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External Debt and Exchange Rate Volatility in Pakistan: Empirical Analysis and Policy Implications

Sidra Bibi[1], Prof. Dr. Abdul Ghafoor Awan[2]

1. M.Phil. Economics, Department of Economics, Institute of Southern Punjab, Multan, Pakistan. sidrawahid786@gmail.com
2. Dean, Faculty of Management Sciences, Institute of Southern Punjab, Multan, Pakistan. drabdulghafoorawan@gmail.com. OIRCID: https://orcid.org/ 0000-0001-5767-6229

Abstract

The main objective of this research paper is to investigate into the association between external debt and exchange rate volatility, utilizing 35 years' time series data spanning over a period from 1985 to 2020. Different analytical techniques such as descriptive statistics, ADF's unit root test, Bound test, ARDL model, and Error Correction Model were employed to determine short run and long run relationship between variables. The exchange rate was dependent variable while independent variables include inflation, interest rate, GDP growth rate, Current account balance, terms of trade and external debt. The empirical analysis reveals negative association between external debt with exchange rate and increasing the volume of external debt increases volatility of exchange rate in Pakistan. Therefore, the study suggests that monetary authorities and fiscal managers should reduce the stock of external debt at sustainable level by boosting tax revenue.

Keywords: Effective Exchange rate; currency depreciation; external debt; inflation; interest payment; current account balance.

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1. Introduction

1.1 Background of study

Exchange rates play a vital role in the global economic environment as they represent the value of one nation's currency in terms of another's. These rates are not only an important indicator of a country's economic system but also has significant influence over its economic performance. They have far-reaching implications relating to international trade, balance of payments, and overall economic sustainability. This is the reason that exchange rates are closely monitored, analyzed, and studied by economists and policymakers throughout world. There is a close link between exchange rates and an international trade. A stronger currency makes imports more affordable but makes exports relatively more expensive in international markets. Consequently, a high exchange rate exacerbates a country's trade imbalance, while a lower rate helps improve it. The intricate connection between exchange rates and trade is instrumental in shaping the economic fortunes of nations in today's globalized world.

Another critical issue is external debt. If its volume is high then it produces debt crisis particularly when government expenditures persistently surpass tax revenues over an extended period, it can lead to severe financial challenges. The level of national debt, and more crucially, the government's strategy to address it, can exert a substantial impact on currency values. A country perceived as having an unsustainable national debt without a credible plan to manage it may experience depreciation in the value of its currency continuously.

The determination of exchange rates is a multifaceted process influenced by a myriad of variables. One of the key drivers is inflation. When a country's

inflation rate decreases, its currency's value tends to appreciate as its purchasing power strengthens in relation to other currencies. Interest rate changes also play a pivotal role in influencing inflation and currency values. Higher interest rates offer more attractive returns to lenders, thereby impacting borrowing costs, debt burdens, and currency fluctuations.

Economic growth is yet another critical factor that shapes a currency's value. A growing and robust economy reduces the need for both domestic and foreign borrowing, leading to greater economic self-sufficiency. It is within this intricate web of factors that this study seeks to operate. The primary objective is to investigate the complex dynamics of exchange rate variations and currency values and their broader implications for economic sustainability, independence, and growth. A notable phenomenon that this study addresses is the current account deficit, which occurs when a nation's expenditures on foreign trade exceed its earnings, necessitating borrowing from other countries to cover the shortfall. Additionally, the terms of trade, which compare export and import prices, are closely linked to a country's balance of payments and can influence currency rates.

Pakistan, as a developing nation, grapples with economic insecurity and currency fluctuations. The instability and fluctuations in the Pakistani rupee's exchange rate can be attributed to both domestic and external debt burdens. This research endeavor aims to shed light on the relationship between these debt burdens and exchange rate dynamics. Ultimately, the study seeks to determine whether this relationship has a positive or negative impact on the exchange rate. It is anticipated that the findings will advocate for lower debt

levels and a stable exchange rate as prerequisites for achieving sustained economic growth in developing countries like Pakistan.

The primary objective of this research is to investigate the relationship between exchange rates and International Trade, particularly how fluctuations in exchange rates influence the balance of payment and also to examine the Impact of national debt on currency values. This study also seeks to unravel the determinants of exchange rates, including inflation, interest rates, economic growth, and government borrowing, in order to provide a comprehensive view of what drives currency value fluctuations and how unhealthy variations affect suitability and economic growth, besides examining the role of current account deficits and terms of Trade: Another objective is to analyze the effects of current account deficits and the terms of trade on exchange rates.

