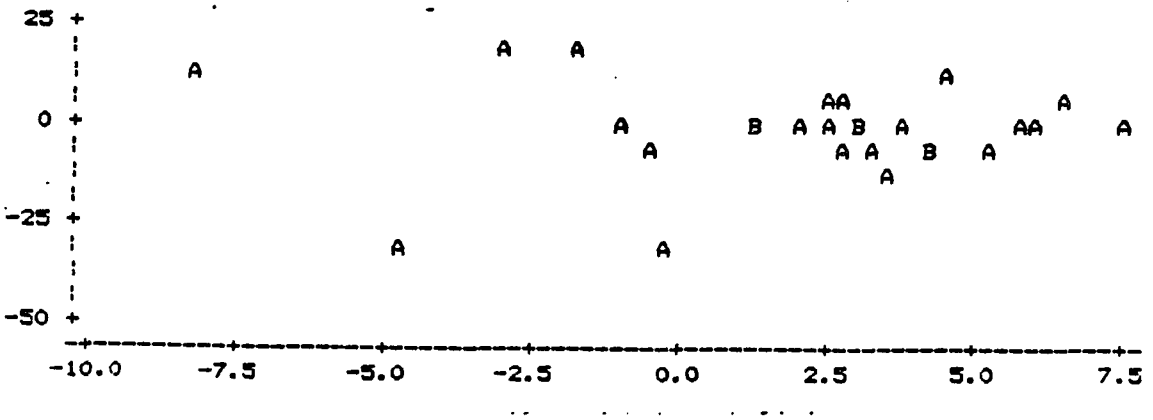



FIGURE 16

MISALIGNMENT AND PERCAPITA GROWTH RATES



EXPORTS GROWTH RATE AND REAL EXCHANGE RATE MISALIGNMENT.

To evaluate the effects of real exchange rate misalignment on the growth of exports, we regressed growth of exports on the index of misalignment and a time trend.

GROWTH OF EXPORTS= 1.72[.24] - 0.54MIS[-2.01] + 0.25T[.64]

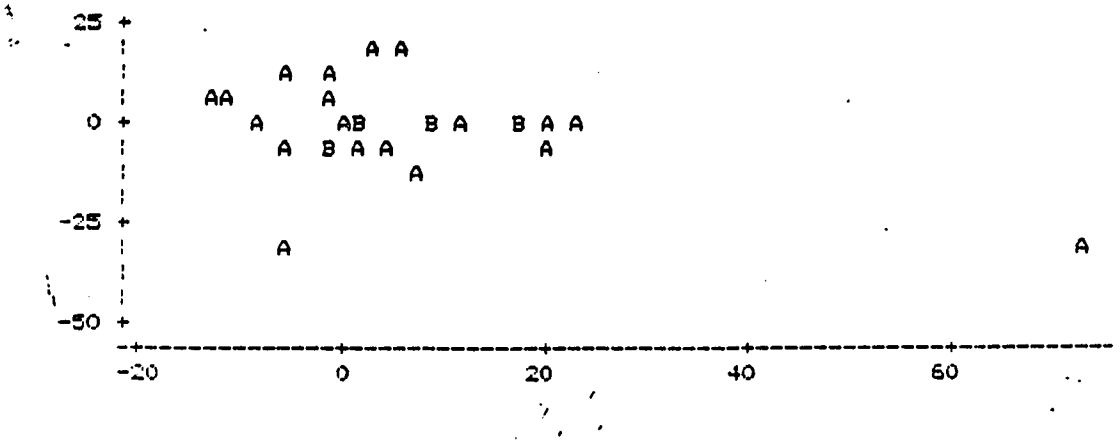
$R^2$= .17 [25]

The results show a significant negative relationship between the growth of exports and real exchange rate misalignment.

Figure[17] shows the plot of real exchange rate misalignment and growth of exports, where the negative relationship can be observed.

FIGURE 17

GROWTH OF EXPORTS AND REAL EXCHANGE RATE MISALIGNMENT



RATE OF INVESTMENT AND REAL EXCHANGE RATE MISALIGNMENT.

