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Impact of Exchange Rate, and Foreign Direct Investment on External Debt: Evidence from Pakistan Using ARDL Cointegration Approach

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ABSTRACT

Using time series data from Pakistan 1973 to 2021, this research examines the effect of exchange-rate, fiscal deficits, foreign direct investment and economic expansion on foreign debt. The auto regressive distributed lag model is used in the research to look into the co-integration analysis of variables and their existence. The study confirms the positive and significant relationship exist among the rate of exchange, foreign direct investment, the fiscal deficit, economic growth, and external debt in the long run. However, in the short run, the real effective exchange rate and fiscal deficit are negatively related to the external debt, whereas the economic growth is positively related to the external debt. The policy maker recommended that rises the exchange rate, the value of a domestic currency falls to some extent, which improves the foreign exchange in which loans must be returned.

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1. Introduction

Every citizen of Pakistan is well aware of the prevailing economic and financial crises in the country. Pakistani rupee keeps on depreciating against the U.S. dollar that in turn causes piling up of debt (Chandia et al., 2019; S. Rahman & Idrees, 2019; Sosa-Padilla & Sturzenegger, 2023). This vicious circle of high indebtedness is much harmful to a developing country. It is drastic enough that there is a need for even making coupon payments. External debt is the amount a debtor country must return to the creditor country which was borrowed, or it may be said that the amount that is payable to the creditor country from which the loan was borrowed (Jacob & Sule, 2022). The loan may be borrowed from a foreign country's government banks and financial institutions. Payments must be made in standardized international currency, i.e. U.S. dollar. The nominally accurate exchange rate is modified to compensate for the impacts of a price deflator or the cost indicator to yield the actual effective exchange rate (Mukaila & Arene,

2022; A. U. Shahid et al., 2022; Shahzadi, Sheikh, Sadiq, & Rahman, 2023). Flores-Sosa, León-Castro, Merigo, and Yager (2022) define the value of a country's currency in comparison to a weighted average of several foreign currencies.

It is derived by dividing the actual nominal exchange rate even by cost deflator or cost index, according to Mukaila and Arene (2022), there is a vast difference between fiscal deficit and government's revenue or earnings, whether from taxes or non-tax sources, and its spending (Shafiq, Hua, Bhatti, & Gillani, 2021). As a result, it is the discrepancy between income and expenditure. When the government expenditure exceeds from its revenue or income, this is referred to as a fiscal deficit Andreff (2022) argued that economic growth is defined as the proportion of FDI in a country's GDP. It may also be expressed as the percentage of FDI in the country's gross domestic product (Shafiq, Bhatti, Bashir, & Nawaz, 2022). Awan, Anjum, and Rahim (2015) use macroeconomic and econometric techniques to examine the effect of the actual exchange rate, fiscal deficit, and economic expansion on Pakistan's external debt. Din et al. (2020) examine the causes and factors underlying Pakistan's currency depreciation and debt accumulation. As a result, these findings suggest policy solutions that the government can use to address these major challenges.

According to Worrell (2023), Pakistan is experiencing ongoing political upheaval, which is having a direct adverse effect on its economy. The problem of relative price devaluation and the financial strain of foreign debt on the economy deserve special attention. Because of Pakistan's vast political rust, no strategy has been effectively applied to address these two pressing issues. Kurita (2022) examines the statement that Pakistan is experiencing the most severe crisis. There is no other method for managing the economy than to devalue, which enhances the debt burden. So, our state is dealing with these two issues, and they must be addressed.

According to Brown, Kelly, and Phillips (2023), the economy in Pakistan is deteriorating due to political rust. The main reasons for this are two forces: rupee depreciation and rising debt-related financial strain. However, these factors remained unexplored in the 2019–21 era. The research gap of this study is to address the impact of these two forces in order to describe how they contributed to the intensity as well as intensity of the economic conditions, because GDP ratio seems to be concerned with external debt, once GDP ratio is increased in a domestic country, national income rises, allowing firms to expand as well as the manufacturing industry to grow.