This research will make several significant contributions to the field of economics and policy analysis. First, the study deepens our understanding of the intricate dynamics of exchange rates, shedding light on the multifaceted factors that drive currency value fluctuations. Second, the findings will provide valuable insights for policymakers in Pakistan and other developing nations, offering recommendations for maintaining economic stability, reducing debt burdens, and achieving sustained economic growth. Third. by investigating the relationship between exchange rates and international trade, the research contributes to the understanding of how trade imbalances can be influenced by currency fluctuations. Fourth, the study presents empirical evidence on the impact of national debt on currency values, offering guidance on prudent debt management strategies. This research will contribute to the academic discourse on the determinants of exchange rates and their broader

implications for economic sustainability and growth, serving as a valuable resource for scholars and researchers in the field of economics.

2. Literature Review

The relationship between external debt and exchange rates has been a subject of extensive research over the years, with scholars and economists investigating this connection from various perspectives and in different countries. Here, we provide a review of the relevant literature on this topic. Faruqe (1995) argued that debt is a crucial determinant of exchange rates in Pakistan. He emphasized the impact of both foreign debts and trade flows on exchange rate variations, highlighting the interconnectedness of external factors on a country's currency value. Ricardo Faini and Daniel Gressani (1998) found that a lower debt burden contributed to exchange rate stability. Their research suggested that reducing external debt could have a positive effect on a country's currency value. Reza Y. Siregar and Victor Pontines (2005) conducted a study on external debt and exchange rates in European and Asian countries. They discovered a strong association between debt levels and currency values in countries such as Indonesia, the Philippines, Thailand, and Korea. Khan and Qayyum (2007) established a strong relationship between purchasing power parity and the exchange rate of the Pakistani rupee. Their work emphasized the role of macroeconomic variables in determining exchange rates. Parveen, Khan, and Ismail (2011) explored the impact of inflation, growth rate, imports, and exports on exchange rates in Pakistan. They examined various macroeconomic factors contributing to currency value fluctuations. Cavallo, Kisselev, Perri, and Roubini (2005) advocated for fixed

exchange rates as a means of maintaining welfare and avoiding domestic wealth loss while servicing debt payments. Ajayi and Choi (1998) and the modified Frankel model (1983) explained the negative impact of exchange rate changes on currencies in lower-developed countries, highlighting the vulnerability of these currencies to external shocks. Meissner, and Stuckler (2010) studied the relationship between reserves and policy credibility, finding a significant negative impact on the value of currency in Asian countries. Korinek (2011) compared local and external debt, highlighting the risk premium associated with foreign currency debt and its impact on currency value. Asma, Asghar, and Rehman (2011) investigated the impact of massive debt on currency value in Pakistan, emphasizing cointegration relationships with parameters like budget deficits and terms of trade. Razi, Shafiq, Ali, and Khan (2012) explored the influence of foreign debt demand, interest rates, and inflation on currency rates in Pakistan. Fida, Khan, and Sohail (2012) identified a long-term relationship between foreign debt and Pakistan's currency rate. Saeed, Rehman, Sial, and Sher (2012) described the relationship between relative monetary variables, foreign currency reserves, and Pakistan's total debt. Joseph (2012) analyzed the impact of external loans on economic activity in Kenya, including growth rates, interest rates, inflation rates, terms of trade, net foreign assets, and government expenditure. Bashir and Luqman (2014) discussed the negative shock of inflation and interest rates on currency appreciation in Pakistan in the long run. Bunescu (2014) failed to find a significant short-run relationship between external debt and exchange rates in Romania. Zakaree. Ibraheem and Blessing (2015) discussed the impact of debt servicing, external debt, interest rates, and foreign reserves, finding significant relationships in Nigeria. Richard, (2015) discussed debt servicing in Nigeria,

find negative shocks of debt servicing on exchange rates in Nigeria. Azreen, Bulot, and Ibrahimin (2016) investigated the effects of macroeconomic conditions in a number of Asian nations. Afshan and Raza (2017) discussed determinant of exchange rate, terms of trade were important in the short period but not in the long period. Abdullah, Yien and Huss (2017) find the relationship between rate of inflation, external debt, domestic debt, and the exchange rate in Malaysia and discovered a strong positive connection between the exchange rate, inflation, and external demand. Khan and Nawaz (2018) described relation between nominal exchange rate and monetary variables in Pakistan and their existence of cointegration relationship, interest rate and inflation had long run relation, and suggested short run monetary policy impacts. Claude (2018) investigated that external debt positively affect debt servicing had negative effect on exchange rate in Chad. Ansari (2019) investigated fiscal deficit and growth variables, impact on Indian currency, and found significant effects. He suggested budgetary policy to control fluctuations in exchange rate. Tiemothy, and Fagbola (2020) described External debt, foreign reserves, and debt service had a short-run large beneficial influence on exchange rate.

