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Real Exchange Rate Misalignment and its Impact on the Pakistan Economy

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List of Acronyms

ADF	Augmented Dickey-Fuller
AIC	Akaike Information Criteria
ARDL	Autoregressive Distributed Lags
BEER	Behavioral Equilibrium Exchange Rate
CAD	Current Account Deficit
FY	Fiscal Year
GDP	Gross Domestic Product
PPP	Purchasing Power Parity
REER	Real Effective Exchange Rate
RER	Real Exchange Rate
SBP	State Bank of Pakistan

Abstract

Globalization and trade liberalization are at their peak in the 21st century, and they have made stable currency policy as a precursor for the success of the external sector of any economy. Persistent real exchange rate misalignment necessitates readjustments of relative prices of goods. By driving away resources from productive activities, the misalignment causes decrease in economic growth. Given the critical role real exchange rate perform in the economy, this study examines the equilibrium real exchange rates and exchange rate misalignment for Pakistan by using the Behavioral Equilibrium Exchange Rates (BEER) approach. The study also provides a historical retrospective analysis of exchange rates from FY1982 till FY2020, covering various exchange rate regimes in the country. The empirical findings suggest that there have been recurring episodes of exchange rate overvaluation and undervaluation thus confirming the existence of exchange rate misalignment, and its negative impact on the economy. 'This study also points out that inconsistent macroeconomic policies, time and again, have led to the real exchange rate misalignment. Pakistan thus needs to develop consistent stable real effective exchange rate policies guided by consistent and accurate measure of misalignment.

Keywords: Real Effective Exchange Rate, Exchange Rate Misalignment, Overvaluation, Undervaluation

1.   Introduction

For decades, the Pakistan economy has been struggling with both internal as well as external economic meltdowns. In a highly integrated and globalized world economy, persistent trade imbalances have spiked a renewed concern about the effect of exchange rate misalignment on foreign trade. Despite of numerous studies around exchange rate and international trade, the topic remains open to many controversies.

Moving on, the key factor for the macroeconomic analysis is the Real Effective Exchange Rate (REER) and its misalignment. REER shows the relative position of a country in terms of international competitiveness of its goods and services trade. Most importantly, REER index[1] as calculated by the State Bank of Pakistan (SBP)[2] is used for the assessment of exchange rate misalignment. As the value of REER rises, it shows a real appreciation in the currency, which means a decrease in international competitiveness and vice versa.

The departure of the real effective exchange rate from its equilibrium level is termed as exchange rate misalignment, i.e., an exchange rate inconsistent with balance of payments (Owoundi, 2016). The deviation of REER from its equilibrium level has drastic consequences for the economy. This misalignment can be a result of changes in the macroeconomic fundamentals, structural changes (technological shift) or policy induced changes (Jehan & Irshad, 2020).

Undervaluation is generally believed to be a guiding policy for an economy towards export diversifications and a driver of economic growth steering towards higher productivity and thus higher growth rates (Rodrick, 2008; Cassino & Oxley, 2013). However, large undervaluation can cause higher inflation and internal imbalances. Furthermore, it increases a country's debt liability as it requires higher amount of local currency for debt settlement (Owoundi, 2016). Besides, prolonged overvaluations act as an indicator of potential currency crisis further causing spiked macroeconomic instability, current accounts deficit, and retardation of economic growth (Krugman, 1979).

This paper evaluates the theory of equilibrium real exchange rates to define misalignment as a deviation of the REER from its sustainable equilibrium level of economic fundamentals. Moreover, it

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[1] Specifically, the REER index is measured as $REER = \sum_{j=1}^{j=37} . \left(\frac{CPI.e}{CPI_j.e_j} \right)^{w_j}$, where CPI is the consumer Price Index of Pakistan, CPI_j is the Consumer Price Index of the trading partner, e is the nominal exchange rate of USD per Pakistani rupee, e_j is the nominal bilateral exchange rate with each trading partner in dollar terms and w_j represents the weight assigned to the jth trading partner in 37 trading partner countries.

[2] https://www.sbp.org.pk/departments/stats/Notice/Revision-Study(REER).pdf

points out how inconsistent macroeconomic policies can lead to real exchange rate misalignment. This paper provides answers to the following research questions:

- How to assess the real exchange rate misalignment using the Behavioral Equilibrium Exchange Rate (BEER) approach in the case of Pakistan?
- Does real exchange rate misalignment exist in Pakistan?
- How does BEER impact the macroeconomic indicators of the Pakistan economy?

Literature on exchange rate misalignment is vastly studied in the case of Pakistan. However, it has been observed that most of the studies employ traditional measures of exchange rate misalignment like Purchasing Power Parity (PPP). It signifies an evident research gap in the literature concerning the real exchange rate misalignment in Pakistan. In addition, recent global macroeconomic disruptions show that growing financial integration has amplified the urgency of constructing accurate measures of long-run equilibrium exchange rates and well-aligned macroeconomic policies.

1.2.   Research Objectives

This paper focuses on the following key research objectives:

1. To assess the real exchange rate misalignment for Pakistan.
2. To examine the impact real exchange rate misalignment on the macroeconomic economy of Pakistan.

Rest of the paper is organized as follows: Section 2 focuses on the Literature Review. Section 3 gives an overview of the macroeconomic conditions and the exchange rate regimes of Pakistan. Section 4 provides the theoretical and empirical frameworks. Section 5 discusses econometric methodology. Section 6 presents the discussion of empirical findings. Section 7 concludes the paper and draws implications for policy.

2.   Literature Review

The subsequent components of this section will provide a detailed review of real exchange rate misalignment and its correlation with the Pakistan Economy.

2.1.   Theory of Exchange Rate and Exchange Rate Misalignment

The theory of equilibrium real exchange rates defines misalignment as a deviation of the real exchange rate (RER) from its long-run equilibrium level. In addition, the role of macroeconomic policies is generally analyzed under three varied nominal exchange rate regimes such as fixed exchange rate regime, managed floating exchange rate regime and free-floating exchange rate regime (Ashour,

et al., 2018). Evidence suggests that inconsistent macroeconomic policies often lead to real exchange rate misalignment (Edwards, 1989). Different nominal exchange rate regimes generate different levels of misalignment and consequently different responses to exogenous shocks (Kemme & Roy, 2006). Improved economic fundamentals and a stable exchange rate support trade besides providing a way for enhanced inflows of capital and financial receipts (Janjua, 2007).

Primarily, the behavior of RER is decomposed as: temporary component and permanent component. The movement in each component of RER is explained by a few determinants. Such that the appreciation/depreciation is explained by economic fundamentals, whereas, the unexplained movements are attributed to cyclical movements or temporary shocks (MacDonald & Dias, 2007; Janjua 2007). The exchange rate misalignment can be due to macroeconomic fundamentals, macroeconomic shocks (policy shocks) or structural changes (Jehan & Irshad, 2020). The misalignment induced by macroeconomic fundamentals (determinants of REER) and structural changes (technological shift) is explained and justified. However, the misalignment due to external shocks such as policy shifts or crisis situation is unexplained part which actually impacts the movement of REER. Therefore, REER misalignment is the deviation of actual REER from the equilibrium path towards, a path inconsistent with the economic fundamentals (Janjua, 2007).

Exchange rates have been critical to volatility and misalignment during a crisis. It has been observed that during economic downturns protectionist measures rise, and they move alongside with the exchange rate movements. Furthermore, studies provide a clear link between trade policy and exchange rates. A major reason for it is that influence of the exchange rate is highly differentiated across the industry. A major concern among policymakers is that how large fluctuations in exchange rates affect the prices of internationally traded goods (Broz, 2010).

Considering the relationship between exchange rate misalignments on growth, studies show that there exists a negative but nonlinear relationship between them. Growth declines significantly if the deviations are large such that high overvaluation leads to low growth while moderate undervaluation leads to rapid growth. Countries must choose between macroeconomic stability and subsidy to the export sector (Nouira, Plane & Sekkat, 2011). However, countries with underdeveloped export market and high foreign indebtedness, undervaluation is not a wise policy option as it raises the debt servicing value (more dollars required to pay-off debt). In addition, it over stimulates the economy as there might be a lack of exportable surplus (Palić, Dumičić, & Šprajaček, 2014).

2.2. Determination of Exchange Rate and Exchange Rate Misalignment

Estimation of equilibrium exchange rates is of prime importance considering the economic fundamentals of the economy. The most used measure for exchange rate is due to the theory of Purchasing Power Parity. However, the empirical evidence show that it is a flawed measure at least in the short run. Firstly, it ignores the actual determining factors of real exchange rate, i.e., net foreign position and comparative activity levels with the trading partners. Secondly, it ignores capital flows consequences on the exchange rate. Lastly, there is some confusion in placing the right value of REER as some consider the real exchange rate to be zero; some consider it to be a better measure if its value is some constant value instead of zero, and it is also considered to be mean reverting by some econometricians. All of these in collusion act as a barrier to international trade (Macdonald, 2000).

Foremost, the normative 'Fundamental Equilibrium Exchange Rates (FEERS)' approach takes both external and internal balance into account. In addition, the Behavioral Equilibrium Exchange Rates (BEERS) advocates that the balance of payments account is of prime importance and both capital and current accounts items are essential in modeling the real exchange rate. It is an effective measure of misalignment as it considers the deviation between the actual and the estimated equilibrium values (Clark & Macdonald, 1999).

Moreover, Permanent and Transitory Decompositions of Real Exchange Rates (PEERS) is the estimation method where we use the BEER estimates and assess the long-run permanent real exchange rate. It takes three techniques to get to the PEER, such as, Beveridge-Nelson Decompositions (1981), Gonzalo & Granger (1995) and Stock & Watson (1998). They mainly decompose real exchange rates into their permanent and temporary parts by cointegration technique and find the permanent equilibrium exchange rate. The 'cointegration-based PEER estimates' take the most relevant variables and consider the potential cointegration relationship (Siregar, 2011).

2.3. Exchange Rate Analysis for Developing Countries

Developing countries mostly maintain overvalued nominal exchange rates as they need to finance their imports by higher taxes leading them towards macroeconomic imbalances (Huizinga, 1997). Persistence appreciated exchange rate is quite common in countries with exchange rate misalignment (Terra, & Valladares, 2010). Following large currency misalignment trade, hysteresis is prone to occur (Baldwin, & Lyons, 1994). Where they create huge asymmetries in the international markets for goods specialization and comparative advantage in trade get ambiguous (Salvatore, 2005).