So, this research makes a contribution to the current literature through different means as consistent with the above mentioned discussion: (i) it is a first study which elaborates the foreign direct investment and exchange rate - external debt nexus in emerging countries like Pakistan, (ii) unlike past empirical studies, this study use technique called 'dynamic ARDL' which can deal with several methodological issues.it provides valuable suggestions based on the findings, which will open the routes for future research on the exchange rate and foreign direct investment external debt nexus in Pakistan and its implications in emerging countries (Yang & Shafiq, 2020).

Clements, Bhattacharya, and Nguyen (2003) this in turn, raises production and, by exporting products, the government managed to earn revenue and pays off debt. As a result, the Gross domestic Products ratio and the external debt have an inverse relationship. There is an inverse relationship between real effective exchange rate and external debt. As a result, domestic currency depreciates, large amounts of currency will be required to cover debt payments. The relationship between real effective exchange rate and external debt can be explained as follows: when the exchange rate rises, the value of a domestic currency falls to some extent, which improves the foreign exchange rate at which loans must be returned (Ajayi & Oke, 2012). As a result, as domestic currency depreciates, large amounts of currency will be required to cover debt payments. The objectives of this study reveal that the positive and

significant relationship between both the exchange rate, and foreign direct investment on external debt.

The rest of the paper is structured as follows: Literature review section presents the review of empirical literature. Furthermore, we introduce data and methodology section. Results and discussion section yields results and discussion and finally the study exhibits the conclusion.

2. Literature Review

The literature review gives insight into previous research on the rate of exchange and external debt, as well as some variable combinations that explain how the new study was carried out. Irena et al. (2018) estimated the effects of rate of exchange in the content of increasing net exports and depreciation effects on foreign debt. The dependent variable was indeed the nominal exchange rate, and the independent variables were external debt, individual consumption, and exports for variable selection, t-test statistics as well as the ADF unit root test are being used. The results revealed that depreciation made domestic goods more affordable in comparison to foreign goods, causing an increase in foreign demand and, as a result, rising domestic exports of goods and services from abroad, boosting domestic consumption of domestic goods and decreasing imports. The effect of exchange rates on external government debt was investigated in this study. The exchange-rate and GDP are used as independent variables in this article, while public debt is used as a dependent variable. In Kenya, the time span seems to be from 1993 to 2013. The Devereus and Lane Model was employed in this paper. The exchange rate has already been fluctuating and simply enjoying, so that is severe for economies so it stifles economic growth.

Shah (2015) examined the factors contributing Pakistan's trade balance to use BOT as dependent variable. According to additional information collected from Pakistan from 1975 to 2010, the rate of exchange, supply of money, FDI, GDP, and overall domestic demand are independent variables. Multiple Regression Model was used in this study. Results indicated that exchange rate depreciation, money supply, and GDP all had a positive relationship with BOT. FDI as well as total domestic market, on the other hand, had been inversely proportional to BOT.

Malik (2015) investigated the effect of trade openness on exchange rate. BOT is indeed an independent variable in this study, as well as EXR seems to be the dependent variable. This study relied on secondary data from Pakistan collected between 1985 and 2013. The data was analyzed using the coefficient of correlation. According to the findings, there is a low and unfavorable correlation among BOT and EXR. GDP was used as the dependent variable, with BOT and investment serving as the independent variables. In this proposal, OLS Multiple Regression Model was used. The authors discovered that all debt indicators increased significantly in 1990. In the case of Pakistan, mismanagement of resources, macroeconomic imbalances, as well as loss of competitive nature in the global market, as well as the role of political interest groups, have raised the financial strain.

The literature review delves into previous research just on exchange rate as well as external debt, and other variables combinations that explain how the new study was carried out Irena et al (2018) reveals the effects of exchange rate changes just on content of increase in net exports and the effects of depreciation on foreign debt. The dependent variable was the nominal exchange rate, while the independent variables were external debt, individual consumption, and exports for selected variables, t-test statistics and the unit root of the ADF test were used.