2.1 Research gap

Despite extensive research on the relationship between external debt and exchange rates in various countries, there are still several gaps in the literature Many studies have examined the long-term relationship between external debt and exchange rates. However, there is limited research on the short-term dynamics and the immediate impact of changes in external debt on exchange rates. While some studies have considered macroeconomic variables such as

inflation, growth rates, and interest rates, there is a lack of comprehensive research that incorporates a wide range of macroeconomic factors and their interplay in influencing exchange rates. Existing literature often discusses the relationship between external debt and exchange rates from an academic perspective. More research is needed to explore the practical policy implications of managing external debt to maintain exchange rate stability and economic welfare. Although some studies briefly touch upon the vulnerability of lower-developed countries to external shocks, a deeper investigation into how these shocks, including global economic crises, affect the relationship between external debt and exchange rates is essential. While several studies have examined cointegration relationships, further research is required to understand the short-run dynamics and the factors driving immediate fluctuations in exchange rates in the existence of high external debt.

2.2 Hypothesis of study

In the light of reviewed literature and objectives of study the following hypotheses have been developed to study the interplay between the variables in the long run and short run.

H_0: Fluctuations in exchange rates do not have a significant impact on the balance of payment in international trade.

H_1: Fluctuations in exchange rates have a significant impact on the balance of payment in international trade.

H_0: National debt does not have a significant impact on currency values.

H_1: National debt does have a significant impact on currency values.

H_0: Inflation, interest rates, economic growth, and government borrowing do not significantly influence exchange rates.

H_1: Inflation, interest rates, economic growth, and government borrowing

significantly influence exchange rates.

H_0: Current account deficits do not significantly affect exchange rates.

H_1: Current account deficits significantly affect exchange rates.

3 Theoretical Framework

The theoretical framework for the study on exchange rates and international trade has been built on the basis of the following economic theories:

First, we discuss *Mint Parity Theory* (1880) highlights the role of a fixed standard in fixing currency value in a situation when all countries are using the same metallic standard, gold or silver. In this way, the exchange of goods and services will be convenient and exchange rate will not likely to volatile. The next theory is *Purchasing Power Parity* (PPP) Theory which was presented by Gustav Cassel in 1918. This theory suggested that the equilibrium exchange rate should be based on the purchasing power of inconvertible paper currencies. There are two types of purchasing power parity: Absolute and relative. Absolute purchasing power parity relates to the exchange rates to the relative internal purchasing power of national currencies while relative PPP explains changes in exchange rates over time bases on change in purchasing power parities. This theory is complicated and is difficult to understand and apply. Robert Mundell (1960) proposed *Monetary Approach to Exchange Rate* theory which relates to balance of payment. This theory states that exchange rate is determined on the basis of demand and supply of currency of each country. This theory treats real income, price level, and interest rates as determinants of exchange rates. It states that increase in

money supply can lead to currency depreciation, aligning with PPP theory. James Tobin suggested *Portfolio Balance Approach* in 1969 which considers domestic and foreign financial assets as imperfect substitutes. It argues that exchange rates are determined by balancing the demand and supply of financial assets, including money. In short, these theories establish link between exchange rate and international trade considering the factors such as currency standards, purchasing power parity, balance of payments, monetary policies, and portfolio balances. By opting these theories, the study provides a nuanced understanding of the dynamics influencing currency values and international trade.

4. Materials and Methods

Methodology of any research is important because it gives the researchers the work plan and allows him to understand their research problem accurately. It also helps the researcher to solve his research problem by working systematically. This research is quantitative in nature, utilizing time series data collected from various sources. The study focuses on examining the relationship between explained and explanatory variables. The data used in this study is secondary, collected from different sources. Data sources include the World Development Indicators and the Economic Survey of Pakistan. The sample of study is external debt in which relationship between external debt and exchange rate will be determined using time series data of 35 years from 1985 to 2020. The research aims to analyze the impact of external debt on the real exchange rate in Pakistan. The selected variables and their sources are mentioned in Table1.