Alternatively, contemporary research suggests that developing countries should keep a devalued exchange rate for long-run economic growth. Some of the evidence suggests that by doing so realignment of RER would not just lead to an increase in net trade of the country leading towards higher growth, but it will also be associated with redistribution of income in the society (Debowicz & Saeed, 2014). However, these findings are based on a misconception about the quality of institutions, foreign exchange markets, and the high foreign debts owned by the developing countries (Owoundi, 2016). Moreover, an empirical study reflected that the exchange rate misalignment and its volatility in REER which is measured by standard deviation tends to be smaller considering the flexible exchange rate regime as compared to others (Hyder & Mahboob, 2006). Furthermore, the exchange rate determined by the Simultaneous Equation Model suggests that rather than devaluing the currency Pakistan should focus on controlling the domestic prices (Siddiqui, Afridi & Mahmood, 1996).

Improved economic fundamentals and financial infrastructure, that developing countries lack, such as well-established forex markets and a stable exchange rate are most likely to enhance trade besides giving a way forward for foreign capital inflows (Janjua, 2007; Bartolini, *et al.*, 1994). The improved economic fundamentals can lead to a better market mechanism to bring the exchange rate on its stable path. Evidence from India suggests that majority of currency exchange dealers undergo short-term changes. These changes are influenced by the market fundamentals at micro level such as flow of information, speculation, market movements and lastly government intervention. Provided economic fundamentals and financial infrastructure are well developed economic agents will make well informed better decision which will lead to efficient market system (Bhanumuthy, 2006).

Furthermore, there is a major role played by expectations in the determination of exchange rate in Pakistan where we also see anticipated inflation is always higher. The exchange rate also has a close link with the interest rate differences among countries and changes with lee it. An empirical study shows that for Pakistan exchange rate misalignment ranges from -11.1% to 20.1% Pakistan as per the data of the fiscal year 1978 to 2005 with zero mean reversion. It further adds that a flexible exchange rate regime provides smaller deviations of the exchange rate from equilibrium values and volatility in REER as compared to other regimes (Hyder & Mahboob, 2006).

Movements of the economy are quite different pre- and post-crisis periods such as around the financial crisis of 2008 most of the currencies were over depreciated and after that they were over appreciated while many were investing in emerging economies for higher profits (Dullien, *et al.*, 2010). Although there is ambiguity and disagreement among economists about the prediction power of exchange rate misalignment for a crisis as it is volatile (Kemme & Roy, 2006). Amidst the Covid-19

pandemic, the world economy has been experiencing a crisis where exchange rate pressure significantly acts as a policy tool as it signals the economic stresses[3].

2.4.   Exchange Rate Policy Analysis

Evidence suggests that in addition to economic factors political economy has a major role in influencing the exchange rate level and policy, especially in developing or least developed countries where institutional setup is quite weak (Broz & Frieden, 2006). Moving on, the explanation for exchange rate policy structure and shifts is limited to economic factors where political factors are also a part of it, and it is particularly true for Pakistan (Javed, *et al.*, 2016).

A brief analysis of the exchange rate policy of Pakistan shows that for decades Pakistan kept shifting its policy from one regime to another. It is quite vivid from the experience and evidence suggests that neither floating exchange rate regime nor fixed exchange rate regimes suit Pakistan. Currently, a managed floating exchange rate regime is adopted to control any speculative or volatile movements to avoid any crisis. During the process of industrialization from 1951-68, exchange rate policy and protective measures were used side by side to promote the domestic industry in Pakistan, which then made the period of 1958-68 as the decade of development (Zaidi, 2015). Provided exchange rate policy and commercial policy are not consistent with each other, higher trade restrictiveness can lead to higher currency misalignment, current account deficit, and inflation resulting into a crisis (Edwards, 1989). Therefore, aligning both policies well is critical for Pakistan.

The optimum policy for developing countries is to have an appropriate mix of fixed and floating exchange rate regimes to limit the exchange rate misalignments (Dubas, 2009). Otherwise, inappropriate mix of both regimes can lead the economy towards higher exchange rate misalignment. Evidently, only good institutional quality and financial development are known to be effective in decreasing the exchange rate misalignment (Nouira & Sekkat 2015).

Flexible regimes are said to lower the misalignment (Holtemöller & Mallick 2013) in some cases, while in other cases the flexible regimes give rise to high volatility and persistent currency misalignments (Collins, 1996). Pegged exchange rate regime reduces the adjustment speed of the real exchange rate back to the equilibrium rate (Caputo, 2015). In the Turkish experience, currency was overvalued during the fixed exchange rate regime and overvalued currencies are mostly linked to a financial crisis (Dağdeviren, Binatli, & Sohrabji, 2012). Some studies suggest that developing countries need to keep a devalued exchange rate to encourage their long-run economic growth. Evidence shows

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[3] https://www.piie.com/blogs/realtime-economic-issues-watch/exchange-rate-policy-covid-19-pandemic.

that realignment would not only lead to a sizable increase in the relative size of the tradable sector leading to higher growth but also an associated re-distribution of income (Debowicz & Saeed, 2014).

Moreover, selection of the right exchange rate regime is a complex subject due to many reasons, for it is a highly interlinked economic variable for both domestic and foreign markets. At the economic level, precise policies and economic regimes define the socio-economic fate of a country. To eliminate exchange rate misalignment, an efficient mix of monetary and fiscal policies is required (Chen, Devereux, Shi, & Xu, 2020). There are many policy options available but it is important to choose a policy that fits the economic scenarios. In addition, it must only choose the policy option which the country has the capacity to implement; otherwise, government's credibility will be at stake (Rizvi, Naqvi, & Mirza, 2014).

The analysis of the literature review shows that exchange rate misalignment has a crucial role for macroeconomic outcomes. Over the years Pakistan has shown persistent currency misalignment as suggested by various studies. Exchange rate policy regimes have a significant impact on the misalignment, and consequently on external balance and domestic prices. However, in the case of Pakistan, there is a significant literature gap. It does not provide exchange rate misalignment for recent periods and traditional methods of estimation (e.g. PPP approach) are used often. Therefore, this study tries to bridge this gap in Pakistani literature.

3. Overview of the Pakistan Economy

3.1. Background

Pakistan has been facing economic difficulties since its inception in 1947. It was majorly constituted as an agrarian economy with 53% of the agricultural share in the GDP (Anjum, 2017). Since then it started as a transitioning economy and attained self-sufficiency in the cotton textile industry by the late 1950s. The 1960s were marked as an era of growth for the Pakistan economy amidst political stability and high growth turn out. The era of nationalization in the 1970s was a major hit for Pakistan while facing conflict situation and partition of East Pakistan. Pakistan had the worst inflationary pressures, low growth, and high trade deficits to cater to. Then in the 1980s, with sharp economic growth revival incidence of poverty declined to 29.1% (Zaidi, 2005).

The economic boom was short-lived as in the 1990s the economy faced the brunt of neglect of the socio-economic development resulting into the debt crisis and a period of stagflation, and short fall in revenues and exports. In the early 2000s, efforts were made to stabilize the economy, which led to a recovery, but global financial recession started hitting the economy in 2008 that further

deteriorated the situation. Since then, the economy could not stabilize itself and continue to face perpetual structural issues, low growth, high inflation, high debt, low exports, and low investment. Table 3.1 reveals the secular macroeconomic situation in Pakistan.

Table 3.1. Trends in the Key Economic Indicators

Variable	1970s	1980s	1990s	2000s	FY2008-18	FY2019	FY2020	FY2021	FY2022
GDP Growth	4.8	6.5	4.6	4.5	5.0	1.9	-0.9	5.7	6.0
GDP Per Capita ($)	177.48	348.29	410.29	746.0	1514.0	1455.1	1457	1676.5	1797.5
Inflation (%)	12.5	7.2	9.7	7.3	5.7	6.8	10.7	8.9	11.0
National Savings Rate	11.2	14.8	13.8	15.9	13.7	11.3	13.3	14.1	11.1
Investment Rate	17.1	18.7	18.3	17.9	15.9	15.6	15.4	14.6	15.1
Total Revenue (% of GDP)	16.8	17.3	17.1	13.9	14.6	12.9	11.2	12.4	8.8
Total Expend. (% of GDP)	21.5	24.9	24.1	18.3	21.4	22.0	15.3	18.5	12.6
Exports (% of GDP)	-	9.8	13.0	12.3	10.4	8.7	7.5	7.4	7.0
Imports (% of GDP)	-	18.7	17.4	16.2	16.9	18.6	14.5	15.6	15.6
Remittances (% growth)	-	1.9	-5.3	26.8	17.7	9.2	6.0	7.3	7.6
Trade Deficit (% of GDP)	10.0	8.9	4.4	3.9	7.0	8.6	7.0	8.2	8.6
CAD[4] (% of GDP)	-	3.9	4.5	3.8	2.8	4.8	1.5	0.8	3.6
Fiscal Deficit (% of GDP)	5.3	7.1	6.9	4.4	6.8	9.1	7.1	6.1	3.8
Public Debt (PKR billion)	120	794	2946	4814	22540	32708	36399	39866	44366
Population (mn people)	-	96.3	124.6	150.9	198.2	211.2	220.4	224.7	235.8
Population Growth (%)	2.7	3.3	2.8	2.5	2.2	2.04	2.0	1.85	1.91
Literacy Rate (%)	-	29.5	40.7	52.6	57.9	60.0	60.0	62.8	-
Health Expenditure	0.6	0.8	0.7	0.6	0.5	1.1	1.1	1.2	-
Education Expenditure	1.7	2.3	2.0	1.7	2.1	2.3	1.9	1.8	-

Source: Pakistan Economic Survey (various issues).

Over the years some of the key economic challenges that Pakistan has been facing are persistent or else they are repeated consistently. Despite facing many abrupt economic crises, the Pakistan Economy managed to stand with them and continued to grow from a low-income country to a lower-middle-income country. Although, it is still not enough as Pakistan's potential is much more than what it has achieved so far. As the population of 235 million people grows around 2%, their socio-economic needs grow exponentially.