We regressed the rate of investment on the absolute value of real exchange rates and a time trend.

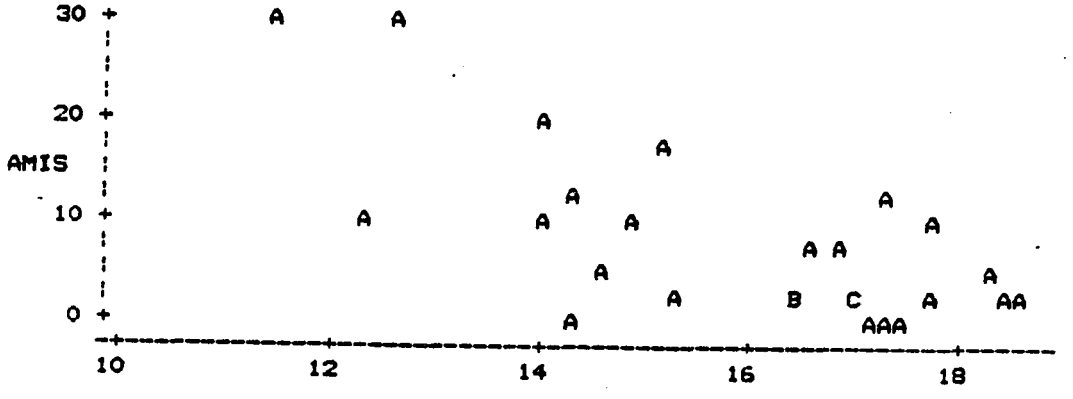
Rate of Investment= 16.38[20.21] - 0.15MIS[-4.28] +.04T[.9]

$R^2$= .51 [26]

The results show a negative relationship between the rate of investment and absolute misalignment of the real exchange rate.

FIGURE 18

RATE OF INVESTMENT AND ABSOLUTE MISALIGNMENT



The negative relationship can be observed in Figure[18]. Higher absolute values of real exchange rate misalignment have been associated with low rates of misalignment in Pakistan for the period under consideration.

We have shown that misalignment of the real exchange rate has had a negative relationship with GDP growth. percapita GDP growth, export growth rate and the rate of investment for Pakistan for the period under consideration.

# CONCLUSION

We have calculated the real exchange rate for Pakistan. Determined its long run equilibrium path and calculated an index of real exchange rate misalignment. We have also examined the effects of real exchange rate misalignment to Pakistan's economy.

Our study is different from earlier studies reviewed by us in many regards.

The difference in methodology from earlier studies starts from the choice of proxies for the real exchange rate fundamentals. We have shown that some of the proxies used in earlier studies were not satisfactory and could also be misleading. Our choice of proxies for technological change and government expenditures on nontradables are a definite improvement on earlier approximations.

The choice of doing a single country study as against a muticountry study, also allowed us to increase the number of observations. The time period considered by us 1960-1990 was twice as much as some of the studies reviewed by us.

The results obtained by us are also different from earlier studies. We do not find any significance for the terms of trade variable. The coefficient was positive and

the sign insignificant in most observations, contrary to what was observed in other studies. We offer an explanation on the basis of structural conditions and fiscal policies, in the country.

The sign on the government expenditure on non tradables coefficient was also positive contrary to conventional theoretical expectations. We have offered an explanation for this observation on the basis of structural conditions and the financing of government expenditures on nontradables.

We find that our proxy for technological change does not outright reject the Ballasa effect as all the other studies reviewed by us have done. Better specification of the technology variable has given us this result.

We have clear unambiguous conclusions from the other variables[something not observed in other studies]. Excess demand for domestic ratio, capital flow as a proportion of GDP and GDP/X+M variable are all inversely related to the RER.

We determine long run equilibrium real exchange rates and calculate an index for misalignment. We show that misalignment for Pakistan has been substantially more in periods of fixed exchange rate regimes, then in more flexible arrangements. None of the studies reviewed by us empirically examine this issue.

We show that real exchange rate misalignment has been inversely related to GDP growth, percapita growth, ratio of exports to GDP and the investment rate for Pakistan for the period under consideration.

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