Table 1 Variable and their sources

Variables	**Sources**
Exchange rate	State bank of Pakistan
External debt	Economic survey
Inflation	World development indicators
Interest payment	World development indicator
GDP	World development indicators
CAB	World Development indicator (WDI)
TOT	Economic survey

The model for this study has been specified as follows: -

$Y = \beta 0 + \beta 1(EXD) + \beta 2(GDP) + \beta 3(INF) + \beta 4(IP) + \beta 5(CAB) + \beta 6(TOT) + \mu$

Where:

Y = Exchange rate (EXR)

EXD = External debt

GDP = Economic growth

INF = Inflation

IP = Interest payment

CAB = Current account balance

TOT = Terms of Trade

$\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ = coefficients

μ = Error term

This model specification allows for the examination of how external debt and other economic variables influence the exchange rate in Pakistan over the

specified time period. The coefficients (β) will help quantify the relationships between these variables.

5. Results

The results estimated through different econometric techniques are described one by one for understanding of readers.

5.1 Descriptive analysis

Descriptive statistic is used to describe the behavior of different variables. The results of descriptive statistics are presented in Table 2

Table 2 Results of descriptive statistics

	EXR	EXD	GDP	INF	IP	CAB	TOT
Mean	52.39740	6.810889	4.774252	8.141922	8.890500	-2.92E+09	1.06E+11
Median	45.04667	7.520000	4.846581	7.844265	10.23764	-1.42E+09	1.66E+11
Maximum	161.8385	18.24000	10.21570	20.28612	16.04803	3.85E+09	4.78E+11
Minimum	9.900000	-6.400000	0.525527	2.529328	2.877621	-1.89E+10	-2.14E+11
Std. Dev.	40.08220	6.237869	2.141343	3.616280	3.764286	4.53E+09	1.88E+11
Skewness	0.871779	-0.358530	0.068432	0.708183	-0.232529	-1.978498	-0.322835
Kurtosis	3.010065	2.489874	2.757509	4.030793	1.743017	7.120695	1.914129
Jarque-Bera	5.700185	1.452010	0.145376	5.753679	3.368036	61.19616	2.992508
Probability	0.057839	0.483838	0.929891	0.056312	0.185627	0.000000	0.223968
Sum	2357.883	306.4900	214.8413	366.3865	400.0725	-1.31E+11	4.78E+12
Sum Sq. Dev.	70689.64	1712.085	201.7553	575.4092	623.4735	9.03E+20	1.56E+24
Observations	45	45	45	45	45	45	45

The results of descriptive analysis show the average, maximum, minimum. Probability value of EXR, EXD, GDP, IP and INF show normal distribution of series and CAB and TOT are not normally distributed.

Table 2 shows the descriptive statistics of selected variables. The mean values indicating the average values of the variables. The data is from 1985 to 2020. The standard deviation of EXR is 40.08220, with a mean of 52.39740. EXD has a standard deviation of 6.237869 and an average of 6.810889. With a standard deviation of 2.14134, the GDP average is 4.774252. The average for INF is 8.141922, with a standard deviation of 3.616280. The average for IP is 8.890500, with a standard deviation of 3.764286. The Skewness is a calculation of symmetry in the data. All variables are small skewed as compare to the CAB. EXR, EXD, GDP and INF are normal symmetric values and TOT has negative values but CAB has more negative value of long left tail. Kurtosis statistics measure the peak flatness of the variable distribution around its normality. EXR has normal kurtosis, INF and CAB has leptokurtic kurtosis. TOT and IP have platykurtic kurtosis. The objective of above analysis is to check the normal distribution of series. Probability test helps us in checking normal distribution. Jarque Bera technique is used to check or to confirm normality and provide joint hypothesis of skewness and kurtosis. This test is non-negative and if it stands for zero then data do not have normal distribution. Thus, the results show that all variables are normally distributed.

5.2. Correlation Analysis

Correlation matrix is employed to ascertain nature and degree of association between pair of variables in the study. This relationship may be positive or negative, close to 1 or close to zero. Close to 1 means perfect correlation and close to zero means there is no correlation between variables. The results of correlation analysis are given in Table 3.