Pakistan is in dilemma of current account deficit and resource scarcity. Where its import bill is twice its exports, indicating very high import dependency for domestic consumption. In FY2018[5], Pakistan's imports were US$56.6 billion, and exports were merely US$24.7 billion, whereas, in FY2019, its imports were about US$50 billion, and exports were US$20.1 billion[6]. The foreign

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[4] CAD: Current Account Deficit.
[5] Pakistan Economic Survey (2022).
[6] Same as above.

exchange use is greater than foreign exchange receipts. It indicates of high demand for imported goods and services and high debt servicing on the one hand, and sluggish growth in exports due mainly to slackness in quality and price competitiveness and restrictive foreign market access on the other. Over time, all these factors led to deindustrialization in the country.

3.2. Pakistan's Exchange Rate Regimes

Historically, Pakistan has undergone different exchange rate regime. The exchange rate regimes evolved remarkably from the 1970s to the present situation. A better understanding may be developed if the post-1970s exchange rate are analyzed after dividing the eras into four phases (Mahmood, 2013). These are given in Figure 3.1. Evidently, the policy makers took several decisions to keep the domestic economy on a sustainable path to manage both internal and external balances.

Figure 3.1: Pakistan's Exchange Rate Regimes
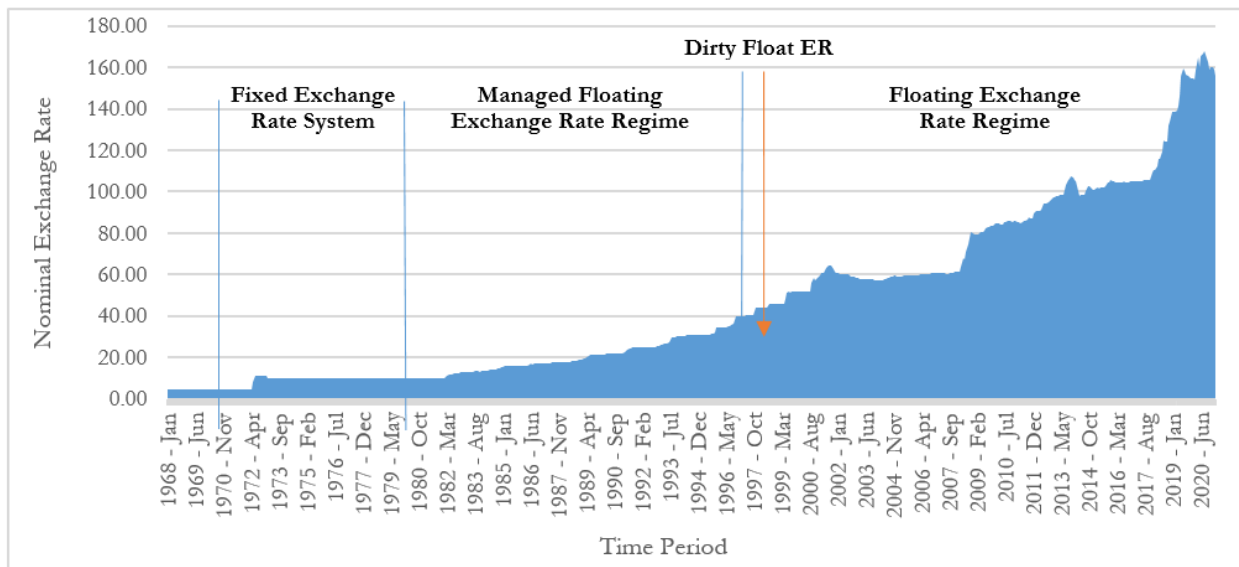
Source: State Bank of Pakistan, Average Monthly Exchange Rates.

A fixed exchange rate policy was implemented until 1982. The value of the Pakistani rupee in terms of US dollars was pegged in 1973. On 8th January 1982, the overvaluation was finally being taken care of by introducing the managed floating exchange rate by the government and linking it to a basket of 16 major trading partners' currencies, which resulted in a decline in the value of Pakistani rupee. Since 1991, the exchange and payment systems were reformed by allowing resident Pakistanis to maintain foreign currency accounts like non-residents, removing restrictions on holding foreign currency and foreign exchange allowances for travel, and liberalizing the rules governing the private

sector's foreign borrowing. This phase is characterized by granting complete foreign equity participation and a restriction-free environment in terms of remitting dividends abroad.

Next, multiple exchange rate regime and dirty float regime witnessed a reversal of all gains of capital and current accounts that were achieved through trade liberalization in the preceding years. A wave of political instability and economic sanctions by the Western countries following the nuclear test by Pakistan signifies the prevailing conditions during this time. In these circumstances, the government was in dire need to preserve its official exchange reserves due to which it had to freeze all the foreign currency accounts, which led to loss of confidence of the private sector in policies.

Finally, a system of the flexible exchange rate has been in action since 20th July 2000 in the country. The involvement of the Central Bank is limited just to keep a check on unnecessary and excessive fluctuations in the exchange rate and the intervention is dealt with the US dollar. This phase experienced minimal restrictions and controls on foreign exchange, unrestricted current account transactions, and free mobility of capital/profits for foreign investors. In conclusion, flexible exchange rate system and liberalization has interlinked the world into a complex system, which makes trade and transactions easier on the one hand and made currencies highly volatile on the other hand. Therefore, study of exchange rate misalignment is of prime importance for stability and sustainable growth.

3.3. Performance of the External Sector

There is a huge import-export gap import grew faster than exports and the consumption-led economy suffered at the hands of persistent huge current account deficits (Figure 3.1), which had to be financed by loans leading to soaring external debt liabilities and depleted foreign exchange reserves. Now the government is trapped in a vicious debt cycle; it borrows more and more to repay past debts and does not have enough money to be invested for socio-economic development. Debt must be sustainable otherwise it continues to bring huge high fiscal and budget deficits to the government where the sustainability of the economy is at high default risk.

Amidst Covid-19, the global supply chains became highly vulnerable with lockdowns across the globe. The world saw a halt in trading activities especially across borders, severely disrupting economic conditions across the globe. The pandemic highlighted the importance and effectiveness of well-coordinated and swift policy responses to economic meltdowns like this.

Figure 3.2. Performance of the External Sector
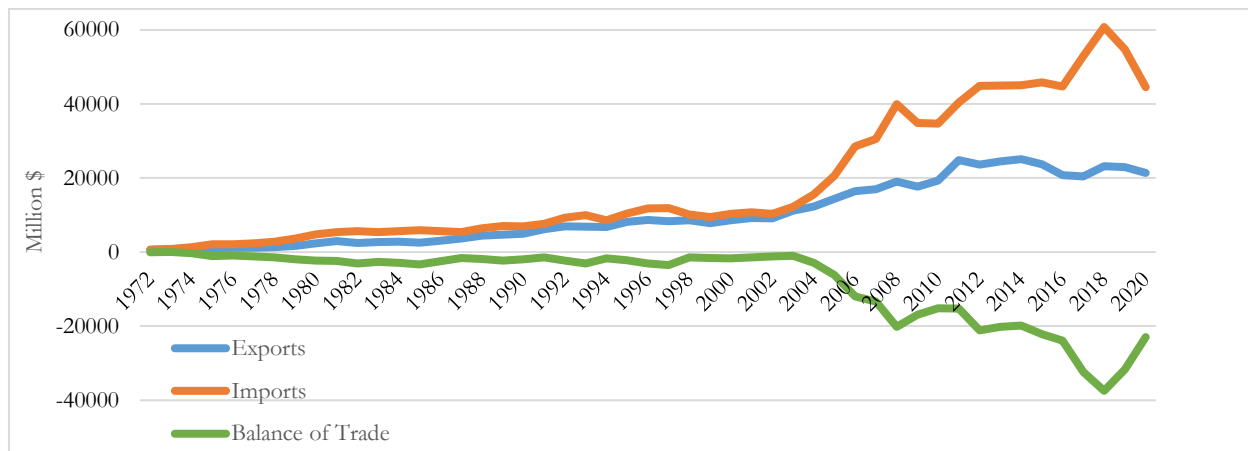
Changes in exchange rates may have a substantial impact on a variety of economic factors, impacting the country's overall macroeconomic stability. In the FY2020 as the government was facing a balance of payments crisis and macroeconomic instability, the State Bank of Pakistan decided to let the exchange rate float freely in the market. The market-based approach led to massive depreciation of the exchange rate, which left the public in severe economic fall-down as inflation soared swiftly. The economic fundamentals came to force and led the kerb market premium to fall greatly, which led to a huge inflow of worker's remittances through formal channels. Therefore, the transition to the market-based flexible exchange rate system kept the unnecessary import demand under check and maintained the export competitiveness. The economy is slowly moving towards equilibrium, however, inflation has sent millions of poor people in Pakistani society to a dismal state.

4.   Theoretical Framework

4.1.   Determination of Real Exchange Rate Misalignment

Exchange rate misalignment can hurt an economy through various channels, and its determination is of prime importance. Devaluation refers to the state where the currency value is deliberately kept lower than the equilibrium value of the real exchange rate. It will lead to higher prices for imports resulting into terms of trade deterioration (Dornbusch, 1982).

The calculation of equilibrium exchange rates is of prime importance considering the economic fundamentals of the economy. In this paper, the Behavioral Equilibrium Exchange rates Approach (BEER) is used to determine the real exchange rate equilibrium levels and consequently the REER misalignment (Clark & MacDonald, 1999).