Shahbaz, Jalil, and Islam (2012) investigated the relationship between variations in the actual rate of exchange and the trade balance. The exchange rate was the dependent variable, and the balance of trade and FDI were the independent variables. This article's data spans the

years 1980 to 2006. In this study, this same ARDL test was utilized for analysis. The findings revealed a long-run relationship between the actual exchange rate and the trade balance, and currency depreciation will result in more severe circumstances. the relationship between the exchange rate, exchange, inflation, FDI, and GDP (S. Rahman & Idrees, 2019; Sarwar, Ali, Bhatti, & ur Rehman, 2021).

Rahman, & Bakar, (2018) argued that the exchange rate was considered a dependent variable, with trade, inflation, FDI, and GDP considered independent variables. Annual time series information for the years 1980-2009 were obtained from the Pakistan Economic Survey. To determine the causality between both the variables, Johansen's cointegration test and the Granger Causality test were used. The study's main findings were that the exchange rate and rising prices were not cointegrated. However, the exchange rate in relation to trade, FDI, and GDP demonstrated the johansen co-integration trend. Rehman et al. (2011) investigated the relationship among public debt, exchange rate, foreign debt, and trade terms in Pakistan. In this study, E.D. was used as a dependent variable and EXR, FD, TOT as independent variables. Secondary annualized data was taken from Pakistan for the period 1972-2008. Johansen and Juselius (1990) cointegration method was used for analysis. The results declared that E.D is positively linked to EXR and F.D but negatively with TOT.

Muhammad (2010) investigated Pakistan's both short- and long-term trade deficits. The trade deficit was the dependent variable in this paper, and the independent variables were domestic consumption, FDI, the actual exchange rate, foreign income, and household expenditures. Secondary data from 1975 to 2008 have been gathered for analysis in this paper. The Johansen cointegration test and VECM methods were used as an analysis methodology. According to the findings, the main components of a BOT deficit were residential expenditure, REER, FDI, and capital inflows. A study determined the primary effects of foreign debt on national currency as well as debt shocks, in addition to their own indirect effects on short-term development and long-run output impacts. GDP growth was taken as the dependent variable and domestic currency & debt as independent variables. The multiple regression model was used and the data analyzed in this study were collected over 1880–1913 and 1973–2003 from 45 countries and result found by the authors were GDP was initially negatively correlated with the population growth rate. The GDP depicted positive relation with foreign debt but a negative with domestic currency (Michael et al., 2010).

Frankel and Rose (1996) analyzed that how the Exchange rate affects emerging markets. Output Growth was used as the dependent variable, and Foreign Interest rate and total debt were independent variables. Data collected was in the form of panel data, and from 100 developing countries, it was collected over the period 1971-1992.Cointegration and estimation test used by the author with OLS method. The results were which countries were facing a currency crisis is due to heavy dependence on foreign debt. At the same time, the currency crisis tends to rise in developing countries when the international interest rate rises. As a result, lower developed countries have to depreciate their currency value forcefully.

Bautista (2003) investigated the bank rate percentage interaction using the covariance matrix as the dependent variable and the time-varying analysis of covariance as well as a time-varying diagonal equation as independent variables. Data from the Philippines from 1988 to 2000 was used. Using DCC analysis, this was determined that there was a strongly positive correlation between prior and subsequent devaluation. Upadhaya (1999) calculated the impact of currency depreciation on aggregate output in six Asian countries. The dependent variable was real output, while the independent variables were the real exchange rate, the domestic cost, and foreign price. The annual data time frame was used, spanning the years 1963 to 1993. The study used the OLS estimator and distributed lag model for analysis. The calculated results indicate that devaluation, in general, is neutral in the long run. However, in some cases, it even could have a contractionary effect.

Faini and Gressani (1998) aimed to clear that monetary authorities are reluctant to devaluation because of the fear of foreign debt and inflation. The REER was utilized as the predictor variables. The independent variables are the nominal rate of interest, inflation rate, currency depreciation rate, domestic public debt, and external public debt. The study analyzed the data collected for the Philippines from 1985-90. They used a multiple regression model and found that devaluation posed negative effects on the public sector.