Table 3 Results of Correlation Analysis

	EXR	EXD	GDP	INF	IP	CAB	TOT
EXR	1:00	-0.145	-0.489	-0.016	-0.651	-0.462	-0.706
EXD	-0.145	1:00	0.092	0.154	0.104	-0.300	-0.125
GDP	-0.489	0.092	1:00	-0.267	0.248	0.086	0.203
INF	-0.016	0.154	-0.267	1:00	-0.114	-0.216	-0.179
IP	-0.651	0.104	0.248	-0.114	1:00	0.336	0.624
CAB	-0.462	-0.300	0.086	-0.216	0.336	1:00	0.532
TOT	-0.706	-0.125	0.203	-0.179	0.624	0.532	1:00

The exchange rate has weak and negative correlation with External Debt (EXD) as its value (-0.145) indicates weak negative correlation with exchange rate. GDP value (-0.489). also shows weak and negative correlation whereas Inflation (INF) (-0.016) reveals very weak and near to zero correlation with exchange rate. The industrial production (IP) has strong negative correlation with exchange rate as its value is (-0.651). The Current Account Balance (CAB) (-0.462). Has moderate and negative correlation. Terms of Trade (TOT) (-0.706) also has strong negative correlation. External Debt (EXD) has very low negative correlation with exchange rate as its value is (-0.145). The GDP (0.092) is very weak positive correlation with external debt. Similarly, external debt also has very weak positive correlation with external debt. The industrial production also has very weak and positive correlation with external debt, which also has weak and negative correlation with external debt. The external debt also has very weak negative association with Current Account

Balance (-0.300). The same is the case of Terms of Trade (-0.125) which has weak and negative correlation with external debt.

The GDP has moderate and negative correlation with exchange rate (-0.489) but very weak and positive correlation with external debt (0.092). However, GDP has very weak and negative correlation with inflation as its value (-0.267) shows. While GDP has weal and positive correlation with industrial production as its value (0.248) depicts. The same is the case of. GDP correlation with Current Account Balance (0.086) and Terms of Trade (0.203) which show very weak positive association between these variables.

Inflation (INF) has very weak and negative correlation with exchange rate (-0.016) weak and positive correlation with external debt (0.154) but negative weak correlation with GDP (-0.267) as well as with Industrial Production (-0.114), Current Account Balance (-0.216) and Terms of Trade (-0.179).

Industrial Production (IP) has strong and negative correlation with Exchange Rate (-0.651) but positive and weak correlation with External Debt (0.104). It also has very weak and positive correlation with GDP (0.248) but weak and negative correlation with Inflation (-0.114). It also has moderate and positive correlation with Current Account Balance (0.336) and Terms of Trade (0.624) as their values highlight.

Current Account Balance (CAB) has moderate and negative correlation with Exchange Rate (-0.462) as well as with External Debt (-0.300) but positive and weak correlation with GDP (0.086). However, it has negative correlation with Inflation (-0.216) but moderate and positive correlation with Industrial Production (0.336). However, current account balance has strong and negative correlation with exchange with Terms of Trade (0.532).

The Terms of Trade (TOT) has strong negative correlation with exchange rate (-0.706) but very weak and negative correlation with External Debt (-0.125). It has positive and weak correlation with GDP (0.203) but weak and negative correlation with (-0.179). It has strong and positive correlation with industrial production (0.624) and with Current Account Balance (0.532). In short most of the correlation between variables are weak and negative.

5.3. ADF's Unit Root Test

A Unit root test is used to examine whether a time series data is stationary & non-stationary. This test is used to check stationarity among variables in order to decide which model either OLS or ARDL should be used. If variables are stationer at different levels, then we can use ARDL model. And if they are stationers at the same level then we can use OLS model. The results of ADF test are shown in Table 4.

Table 4 Results of ADF Test

Variables	Level		First difference		Second difference		Decision
	Intercept	Trend &Intercept	intercept	Trend & intercept	Intercept	Trend & intercept	
EXR	4.01386 1.0000	1.2507 0.9999	1.695 0.999	*3473 0.000	6.104 0.000	6.826 0.000	I (1)
EXD	4.64728 0.0004	4.91306 0.0012	7.245 0.000	6976 0.000	8952 0.000	8.519 0.000	I (0)
GDP	5.55196 0.0000	6.49946 0.0000	8.546 0.000	8.755 0.000	9346 0.000	9.650 0.000	I (0)
INF	*3.4956	3.48586 0.0501	-7541 0.000	7.442 0.000	8053 0.000	8.908 0.000	I (0)
IP	-1.08738 0.7126	0.86129 0.9514	2.666 0.073	-2040 0.189	16301 0.000	15411 0.000	I (1)
CAB	3.85889 0.0049	4.54336 0.0039	4.084 0.04	4.208 0.005	8.818 0.000	8.556 0.00	I (0)
TOT	-1.01098 0.7441	1.82787 0.6788	*8.42 0.000	8.747 0.000	10819 0.000	10422 0.000	I (1)

The results in Table 4 show the stationary level of variables. There are some variables which are not stationer at level and some are stationer at intercept. So, we can run ARDL approach to determine the impacts of lag of dependent and the independent variables to predict and decide long run relationship. Exchange rate, Interest payments and Terms of trade has first order stationary and External debt, Inflation, GDP and Current account balance are stationary on level. Different variables are stationers at different levels so we can use ARDL approach.