Following the BEER approach which gives us equilibrium exchange rates and ultimately exchange rate misalignment, we begin with defining the estimation process theoretically. In this method, the actual real exchange rate is determined in the following way:

$$e_t = \beta_1 U_{1t} + \beta_2 U_{2t} + \lambda' T_t + \varepsilon_t \qquad \ldots 4.1$$

This equation shows a long-run vector of variables U_{1t} this includes variables that have a persistent effect and are known as fundamental variables such as net foreign assets, terms of trade, and productivity. Moving on, the medium-term vector of variables is U_{2t} contains real interest rate variable to capture the fluctuations of the business cycle, and short-run variables are represented by the transitory variable vector T_t, i.e., short run deviation from sustainable economic fundamentals. Where, ε_t represents the random error term. Moving on, it is significant to differentiate between actual and equilibrium exchange rates as we have to calculate exchange rate misalignment eventually. The current misalignment is calculated by subtracting the equilibrium real exchange rate from the actual exchange rate. It can be termed as follows:

$$cm = e_t - e_t^* = e_t - \beta_1^* U_{1t} + \beta_2^* U_{2t} = \lambda' T_t + \varepsilon_t \qquad \ldots 4.2$$

It is evident from equation 5.8 that current misalignment is just the equivalent of the sum of transitory fluctuations and random errors. The total misalignment **tm** is, therefore, the actual and real exchange rate misalignment measured with long-run or sustainable fundamental economic variables.

$$tm_t = e_t - \beta_1^* \bar{U}_{1t} + \beta_2^* \bar{U}_{2t} \qquad \ldots 4.3$$

The calibrated economic fundamentals in the estimation model are calculated by using the Hodrick Prescott filter, ultimately, reaching the real exchange rate misalignment. In addition to distinguishing between the impact of transitory factors on REER misalignment and persistent economic fundamental, equation 4.3 is further extended by adding and subtracting e_t^* from the right-hand side to produce equation 4.4 given as follows:

$$tm_t = (e_t - e_t^*) + [\beta_1^* (U_{1t} - \bar{U}_{1t}) + \beta_2^* (U_{2t} - \bar{U}_{2t}) \qquad \ldots 4.4$$

Since, $(e_t - e_t^*) = \lambda' T_t + \varepsilon_t$ as seen in equation 4.2, the total misalignment from equation 4.5 can be written as follows:

$$tm_t = \lambda' T_t + \varepsilon_t + [\beta_1^* (U_{1t} - \bar{U}_{1t}) + \beta_2^* (U_{2t} - \bar{U}_{2t}) \qquad \ldots 4.5$$

Therefore, the BEER approach provides a clear distinction between the two effects that other methods do not provide. From the above discussion, the function of the real exchange rate is developed as follows:

$$e_t = f(tot, to, gov, debt, fdi, prd, r-r^*)$$

where, **tot** represents terms of trade, **to** represents trade openness, **gov** represents government consumption expenditure, **debt** shows external debt servicing, **fdi** shows FDI inflows, **prd** represents the relative productivity of a country proxied by the per capita GDP, and **r-r***represents the interest rate differential. When the exchange rate depreciates then the relative prices of imports increase and the relative prices of domestic goods decrease. Secondly, the elasticity condition ensures that the deterioration of terms of trade improves the trade balance of the home country. Lastly, the demand shifts toward domestic goods and lead towards income expansion. Now at the higher income levels imports demand also increases that dampens the trade balance improvements but does not offset them completely. Since we have employed a strategic assumption that the depreciation does not affect domestic prices, therefore, nominal and real exchange rate corresponds one to one. Provided there is a change in domestic prices then the relative prices will rise, export competitiveness will stay the same and there will be no real effect on the economy. Therefore, a careful measurement of each aspect of the model is needed.

5. Data, Empirical Model & Econometrical Techniques

5.1. Data Description

This paper is comprised of three econometric models to achieve the research objectives. To begin with, real exchange rate misalignment is estimated and its impact on the economy is assessed. This is a time series analysis, and the period under analysis is from FY1982 to FY2020. For this model secondary data of various variables are used, which sourced from various data sources, i.e., Pakistan Economic Survey, SBP[7], WDI[8] and IFS[9] (Table 5.1).

5.2. Econometric Methodology

Firstly, before the estimation process, the actual time series graphs are analyzed, and the basic descriptive statistics are evaluated. Secondly, as this analysis is based on time-series data, the empirical analysis starts with a test of stationarity, i.e., a unit root test. A non-stationary series have a stochastic process at its back with structural breaks. The Augmented Dickey-Fuller (ADF) test for unit root testing is applied to all the variables to check their order of integration, and if they are stationary data series or not. Lastly, the appropriate lag length for the model is chosen using Akaike Information Criteria (AIC) and then move forward to the model estimation.

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[7] SBP: State Bank of Pakistan.
[8] WDI: World Development Indicators.
[9] IFS: International Financial Statistics.

A non-stationary series have a stochastic process and a major source for non-stationarity of the data series is the Unit root. The hypothesis follows:

$H_0: \alpha = 0$ (non-stationary)

$H_1: \alpha < 0$ (stationary)

Table 5.1. Data Description & Data Sources

Variable	Definition	Source of Data
Variable for Model 1		
Terms of Trade	Value of Pakistan's exports as a percent of the value of its imports.	Pakistan Economic Survey
Trade Openness	Summation of Imports as % of GDP & Exports as % of GDP	Pakistan Economic Survey
Government Spending	The final total value of government consumption expenditure in million USD terms	International Financial Statistics (IFS)
Interest Rate Differential	The weighted differential between the interest rates on government bonds of Pakistan & its trading partners.	International Financial Statistics (IFS)
Debt	Debt & Debt servicing (Million USD terms)	International Financial Statistics (IFS)
Capital Inflows	Capital Inflows in the form of FDI (Million USD Terms)	World Development Indicators (WDI)
Relative Productivity	The growth performance (relative productivity) of the BalSam is the ratio between the country's real per capita GDP and the geometric mean (weighted similarly as the exchange rate) of the same variable in the 37 major trading partners.	World Development Indicators (WDI)
REER	Real Effective Exchange Rate Index PKR/USD (measure of currency value in real terms weighted by the average of trading partners)	State Bank of Pakistan
Exmis	The difference between long-run equilibrium & actual real effective exchange rate.	Author's calculation fro, Estimated data of Model 1

5.2.1. Equilibrium Exchange Rate Estimation

To begin with, analysis for estimation of exchange rate misalignment is reported for Pakistan. Following Clark & MacDonald (1999), the Behavioral Equilibrium Exchange rates Approach (BEER) is used to determine the real exchange rate equilibrium levels and consequently the REER misalignment. In brief, the calculation of exchange rate misalignment with the BEER approach proceeds with four stages. Firstly, testing the hypothesis that whether the REER has a long-run relationship with that macroeconomic variable or not to get to the long-run equilibrium level of REER. Secondly, assessing the equilibrium REER from the estimated coefficients. Thirdly, applying Hodrick Prescott Filter to get the long-run trend for a real effective exchange rate. Lastly, the exchange rate misalignment is the deviation of actual REER from the long-run equilibrium value. This is usually

done by the Error Correction Models (ECM) or Dynamic Lag Distributed Models (Johansen, 1995) depending upon the order of integration of the variables.

The autoregressive distributed lag model (ARDL) contains the lagged values of the dependent variable and the current and lagged values of independent or explanatory variables ARDL (*p, q*) gives us an efficient long-run relationship estimate. It provides us with a combination of exogenous and endogenous variables. For the application of the ARDL model there should be a mix of order of integration, i.e., *I(0)* and *I (1)*. Such that some time series are stationary at level and some of them are stationary at first difference. In addition, variables of second-order of integration are not allowed in ARDL estimation, and the dependent variable must at least be integrated at first difference. The model is presented as follows:

$$\triangle \ln REER_t = \sum_{i=1}^{p} \beta_i \triangle lnREER_{t-i} + \sum_{i=0}^{q} \alpha_{1i} \triangle lnTOT_{t-i} + \sum_{i=0}^{q} \alpha_{2i} \triangle lnTO_{t-i} + \triangle lnGOV_{t-i} +$$
$$\sum_{i=0}^{q} \alpha_{4i} lnDR_{t-i} + \sum_{i=0}^{q} \alpha_{5i} \triangle lnDPT_{t-i} + \sum_{i=0}^{q} \alpha_{6i} \triangle lnFDI_{t-i} + \sum_{i=0}^{q} \alpha_{7i} \triangle lnRP_{t-i} +$$
$$\delta_1 lnTOT_{t-1} + \delta_2 lnTO_{t-1} + \delta_3 lnGOV_{t-1} + \delta_4 lnDR_{t-1} + \delta_5 lnDPT_{t-1} + \delta_6 lnFDI_{t-1} +$$
$$\delta_7 lnRP_{t-1} + \mu_t \qquad \qquad \dots 5.1$$

Equation 5.1 shows Autoregressive Lag Distributed (ARDL) model. Where, *β* parameter shows the relationship of dependent variable with its lagged values, *a* parameters show short term relationship of the independent variables and the *δ* parameters show the long-term behavior of the variables. Moreover, *λ* shows the error correction term (ECT) which is short-term disequilibrium. Cointegration analysis is done by the Pesaran Bounds test where all the F-stats should be above the upper bound for confirmation of Cointegration existence. Moving on, disaggregated form of the short-run and long-run model are shown in Equations 5.1a & 5.1b respectively with the hypothesis as follows.

We develop the following short-run and long-run models:

Short-run model:

Hypothesis of the short-run model

H_0: $\lambda = 0$ $\theta_i = 0$ & $\phi_i = 0$

H_1: $\lambda < 0$ & $\theta_i \neq 0$ & $\phi_i \neq 0$

$$\triangle \ln REER_t = \sum_{i=1}^{p} \theta_i \triangle lnREER_{t-i} + \sum_{i=0}^{q} \phi_{1i} \triangle lnTOT_{t-i} + \sum_{i=0}^{q} \phi_{2i} \triangle lnTO_{t-i} + \sum_{i=0}^{q} \phi_{3i} \triangle$$
$$lnGOV_{t-i} + \sum_{i=0}^{q} \phi_{4i} lnDR_{t-i} + \sum_{i=0}^{q} \phi_{5i} \triangle lnDPT_{t-i} + \sum_{i=0}^{q} \phi_{6i} \triangle lnFDI_{t-i} + \sum_{i=0}^{q} \phi_{7i} \triangle$$
$$lnRP_{t-i} + \lambda \mathcal{E}_{t-1} + v_t \qquad \qquad \dots (5.1 \text{ a})$$

Long-run model:

Hypothesis of long-run model

$H_0: \psi_i = 0$ or $H_1: \psi_i > 0$

$$ln\,REER_t = \delta_0 + \psi_1\,lnTOT_{t-1} + \psi_2\,lnTO_{t-1} + \psi_3 lnGOV_{t-1} + \psi_4 lnDR_{t-1} + \psi_5 lnDPT_{t-1} +$$
$$\psi_6\,lnFDI_{t-1} + \psi_7\,lnRP_{t-1} + e_t \qquad\qquad (5.1\,b)$$

where,

REER = Real Effective Exchange Rate

TOT= Terms of Trade (TOT)

TO= Trade Openness

GOV= Government Spending

DR= Interest Rate Differential with trading partners

DPT= External Debt & Debt servicing

FDI= Foreign Direct Investment inflows

RP= Relative productivity differential (Balsam Growth Effect)

where, *i* represents the number of lags (such that i = 0, 1, 2, …) and t shows the time trend of the variable. θ parameter shows the relationship of dependent variable with its lagged values, ϕ parameters show short term relationship of the independent variables in equation 5.1a. The δ_0 shows the intercept of the long-run equilibrium model as it shows the relationship of dependent variables with independent variables at the long-run equilibrium state. ψ parameters show the long-term behavior of the variables.