3. Data and Methodology

This study used annual time series collected from all over Pakistan around 1973-2021 to investigate the impact of the precise actual currency exchange rate on foreign debt. The data was provided by the SBP, the Trading Economics of Pakistan, as well as the world development indicators.

Many methodologies have been tested to find out the effect of REER, FD, and economic expansion on ED. Nonetheless, a most appropriate technique for data pre-testing is as follows:

$$ED = f(REER, GDP, FD, INF) \quad (1)$$

$$REER = (RBER_{it})\, W_{it} \quad (2)$$

Where, $RBER_{it}$ $-real\ bilateral\ exchange\ rate\ of\ the\ PKR\ to\ US\ Dollar\ for\ period\ of\ t$

$$RBERUSt = 100 * ERust \frac{ERust}{ERus0} * \frac{CP1ust}{CP1pkrt} \quad (3)$$

Where,
$ERust$ $-nominal\ exchange\ rate\ of\ PKR\ to\ US\ Dollar\ of\ the\ period\ t$
$ERus0-relevant\ nominal\ exchange\ rate\ of\ base\ period$ 0
$CP1ust\ and\ CP1pkrt$ $-\Delta\ in\ CPI\ index\ in\ US\ and\ PKR,\ for\ period\ t\ relevant\ to\ base\ period$ 0
$W_i-\ Weight\ of\ country\ calculated\ from\ the\ below\ formula$

$$W_i = \frac{M_i + X_i}{\sum_{i=1}^{k} M_i + \sum_{i=1}^{k} X_i} \quad (4)$$

Where,
W_i=$weight\ of\ i\ country\ in\ overall\ trade\ volume\ of\ doemstic\ country$
M_i=$import\ of\ Paksitan\ from\ i\ country$
X_i=$export\ of\ pakistan\ to\ i\ country$
$\sum_{i=1}^{n} Mi$=1=$import\ of\ pakistan\ from\ total\ i\ countries$
$\sum_{i=1}^{n} Xi$= $total\ exports\ of\ pakistan\ to\ i\ countries$
$\mathrm{FD} = \sum expenditure - \sum Receipts$
FDIGDP = percentage of Current GDP

3.1 Econometric Model

$$\mathrm{ED} = \beta 0 + \beta 1\ \mathrm{REER} + \beta 2 \mathrm{FDI} + \beta 3\ \mathrm{FD} + \beta 4\ \mathrm{FDI} + \varepsilon \quad (5)$$

Whenever the exchange rates increase, the valuation of a national currency falls to some extent, which reinforces the foreign exchange in which loans should be made returned. The link in both REER and ED can summed up as follows:

As GDP is concerned with the external debt, when GDP increases in the domestic country, then the national income of that country rises, providing the businesses to expand and the industrial sector to grow. This, in turn, will raise the production and by exporting products govt.

Earns revenue and pays for the debt. Hence, there exists an inverse relationship between GDP and ED. The first null hypothesis of this study will be long-run relationship not exist between the ED. This, in turn, will raise the production and by exporting products govt. Earns revenue and pays for the debt. Hence, there exists an inverse relationship between GDP and REER. Conversely, its alternative hypothesis will negate it.

H_o = There is no long-term relationship between ED and REER.

H_1 = There is a long-term relationship between ED and REER.

The study's second null hypothesis will be that there is not a long-run relationship between external debt and the FDI/GDP ratio. Its alternative hypothesis, on the other hand, will refute it.

H_o = There is not a long-run relationship between ED and GDP.

H_1 = There is a long-run relationship exists between ED and GDP.

This study's second null hypothesis will be that there's not a lengthy connection between outside debt and F.D. Its alternative hypothesis, on the other hand, will refute it.

H_o = ED. and F.D. have no long-term relationship.

H_1 = ED. and F.D. have a long-term relationship.

3.2 Descriptive Statistics

Descriptive statistics is a technique that explores the information in the model about the measures of dispersion like mean, median, standard deviation, kurtosis, skewness, maximum, minimum, probability and Jarque-Bera. Normally it is used to view the normality of the model.