5.4. Bound Test

Bound Test is the first step in ARDL approach to check the presence of long run association between variables. It checks the limit of the lags in ARDL technique. The table 4 show bound limit of the lags, which predicts long run association between variables. The results of Bound test are shown in Table 5

Table 5 Results of Bound Test

ARDL Bounds Test		
Date: 06/14/22 Time: 05:56		
Sample: 1989 2020		
Included observations: 32		
Test Statistic	Value	k
F-statistic	11.06604	6
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.12	3.23

5%	2.45	3.61
2.5%	2.75	3.99
1%	3.15	4.43

Table 5 shows the critical value of upper bound 1(1) and lower bound 1(0). The results show that the value of F. Statistics is 11.06604 and it is greater than the upper bound value which is 3.23. If the value of Statistic is less than the critical value of lower bound, then there is no long run relationship and if the value of Statistic lies between the upper and lower bound then there is inconclusive evidence about the long run relationship. The estimated results show that the value of Statistic is greater than upper bound so according to Pesarn et al (2001) and Nayaran (2004) the null hypothesis is rejected due to the critical value of Statistic that is greater than the critical value of upper bound. Thus, alternative hypothesis, which states that there is long run association between variables, is accepted. Now we will further proceed to check cointegration and long run relationship between variables through ARDL model

5.4. 2 Long run results of ARDL Model

The estimated results of ARDL Model are presented in Table 6.

Table 6 Estimated results of ARDL Model

ARDL Cointegrating And Long Run Form				
Dependent Variable: EXR				
Selected Model: ARDL (1, 0, 0, 1, 0, 1, 1)				
Date: 08/18/21 Time: 14:06				
Sample: 1 61				
Included observations: 43				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(EXD)	-1.140299	0.071129	-3.056540	0.0045
D(GDP)	0.378594	0.227368	-0.278345	0.7825
D(CAB)	2.621069	0.000000	1.223648	0.2300
D(INF)	-4.124420	0.145164	2.679797	0.0127
D(IP)	2.383060	0.339727	0.090432	0.9285
D(TOT)	-3.616578	0.000000	-2.636211	0.0216
CointEq (-1)	-0.746573	0.034128	2.819528	0.0082
Cointeq = EXR - (2.2594*EXD + 0.6577*GDP + 0.0000*CAB -2.5341*INF				
-8.2967*IP -0.0000*TOT + 115.8031)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
EXD	0.812224	1.241169	2.820370	0.0781
GDP	2.494791	2.460908	0.267258	0.0910
CAB	12.238098	0.000000	2.992409	0.0549
INF	-2.714315	1.124876	-2.252807	0.0313
IP	1.189183	1.878330	-4.417089	0.0001
TOT	-8.317541	0.000000	-3.452366	0.6541
C	59.526854	18.367821	6.304672	0.0000

The part fist of Table 6 shows short run results and relationship between dependent and independent variables. The value of ECM is -0.74. It suggests the speed of adjustment. The ECM coefficient shows how much time variables will take in returning to equilibrium and it should have a coefficient with negative sign and it is statistically significant at less than 1% level ensuring that long run equilibrium can be attained. External debt and Terms of trade has negative relationship, and inflation has positive relationship with exchange rate in short run. GDP, Current account balance and Interest payment has no significant relationship with Exchange rate.

The Second part of Table 6 shows long run cointegration between variables. In long run External Debt, GDP, Current account balance, Interest payment has positive relationship with exchange rate. Inflation and Terms of trade has negative relationship with Exchange rate in long run. The co-efficient value of external debt is 0.81which means one-unit increases in external debt will likely to increase in exchange rate by81%. This effect is strong and statistically significant. The co-efficient value of GDP is 2.49 which mean that one-unit increases in exports is associated with 49 % increase in exchange rate and this relationship is also statistically significant. Similarly, one-unit increases in current account balance is associated 23% decrease in exchange rate and this is also statistically significant. These two variables have negative relationship in the long run. The co-efficient value of inflation is -2.71 which means one-unit increases in inflation will likely to depreciate in exchange rate by 71% and it is also statistically significant. The co-efficient value of interest payment on loans shows that one-unit increases in interest payment will likely to increase exchange rate 1.83% and this relationship is

statistically significant. The co-efficient value of term of trade is -8.31, which means one unit increases in debt servicing will decrease exchange rate by 83%.