The independent variables are in the form of vectors, and they are chosen such that they impact the real effective exchange rate as economic fundamentals, and its movement from equilibrium value, therefore, can be studied. As the productivity of an economy increases it leads towards real exchange rate appreciation (Tang & Lee, 2003). Short-run and long-run models, as shown above, are estimated. The ECM term in the short-run model explains the shocks in the short term, i.e., disequilibrium. The λ parameter in equation 1 is of prime importance as it shows the disequilibrium term. It must be negative and significant, and if $\lambda = 0$, i.e., insignificant then it shows that there is no disequilibrium in the short-run and then there will be no need to apply a short-run model.

The equilibrium values of REER are calculated by the using Hodrick Prescott Filter to generate permanent values for equilibrium real effective exchange rate to avoid unsustainable level values of the determinants (Palić, Dumičić, & Šprajaček, 2014).

Moving on, the values of REER are compared with the equilibrium REER which are determined using the HP filter analysis. The deviation is calculated by showing real exchange rate misalignment in the form of overvaluation or undervaluation of the exchange rate over time. Alternatively, the method of the simultaneous equation has been used for this analysis (Siddiqui *et al.*, 2016). However, for the analysis of the impact of real exchange rate misalignment on significant macroeconomic indicators cointegration approach provides a more relevant analysis. Before moving forward to the estimation, theoretical linkage between dependent and independent variables are explained as follows:

The relationship between REER and trade openness is such that lower openness levels restrict imports and consequently the REER appreciates. Earlier theoretical models argued that reduction in import restriction or trade openness causes depreciation of REER (Dornsbusch, 1974) and it is a result of current account imbalance, which induces a depreciation effect on REER (Balassa, 1978). However, Edwards (1989) negated the conventional view and showed that the relationship between trade openness and REER is ambiguous where two effects, i.e., income effect and substitution effect simultaneously work in opposite directions.

In Intertemporal models, tradeable and non-tradeable are substitutes, show that initial levels of tariff play a critical role in the analysis. If trade openness rises in the presence of initially high tariffs, then with the income effect dominating the substitution effect, the social welfare rises; consequently, there is a rise in demand for non-tradable goods, which leads to an appreciation of the REER. On the other hand, if the initial tariff protection is low then trade openness will put downward pressure on relative prices of tradable to non-tradable making the future consumption of importable goods cheaper. Therefore, demand will shift towards importable that will cause REER to depreciate (Gantman & Dabos, 2018).

The Relationship between REER and terms of trade (TOT) shows that the impact of TOT on REER is ambiguous, as it depends on the offsetting of either income effect or substitution effect. The rise in TOT is assumed to appreciate the equilibrium REER to the extent that it improves the trade balance; the income effect dominating the substitution effect suggests a likely positive sign (Sekkat, 2016). Conversely, if the substitution effect dominates the income effect, prices of imports will rise trade deficit will increase, and then the impact of TOT deterioration will be negative, i.e., REER will depreciate (Hyder & Mehboob, 2006).

The relationship between REER and government consumption is such that the expenditure which creates stronger demand for non-tradable increases their relative prices leading to an

appreciation in the equilibrium REER; then a positive sign is expected for it. Investment may be expected to have different effects on the evolution of relative price levels. Whereas, a long-run increase in public investment has an ambiguous impact on the real exchange rate. While an increase in public investment that delivers a productivity gain in the tradable sector may generate real appreciation through the Balassa-Samuelson mechanism (Balassa 1964, Samuelson 1964), if public investment disproportionately raises productivity in the non-tradable sector, it may lead to real depreciation (Galstyan & Lane, 2009). In addition, if government consumption is largely based on tradable goods then it will deteriorate the current account balance and lead to REER depreciation.

Relationship between REER and external debt shows that the higher the country's debt services the higher will be the demand for foreign currencies, which raises the current account deficit inducing depreciation of the exchange rate; it is expected to be negative (Sekkat, 2016).

The relationship between REER and FDI inflows shows that higher FDI inflows involve stronger demand for both tradable and non-tradable goods & services, which lead to a higher relative price of non-tradable and REER appreciation (Nouira *et al.*, 2011; Sekkat, 2016). This is needed for domestic resources to be diverted toward production in the non-tradable sector to meet increased demand; the relationship is expected to be positive (Hyder & Mehboob, 2006).

The relationship between REER and interest rate differential shows that a higher international interest rate differential attracts more foreign capital inflows, which leads to an appreciation of the rupee. Higher capital inflows will ensure higher net foreign assets, which will create a dominant wealth effect where people will demand more tradable; therefore, REER will appreciate. However, if the size of capital inflows is lesser than the current account deficit then REER can depreciate (Hyder & Mehboob, 2006).

Relationship between REER and relative productivity. Relative productivity reflects a productivity gap and thus captures the potential Balassa-Samuelson effect. The increase in wages in the tradable sectors due to higher productivity spills over the wages in non-tradable sectors. The latter induces an increase in inflation and an appreciation of the REER thus making the expected sign to be positive (Nouira *et al.*, 2011; Sekkat, 2016).

6.   Empirical Results & Discussion of Findings

To begin with, the stationarity of the time series data was tested by the unit root test. It follows that if the adjusted t-stats calculated are greater than the tabulated values of the t-stats, the null hypothesis is rejected. For the variable series *REER, TOT, TO, GOV, DPT & FDI* there is a unit root, i.e., they are not following a random pattern of movement along time as the probability value is greater

than 0.05 and adjusted *t*-stats are insignificant hence null hypothesis is accepted and ADF is applied on the first difference.

These variables turn out to be stationary at first different, i.e., integrated of order one I(1) with t-values greater than critical values and *p*-values less than 0.05. Whereas, the variable series DR and RP are stationary at level, i.e., I(0). There is no existence of structural break, therefore, ADF test is performed. As the order of integration is mixed, it justifies the use of the ARDL model for the estimation of exchange rate misalignment. Results are shown in Table 6.1.

Table 6.1. Unit Root Test Results (Model 1)

Variable	t-Statistics I(0)	t-Statistics I(1)	OOI
Real Effective Exchange Rate(REER)	-1.332(0.867)	-6.538(0.00)	I(1)
Terms of Trade (lnTOT)	-3.071(0.124)	-7.107 (0.00)	I(1)
Trade Openness (lnTO)	-2.870(0.181)	-5.55(0.00)	I(1)
Government Spending (lnGOV)	-1.509(0.812)	-6.07(0.00)	I(1)
Interest Rate Differential (lnDR)	-4.045(0.002)		I(0)
Debt (lnDPT)	-2.421(0.364)	-9.805(0.00)	I(1)
Capital Inflows (lnFDI)	-2.947(0.157)	-8.38(0.00)	I(1)
Relative Productivity (RP)	-3.921(0.019)		I(0)

6.1.   ARDL Model Estimation Results

Estimated ARDL model and the AIC criteria provide the optimal lags for each variable such that the model becomes ARDL (1, 4, 4, 4, 3, 4, 2, 4). The results for the short-run dynamics and long-run model are given in Table 6.1.1.

Empirical Results of Long-run Coefficient

Before the discussion of the estimated results of the model, it is necessary to establish that there is an existence of cointegration and long-run relationship among variables in our model. Bounds Test results are given in Table 6.1.2. It shows that the value of F-statistics is well above the upper bound, hence, cointegration exists among the variables of this model.

As the existence of a long-run relationship is approved, interpretation of results is made as follows. The estimated result shows that REER has a positive and significant relationship with the terms of trade (TOT) as the coefficient's sign is positive and t-stats value exceeds 2 and the p-value is less than 0.05. It can be said that a rise of 1% in terms of trade appreciated the REER by 1.228% in the long- run. These results are very well aligned with the literature and expectations. As literature supports that the rise in the terms of trade is assumed to appreciate the equilibrium REER to the extent that it improves the trade balance; the income effect dominating the substitution effect (Sekkat,

2016). Such that with every unit of exported good it can buy more importable goods such that it improves the trade deficit therefore the expected estimation sign is positive.