3.3 Unit Root Test

The unit root method was created to determine the stationarity of variables in time series. It considers the null hypothesis to be non-stationary, while the alternative hypothesis is stationary.

3.4 Breusch-Pagan-Godfrey Heteroscedasticity Test

It is a test developed to indicate the existence of heteroscedasticity that is caused by the disturbance terms. The presence of heteroscedasticity violates the assumption of OLS and also provides poor inferences that will lead to a sub-optimal outcome.

3.5 ARDL bounds Test

The cointegration method designed to test the long-term validity of the relationship between variables. The study employed regardless of integration order, either I(0) or I(1) (1).

Short-run and long-run analyses reveal the model's direction and nature in relation to its magnitude. In reality, it indicates the model's responsiveness to small changes in the relevant variables.

4. Result and Discussion

Table 1 indicate the descriptive statistics results, which include the dispersion of all variables in question. The value of Jarque-Bera described that the residuals of all the series were normally distributed.

Table 1
Descriptive Statistics

	ED	REER	FD	GDP	FDI
Mean	39.10494	115.9787	1.242310	0.996037	0.231024
Median	40.29563	109.8023	6.935409	0.772219	3.514321
Maximum	54.29598	200.4290	2.722210	3.668323	1.325612
Minimum	24.64950	96.48704	4.226709	0.331453	2.262722
Std. Dev.	9.932612	21.46820	8.258209	0.801763	3.281256
Skewness	-0.037867	2.159536	0.738141	2.192167	0.713842
Kurtosis	1.478130	8.459320	1.854189	7.053554	1.584123
Jarque-Bera	3.385991	70.66872	5.092928	51.99496	4.065917
Probability	0.183968	0.000000	0.0778358	0.000000	0.580258

So, it confirmed that there was a normal distribution. On the other hand, the series had a zero mean and constant variance which was the condition of normality. It could also be observed from the table that exchange rate (REER), fiscal deficit (FD) and economic growth (GDP) was positively linked with external debt (ED).

Table 2
ADF for Augmented Dickey Fuller Test for Unit Root

Variables	AT LEVAL		FIRST DIFFERENCE		Decision
	INTERCEPT	TREND & INTERCEPT	INTERCEPT	TREND & INTERCEPT	
ED	2.153	0.366	-1.325	-3.681	1(1)
REER	-2.213	-3.564	-5.132	-6.200	1(0)
FD	-1.725	-1.712	-5.771	-6.786	1(1)
GDP	-1.233	-0.616	-4.123	-6.144	1(1)
FDI	-0.1235	-0.325	-3.245	-4.678	1(1)

Table 2 displays this same unit root test results for all variables. This same augmented dickey fuller test belongs to the unit root test category. It examines a variable's or series' stationarity at level I(0), the first difference I(1), and the second difference I(2) (2). ADF accepts the null hypothesis because the series contains a unit root, indicating that it is not stationary, and its alternative hypothesis rejects it. Whenever the probability that a variable has a value is less than 0.1, the null hypothesis is rejected, and the results indicate that the variable is stationary. According to the table, external debt (ED), gross domestic product, foreign direct investment (FDI) and fiscal deficit (FD). were stationary for first variation I(1), but only REER was stationary at level I. (0).

Table 3
ARDL Bound Test

			Critical Value Bounds		
Test Statistic	**Value**	**K**	**Significance**	**I_0 Bound**	**I_1 Bound**
F-Statistic	6.549	5	10%	1.81	2.93
			5%	2.14	3.34
			2.5%	2.44	3.71
			1%	2.82	4.21

Table 3 shows the results of the ARDL bounds test, which is used to investigate the existence of a long-run relationship, also known as cointegration. This test's null hypothesis

presumes that there's not a long-run relationship. Its output is interpreted using off-statistics as well as upper bound value systems. Level I(0) values seem to be lower bound values, whereas first distinction values I(1) are higher. Assume the f-statistics value seems to be greater than the upper bound at a 5% significance level. In that case, the existence of a long-run relationship was being confirmed, as well as the null hypothesis is rejected. The f-statistics value was 6.549, that was significantly greater than the upper bound I(1) at a 5% level of significance of 4.21, as shown in the table. As a result, the condition was met, and the existence of a long-run relationship between foreign direct investment, exchange rate, fiscal deficit, economic growth (GDP) and external debt (ED**)** was confirmed.