5.5. Causality Test

Causality test is used to check their one sided or both sided relationships. The causality approach is used to determine that one variable may be used to determine another. The results are shown in Table 7

Table 7 Results of Causality Test

Pairwise Granger Causality Tests			
Date: 08/17/21 Time: 21:38			
Sample: 1 61			
Lags: 1			
Null Hypothesis:	Obs	F-Statistic	Prob.
EXD does not Granger Cause EXR	49	2.68502	0.1081
EXR does not Granger Cause EXD		0.37134	0.5453
GDP does not Granger Cause EXR	59	0.00029	0.9865
EXR does not Granger Cause GDP		7.59292	0.0079
INF does not Granger Cause EXR	60	0.16358	0.6874
EXR does not Granger Cause INF		0.00012	0.9912
IP does not Granger Cause EXR	43	9.39580	0.0039
EXR does not GrangeCause IP		0.00321	0.9551
CAB does not Granger Cause EXR	44	52.0384	8.E-09
EXR does not Granger Cause CAB		0.25528	0.6161
TOT does not Granger Cause EXR	60	0.06528	0.7993
EXR does not Granger Cause TOT		3.21152	0.0784

The results of the Granger causality show that EXD does not Granger Cause EXR: The null hypothesis that External debt (EXD) does not Granger cause Exchange rate (EXR) is not rejected as its p-value is = 0.1081. However, the alternative hypothesis is accepted, suggesting that EXD does Granger cause EXR. EXR does not Granger Cause EXD: The null hypothesis that EXR does not Granger cause EXD is not rejected (p-value = 0.5453). There is bidirectional Granger causality between EXD and EXR. GDP does not Granger Cause EXR: The null hypothesis that Gross Domestic Product (GDP) does not Granger cause EXR is not rejected (p-value = 0.9865). However, the alternative hypothesis is accepted, suggesting that GDP does Granger cause EXR. EXR does not Granger Cause GDP: The null hypothesis that EXR does not Granger cause GDP is rejected (p-value = 0.0079), indicating unidirectional Granger causality from GDP to EXR. INF does not Granger Cause EXR: The null hypothesis that Inflation (INF) does not Granger cause EXR is not rejected (p-value = 0.6874). However, the alternative hypothesis is accepted, suggesting that INF does Granger cause EXR. EXR does not Granger Cause INF: The null hypothesis that EXR does not Granger cause INF is not rejected (p-value = 0.9912). There is bidirectional Granger causality between INF and EXR. IP does not Granger Cause EXR: The null hypothesis that Interest Payment (IP) does not Granger cause EXR is rejected (p-value = 0.0039), indicating unidirectional Granger causality from EXR to IP. EXR does not Granger Cause IP: The null hypothesis that EXR does not Granger cause IP is not rejected (p-value = 0.9551). CAB does not Granger Cause EXR: The null hypothesis that Current Account Balance (CAB) does not Granger cause EXR is rejected (p-value = 8.E-09), indicating bidirectional

Granger causality. EXR does not Granger Cause CAB: The null hypothesis that EXR does not Granger cause CAB is not rejected (p-value = 0.6161). TOT does not Granger Cause EXR: The null hypothesis that Terms of Trade (TOT) does not Granger cause EXR is rejected (p-value = 0.0784), indicating unidirectional Granger causality from TOT to EXR. EXR does not Granger Cause TOT: The null hypothesis that EXR does not Granger cause TOT is not rejected (p-value = 0.7993). In summary, the Granger causality test results indicate various causal relationships between the variables, including bidirectional, unidirectional, and absence of Granger causality. These findings are valuable for understanding the temporal relationships between the variables in your analysis

6. Discussion

The study aimed to investigate the impact of external debt on the real exchange rate in Pakistan, in the context of Pakistan's debt crisis and exchange rate volatility. The data utilized for this research spanned from 1985 to 2020 and was sources such as the World Development Indicators (WDI), the International Monetary Fund (IMF), and the State Bank of Pakistan. To assess the relationship between external debt and exchange rate dynamics, the study employed a range of analytical tools such as descriptive statistics, correlation analysis, autoregressive distributed lag (ARDL) model and Granger causality test.