Table 6.1.1. ARDL Estimation Results (Model 1)

Variable	Coefficient	t-Statistics
Dependent Variable: LnREER		
Short-run Model		
lnTOT	0.223	3.68(0.00)
lnTOT(-1)	-0.581	-6.65(0.00)
lnTOT(-2)	0.301	4.77(0.00)
lnTOT(-3)	-0.113	-2.45(0.03)
lnTO	0.048	0.55(0.58)
lnTO(-1)	1.113	7.01(0.00)
lnTO(-2)	-0.565	-4.68(0.00)
lnTO(-3)	-0.515	-4.96(0.00)
lnGOV	0.191	1.67(0.21)
lnGOV(-1)	0.380	4.02(0.00)
lnGOV(-2)	0.428	4.49(0.00)
lnGOV(-3)	0.087	1.45(0.17)
lnDR	0.129	5.22(0.00)
lnDR(-1)	-0.050	-1.93(0.08)
lnDR(-2)	-0.076	-3.48(0.00)
lnDPT	0.036	1.59(0.13)
lnDPT(-1)	-0.411	-9.35(0.00)
lnDPT(-2)	-0.220	-4.75(0.00)
lnDPT(-3)	-0.102	-2.84(0.01)
lnFDI	0.049	4.13(0.00)
lnFDI(-1)	0.043	3.55(0.00)
RP	0.014	6.37(0.00)
RP(-1)	0.013	3.52(0.00)
RP(-2)	-0.009	-2.19(0.05)
RP(-3)	0.009	-3.29(0.00)
ECM Term	-0.639	9.803(0.00)
Long-run Model		
Constant	1.361	2.26 (0.044)
Terms of Trade (lnTOT)	1.228	6.094 (0.00)
Trade Openness (lnTO)	2.687	2.71 (0.020)
Government Spending (lnGOV)	-0.894	-4.49 (0.00)
Interest Rate Differential (lnDR)	0.201	1.98 (0.07)
Debt (lnDPT)	-0.495	-3.59(0.004)
Capital Inflows (lnFDI)	0.0045	0.10(0.92)
Relative Productivity (RP)	0.011	3.057 (0.01)
LM Test	F-Stats:0.267 (Prob.F: 0.123)	
Breusch Pagan Hetro. Test	F-Stats:0.858 (Prob.F: 0.652)	
Ramsey Reset Test	F-Stats: 0.543 (Prob. F: 0.478)	

Table 6.1.2. Bounds Test

F-Bounds Test: Null Hypothesis = No Levels Relationship (No Cointegration)				
Test Statistics	Value	Significance Level	I(0)	I(1)
F-Statistic	6.18	10%	1.92	2.89
K	7.0	5%	2.17	3.21
		2.5%	2.43	3.51
		1%	2.73	3.94

Similarly, REER has a positive relationship with trade openness, and it is significant as well. Such that 1% rise in trade openness will cause 2.687% appreciation in the value REER. Ideally, there should have been a negative relationship between the two, however, this result is still in line with the literature. In the case of Pakistan, trade has not been quite liberalized for decades. Theoretically, if trade openness rises where tariff levels are high initially then welfare rises the income effect dominates the substitution effect and there is a rise in demand for non-tradable goods, which leads to an appreciation of the REER (Gantman & Dabos, 2018).

Moving on, surprisingly REER has a negative and significant relationship with Government gross final consumption. Where, a 1% increase in government spending causes REER to depreciate by 0.894%. The literature suggests that, while an increase in public investment that delivers a productivity gain in the tradable sector may generate real appreciation, if public investment disproportionately raises productivity in the nontradables sector, it may lead to real depreciation (Galstyan & Lane, 2009). In addition, if government consumption is largely based on tradable goods then it will deteriorate the current account balance and eventually lead to REER depreciation. It is exactly the case in Pakistan as a major part of government spending goes towards the financing of current expenditure and deficit (Janjua, 2007).

REER has a positive and significant relationship with the interest rate differential across trading partners. It can be interpreted that 1% increase in the relative interest rate there is a 0.201% appreciation in REER. As the interest rate differential raises the incentive to open a deposit account in Pakistan increases, therefore, when foreign investors invest here foreign reserves mount up.

The foreign exchange reserves act as the shock absorber for the economy at the open macroeconomic front. As the reserves supply increases in the country if it is not absorbed by the State Bank of Pakistan, and it will lead to the appreciation of the currency. However, the estimation coefficient is quite low suggesting low foreign reserves availability in the case of Pakistan (Hyder & Mehboob, 2006).

The long-term association of REER and debt servicing variables shows a negative and significant result. It can be said that a 1% increase in the debt servicing amount causes REER to

depreciate by 0.495%. In theory, the higher the country's debt services the higher will be the demand for foreign currencies which rises the current account deficit inducing depreciation of exchange rate; estimation results are completely in line with expectations (Sekkat, 2016).

Furthermore, there is a negative insignificant relationship between FDI inflows and REER in Pakistan. According to literature higher FDI inflows domestic resources to be diverted toward production in the non-tradable sector to meet increased demand (Hyder & Mehboob, 2006). However, this might be due to the reason that the FDI is quite meager as compared to potential opportunities for Pakistan and its relationship with REER depends greatly on the magnitude of inflows (Janjua, 2007).

Lastly, REER has a positive and significant relationship with relative productivity. As the productivity of an economy increases it leads towards real exchange rate appreciation (Tang & Lee, 2003). It can be said that a 1% increase in relative productivity will cause REER to appreciate by 0.011%. Pakistan has been struggling with lower relative productivity and that can explain the reason for quite a low magnitude of relative productivity on REER.

Empirical Results of Short-run Coefficient

The results show that for the short run the ECM term (-0.63) has a negative sign indicating the stability of the model, and it is significant as well. It shows that the economy faces disequilibrium in the short-run, which is adjusted with the speed of approximately 63% each year till the long-run is converged back. It shows a normal speed of adjustment from short-run fluctuations towards long-run equilibrium.

The estimated coefficients are in line with the long-run estimates and some of the variables show a lagged effect on REER as well. It is worth mentioning that, macroeconomic policies are the key influencers on the REER position in the short run (Janjua, 2007). In the short-run, the terms of trade show a negative and relationship with REER in 1nd and 3rd lag as discussed earlier it is possible due to a greater substitution effect than the income effect.

Similarly, trade openness also shows insignificant results in the level form, and it has a significant positive impact on REER in the 1st lag period. It shows a negative and significant relationship with REER in the 2nd and 3rd lags. It is justified by literature, as trade openness has both substitution effect and income effect components.

Government spending also has some lagged positive and significant impacts on the REER. Moreover, FDI inflows show a positive and significant relationship with REER up to 1 lag period

suggesting that foreign direct investment takes time to materialize in the economy. Lastly, in the short run, there is a negative relationship between relative productivity and REER suggesting that the production process is a lagged activity, and it might take several lag periods to reach the final output to have a positive impact on REER.

Diagnostic Tests of the Model

It is of critical importance for the ARDL model to have model residuals that are normally distributed, homoscedastic, and free from autocorrelation. We can suffice on the slightly skewed distribution but the other two aspects are of prime importance. Table 6.1.2 presents the F-statistics and probability values for both tests. Both the results of the test are consistent, and thus the null hypothesis of no heteroscedasticity and no autocorrelation is accepted as the p-value is greater than 0.05.

To check the goodness of fit of our ARDL model, the Ramsey stability test is performed as shown in Table 6.1.2. The Ramsey Regression Equation Specification Error Test (RESET) is a test to identify any specification errors in the model. It tests if non-linear combination of regressed values explains the dependent variable's response. The test results identified by F-statistics show that the p value is higher than 0.05 such that we cannot reject the null hypothesis of correct specification at 5% level. It indicated that the specified functional form is correct, and it does not have any omitted variables.

Moreover, to check the structural stability of our model CUSUM test and Square of CUSUM (Q CUSUM) test are done. The following figures present the results for systematic changes in the regression coefficients. The results indicate that there is long-run stability of the model, as the statistics of the model are within the bound level values of the model at a 5% level of significance.

Figure 6.1.1: CUSUM Test
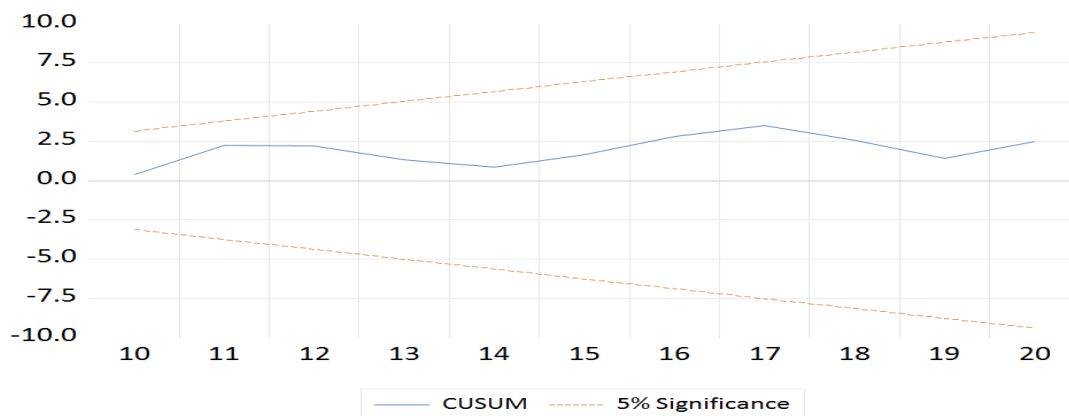
Figure 6.1.2: Q-CUSUM Test
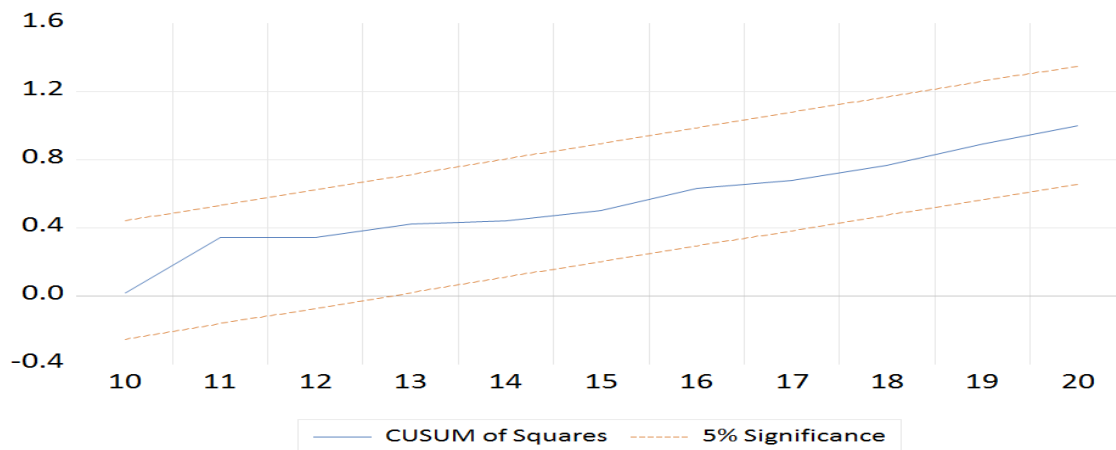
To check the existence of multicollinearity (which inflated variance) among the independent variables we perform Variance Inflation Factors (VIF) test. Here, to interpret this we follow the rule of thumb that says that the centered VIF values for all variables should be less than 10 for the model to qualify as good fit. Table 6.1.3 reveals that the VIF for all variables is well below 10, therefore, it can be concluded that there is no multicollinearity existence which can hamper the model from providing efficient results.