The findings of this study indicate several significant relationships and trends which are briefly explained in the following: -

External public debt and interest payments were found to be statistically significant. Interest payments on loans were shown to have a positive and significant relationship with exchange rate volatility. This implies that an

increase in interest payments is associated with higher exchange rate volatility and a negative impact on the value of the Pakistani rupee. Essentially, higher interest payments can lead to a depreciation of the rupee. In contrast, the study found that GDP and current account balance did not exhibit a significant relationship with exchange rate volatility. This suggests that these variables may not be crucial determinants of exchange rate fluctuations in Pakistan. Specifically, changes in GDP and the current account balance do not seem to have a potential impact on exchange rate. On the other hand, inflation and terms of trade were found to have significant negative effects on the exchange rate. Inflation was shown to negatively impact the exchange rate both in the short run and the long run. Similarly, terms of trade had a negative and significant effect on exchange rates in the short run. However, this impact was not observed in the long run, indicating that other factors might outweigh the influence of terms of trade over time. These results are consistent with the studies of Johnson, et.al (2021), Awan & Hussain (2021), Aderemi, et al. (2020) and Choudhry & Hassan, (2015) who found close link between external debt and exchange rate volatility and suggested to take effective policy initiatives for external debt management.

The study revealed a complex relationship between external debt and exchange rates. In the short run, an increase in external debt led to a decrease in the exchange rate, indicating a negative impact. However, in the long run, the impact of external debt turned positive, implying that as external debt increases, the exchange rate and the value of the Pakistani rupee decrease. This suggests that the dynamics between external debt and exchange rates evolve over time. While GDP had an insignificant impact in the short run, it exhibited

a positive effect on exchange rates in the long run. Similarly, the current account balance was insignificant in the short run but had a positive and significant impact on exchange rates in the long run. This suggests that the long-term effects of these variables on exchange rates are more pronounced.

7. Conclusions

From the above discussion we can conclude that that external public debt and interest payments are two main causes of volatility of Pak Rupee because Pakistan has low tax revenue and high volume of external debt. It has to face problem in payment of principal loans plus interest on it. Sometimes, it leads the country to the edge of sovereign default. When heavy loans payments are made it creates shortage of dollar and causes Pak Rupee to depreciate. It suggests that managing external debt and interest payment obligations is crucial for stabilizing the exchange rate. It has also been noted that that GDP and the current account balance do not have a substantial impact on exchange rate volatility. In the short run, these variables were insignificant, while in the long run, GDP exhibited a positive effect on exchange rates, and the current account balance had a positive and significant impact. Inflation had a negative impact on the exchange rate both in the short and long run. Similarly, terms of trade had a significant negative effect in the short run, although its impact diminished in the long run.

7.1 Policy implications

The policy implications of this study are that the policymakers should be mindful of inflation and terms of trade conditions when addressing exchange rate stability. The relationship between external debt and exchange rates in Pakistan is complex and time-dependent. In the short run, an increase in external debt led to a decrease in the exchange rate, while in the long run,

external debt had a positive impact on the exchange rate. This indicates that the dynamics between external debt and exchange rates evolve over time and depend on various economic conditions. The policymakers in Pakistan should consider the significant influence of interest payments on exchange rate volatility. Managing external debt obligations efficiently can help stabilize the exchange rate and protect the value of national currency. They should also focus on controlling inflation rates and monitoring terms of trade to mitigate their negative impact on the exchange rate. Implementing inflation-targeting policies and trade balance management strategies could be beneficial for Pakistan.

7.2 Limitations and suggestions for further research

This study has some limitations. For instance, the study relied on historical data from various sources, which may have limitations in terms of accuracy and coverage. Future research could benefit from more comprehensive and up-to-date datasets. It also used specific econometric models and assumptions to analyze the data. Alternative models or approaches could yield different results. Cross country data can be used to compare the dynamics of economic variables in different countries and their impact on their economies. Moreover, micro level studies can be conducted to examine the effects of exchange rate volatility, high inflation rate, low foreign exchange rate and dollarization.

In the light of these limitations, some suggestions are made for future research on these issues. Future research could delve deeper into the causal mechanisms underlying the relationships identified in this study. Understanding the channels through which external debt, interest payments, inflation, and other factors affect exchange rates can provide more precise

policy guidance. Further investigations could assess the effectiveness of different macroeconomic policies in mitigating exchange rate volatility and managing external debt. Employing more sophisticated time series and econometric modeling techniques could offer a more nuanced understanding of the dynamics between economic variables and exchange rates in Pakistan. Consideration of external factors, such as global economic conditions and international financial markets, could provide a more comprehensive view of exchange rate determinants in Pakistan. To sum up, this study provides valuable insights into the complex relationship between external debt, economic variables, and exchange rates in Pakistan. The findings have practical implications for policymakers, but further research is needed to deepen our understanding and refine policy recommendations.

Data statement

The data used in this study has been incorporated into it.

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