Table 6.1.3. Test for Multicollinearity, Variance Inflation Factors (VIF)

Variable	Coefficient Variance	Centered VIF
Terms of Trade (lnTOT)	0.0086	2.713
Trade Openness (lnTO)	0.0502	1.654
Government Spending (lnGOV)	0.0147	1.296
Interest Rate Differential (lnDR)	0.0019	1.395
Debt (lnDPT)	0.0013	3.252
Capital Inflows (lnFDI)	0.0012	3.007
Relative Productivity (RP)	0.00047	1.7901

Finally, calculation of exchange rate misalignment is worked out, given as follows:

Total Misalignment = Current Misalignment + Long-run Misalignment

Current misalignment has a consistent behavior with the transitory and random errors. Such that current misalignment is equal to the difference between observes real effective exchange rate (REER$_t$) and the equilibrium real effective exchange rate (BEER$_t$). Whereas, the economic fundamentals as determinants of equilibrium exchange rate might also be in a disequilibrium a level that is not sustainable. Therefore, to cover for that the Hodrick Prescott Filter is used to capture it for

the analysis of exchange rate misalignment (Palić, Dumičić, & Šprajaček, 2014). First, it determines the equilibrium real effective exchange rate values HP trend, and then we can see the exchange rate misalignment over time as a deviation from equilibrium value. The results are shown in Figures 6.1.3 and 6.1.4.

The findings of this model are in line with the literature (Haider & Mahboob, 2005; Debowiz & Saeed, 2014). Over the years Pakistan has experienced many episodes of overvaluation and undervaluation. On average the exchange rate misalignment ranges from -12% undervaluation to 17% overvaluation. A major episode of undervaluation was seen from 1987 to 1995, whereas there have been persistent four major episodes of overvaluation in Pakistan: (i) 1996 to 1999; (ii) 2005 to 2008; (iii) 2011 to 2015; and (iv) 2018-2019. Detailed results are reported in Table 6.1.4.

Figure 6.1.3. Exchange Rate Misalignment
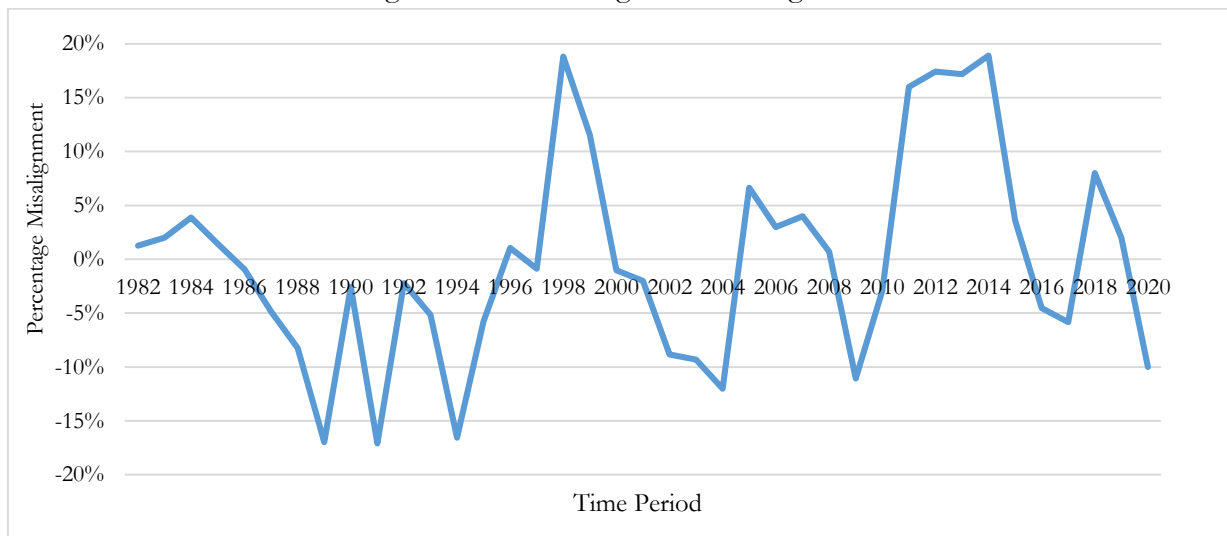
Figure 6.1.4. Comparison of Actual and Equilibrium REER
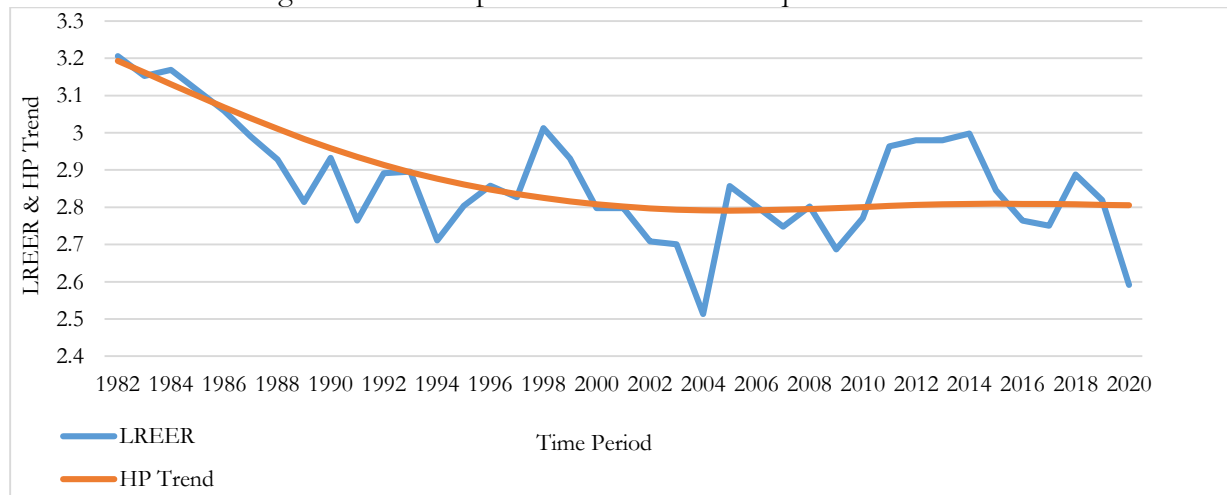
Table 6.1.4. Exchange Rate Misalignment over Years

Time Period	Outcome
1982-1986	Overvalued
1987-1995	Undervalued
1996-1999	Overvalued
2000-2004	Undervalued
2005-2008	Overvalued
2009-2010	Undervalued
2011-2015	Overvalued
2016-2017	Undervalued
2018-2019	Overvalued
2020	Undervalued

6.2. Impact on the Economy

Finally, in line with first research objective, the impact of exchange rate misalignment on the macroeconomic variables is assessed, such as on imports, exports as a percentage of the GDP (Figure 6.1.5). A clear link can be seen between exchange rate misalignment and macroeconomic fundamentals such that during the periods of undervaluation the exports showed a positive trend, i.e., exports rise in response to devalued real effective exchange rate. Similarly, the GDP also shows rising trend during the phases of undervaluation. Moreover, it is quite evident that during the phases of overvaluation the imports surge. Especially in the period of 2017-18, there was a clear overvaluation in the economy. It was primarily due to governments deliberate attempts to keep exchange rate appreciated around 100 RS/$ to gain public support and praise.

During FY2018, Pakistan signed a Free Trade Agreement (FTA) with China. Although, during the period of overvaluation when imports were already cheaper FTA led to even cheaper imports and imports surged causing further trade deficit and balance of payment crisis rose. With the new government in power, it followed a market-based flexible exchange rate system, which shot up the exchange rate sharply. Pakistan had to seek assistant from the International Monetary Fund with stringent policy conditions which deteriorated Pakistan economy substantially. Therefore, it can be concluded that exchange rate misalignment is crucial for Pakistan's economy as it be a significant tool besides leading the economy to a possible crisis.

Figure 6.1.5. Exchange Rate Misalignment Vs Imports & Exports of Pakistan
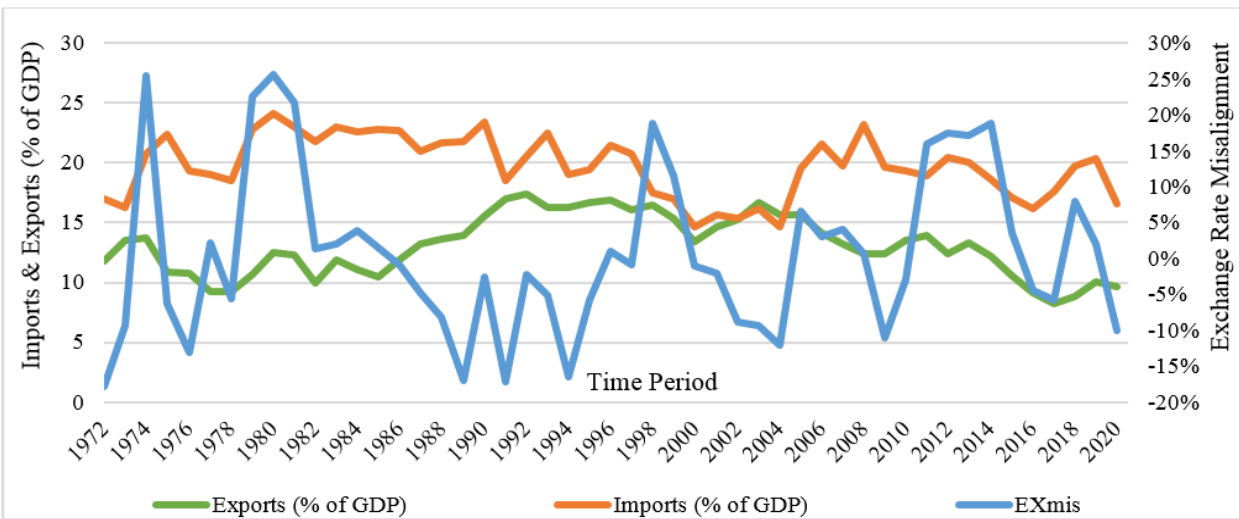
Furthermore, it can be explained with trend lines as shows in Figure 6.1.6; where, the exchange rate misalignment is divided into two periods: periods of relative undervaluation and period of relative overvaluation. The yellow trend line depicts that moving towards the R.H.S overvaluation is rising in the economy. The figure depicts that during the periods of overvaluation imports shows an increasing trend while imports show a decreasing trend during the periods of undervaluation. However, it is also evident that as during the period of undervaluation exports also fall or stay stagnant in case of Pakistan as indigenous industry is lacking inputs and a major share of exports are dependent on imported raw material and intermediate products.

Relatively Position of Real Effective Exchange Rate

In sum, overvaluation puts the economy in a dismal state while undervaluation adds some foreign competitiveness leverage. However, undervalued periods also rise the demand for dollar to pay back debt and supports the exports growth only if the economy has productive capacity (also see, Owundi, 2016). Therefore, persistent misalignment is bad for the economy and Pakistan need to keep a stable and close to equilibrium level REER and explore avenues to boast productivity.

Lastly, the impulse response function is generated to see the effects of changes in exchange rate on vital economic indicators such as growth, inflation and export competitiveness; the results are shown in the Figure 6.1.7 below. It can be seen that as there is a slight depreciation observed in the exchange rate movements the inflaton responds immediately and raises as well. It fades away after some months showing that it also has lag effects.

Figure 6.1.6: Trends in Import & Export during Periods of Undervaluation Vs Overvaluation
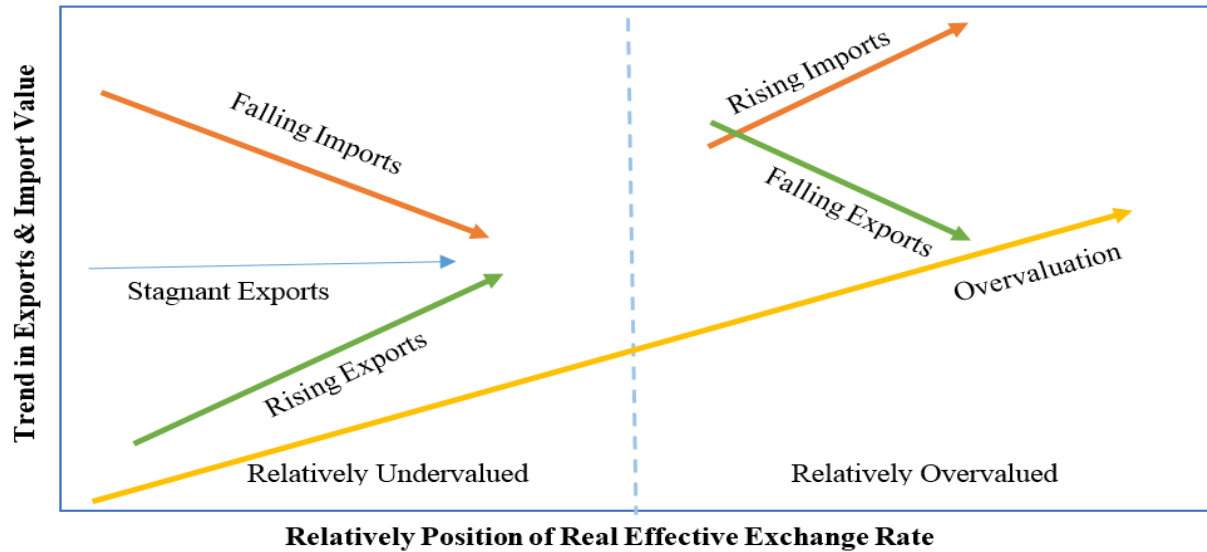
REER depreciates and inflation raises domestically there is decline in domestic aggregate demand and consequently a decline in growth and employment. It also shows that both monetary and fiscal side variables face a negative effect of exchange rate misalignment as inflaton not only makes the locals worse off rather it also effects exports majorly leading to a decline in growth and developmet of economy overtime. Undervaluation makes a country's exports quite cheaper comparatively and more competitive, thereby, increasing exports. It might lead the economy towards positive growth, but it actually dilutes overtime, and it overstimulates the economy as it might not have the production capacity, exportable surplus or access to international markets to raise its exports.

Figure 6.1.7: Impulse Response Function to Real Effective Exchange Rate Shocks

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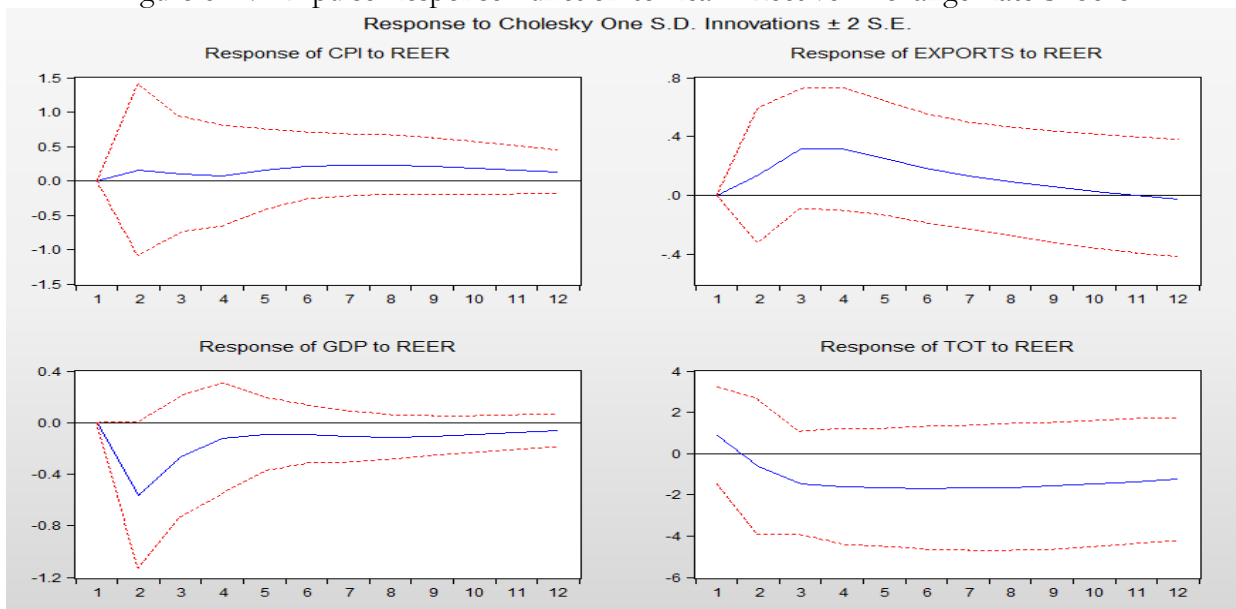
The recent Covid-19 crisis dismantled the global economy as it brought demand shock, supply shock and financial shock altogether. As a result, exchange rates around the world have mostly depreciated in response, i.e., exchange rate misalignment, except for a few G20 countries. In such circumstances, Pakistan's debt liability has mounted up to $110 billion[10] of accumulated foreign debt burden. Therefore, surging inflation and mounting debt harmed the country more than getting benefits from exports as there are many international markets and border lockdowns in effect.

Moreover, it doesn't just raise exchange rate volatility and misalignment risks, but it leads to other issues as well such as high inflation, unemployment, low growth and ultimately political unrest. Stock market fall out and exchange rate movements have a positive and significant relation and it can be used effectively by policy makers for a coordinated well-structured policy to control the loss from this crisis.

7.   Conclusion and Policy Implications

7.1.   Conclusion

Exchange rate has the tendency to deviate from equilibrium level of real exchange rate and is termed as exchange rate misalignment. Such that exchange rate is inconsistent with the balance of payment. The deviation of REER from the equilibrium level either way have drastic consequences for the economy. This study provides an analysis of the real exchange rate misalignment and its adverse implications for the economy. The cointegration analysis with BEERs approach shows that there are immediate short-run effects of exchange rate movements for the economy, which adjust to the equilibrium quite slowly.

Empirical analysis reveals that there has been recurring real exchange rate misalignment in Pakistan. A clear link can be seen between exchange rate misalignment and macroeconomic fundamentals such that during the periods of undervaluation the exports showed a positive trend, i.e., exports rise in response to devalued real effective exchange rate. The analysis also shows that undervaluation leads to overstimulation of the economy (as it does not have the potential to attain needed exportable surplus) while overvaluation leads to a current account deficit causing a decline in domestic aggregate demand and consequently a decline in growth and employment.

A devalued exchange rate makes domestic exports cheaper and more competitive in the foreign market, therefore, it can have a positive relationship. However, in case of overvaluation the relationship is negative. Persistent undervaluation can damage the macroeconomic balance as the debt

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[10] https://tradingeconomics.com/pakistan/external-debt.

value of the country keeps on mounting. Consequently, Pakistan experienced not only exchange rate volatility and misalignment persistently, but it also led to other issues as well such as high inflation, unemployment, low growth, surging debt servicing and ultimately socio-political unrest.

Economic policy instruments such as monetary policy, fiscal policy and exchange rate policy are quite useful as tools during the time of elections as employed by governments all over the world to influence the voters. This is also a vital issue for Pakistan as people have little understanding of exchange rate and what goes around the economy through the channels of politics. We saw an artificial overvaluation of currency in 2018 following extreme balance of payments crisis, and the country was left with nothing but to ask for IMF Bailout Programs. In addition, both monetary and fiscal side variables face a negative effect of exchange rate misalignment as inflation not only make the locals worse off rather it also effects exports majorly leading to a decline in growth and hence socio-economic development. Therefore, modeling an effective mechanism to determine exchange rate which would lead the policy makers to get the exchange rate to its equilibrium value is of vital importance.

7.2. Policy Implications

Based on the above conclusion, this section draws some implications for policymaking in Pakistan. These are the following:

- Recurring episodes of real exchange rate misalignment signals an alarming situation for the Pakistan economy. Based on the analysis presented in this paper, the authorities need to prepare an effective mechanism to maintain real exchange rate as close to equilibrium as possible, i.e., stable REER.
- To remove the real exchange rate misalignment, stable prices can create real depreciation to bring real exchange rate back to its equilibrium values.
- Productive inefficiencies need to be removed by using consistent exchange rate and trade policies, which will facilitate in the removal of macroeconomic imbalances.
- There is a need for exchange rate and trade policy coordination to tackle the issue of misalignment and its adverse implications for the macroeconomy.

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