Table 4
ARDL Short Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
d(ED)	-0. 954671	0.516234	-0.018369	0.9854
d(REER)	-0. 734588	0.366781	-2.198725	0.0346
d(REER(-1))	0. 821773	0.352456	2.350442	0.0245
d(FD)	-0.723048	0.187724	-3.851663	0.0005
d(GDP)	0.313031	0.079696	3.927796	0.0004
d(GDP(-1))	0.272094	0.138734	1.961273	0.0578
d(FDI)	0.412568	0.089223	3. 779265	0.0004
d(FDI(-1))	0.242231	0.173835	1.92963	0.0578
ECT	-0.631886	0.154216	-3.042740	0.0000

Table 4 shows the ARDL short-run outcomes confirm that the exchange rate and fiscal deficit are positive link with external debt. However, the GDP has a positive and significant relationship with the external debt. These are aligned with studies (S. Rahman & Idrees, 2019). Thus, the short-run findings corresponded with economic theory. According to the magnitude, it is noted that if exchange rate increases by 1%, ED decreases by -0.734588%, illustrating a negative and descending relationship. When FD. increases by 1%, ED. decreases by 0.723048%, indicating a bad as well as inverse relationship. On the other hand, economic growth (GDP) increases by 1%, ED increases by 0.313031%. Furthermore, one percent raise in foreign direct investment of 0.412568 will lead to external debt (ED).

These outcomes exhibit that FDI have a positive and significant association with external debt in the short run. These are aligned with studies (Chandia et al., 2019; S. U. Rahman, Chaudhry, Meo, Sheikh, & Idrees, 2022; Shahid, Muhammed, Abbasi, Gurmani, & ur Rahman, 2022; Zulfiqar et al., 2022). The cointegrating equation (ECT) lag value is negative, with a magnitude of -0.631886. This value indicates how long it will take for the model to transition from disequilibrium to equilibrium as well as from shorter term to long run. In a nutshell, it shows the time required for adjustments towards an equilibrium, which is the time needed to converge towards equilibrium.

Table 5
Long Run ARDL Estimation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REER	0.776	0.205	3.776	0.001
FD	0.336	0.078	4.308	0.000
GDP	0.292	0.162	1.799	0.081
FDI	0.459	0.094	3.812	0.015

Table 5 The results from the long-run analysis of the model. It describes the behavior of the model in a long period regarding the trend and magnitude of the concerning variables. But results in the case of long-run are inconsistent with the theory. Nevertheless, it is clear from the table that foreign direct investment (FDI), fiscal deficit (FD), exchange rate (REER), economic growth (GDP) have significantly and positively correlated with the external debt (ED), It is

resulted that when there is a 1% upward change in REER, then ED it also moves up to 0.776%, indicating direct and positive correlation.

But when FD goes up by 1%, then ED. also moves up 0.336%, which seems difficult to interpret and is inconsistent. When GDP moves up by 1%, the ED. also goes up by 0.292%. The positive influence of FDI, exchange rate, fiscal deficit and economic growth with external debt. These studies are aligned with Bilal, Shah, Rahman, and Jehangir (2022); Folorunso (2013); Zhu, Fang, Rahman, and Khan (2021).

5. Conclusion

The core aims of the study to analyze the impact of exchange rate, foreign direct investment, economic growth (GDP) fiscal deficit on external debt (ED) in Pakistan. The study covered the time period from 1973-2021. Using ARDL Bounds testing to cointegration technique, our findings confirm that the influence of economic growth, exchange rate, fiscal deficit and foreign direct investment have a positive and significant with external debt of Pakistan. As a result of the depreciation, domestic goods became more affordable in comparison to foreign goods, causing an increase in foreign demand and, as a result, rising domestic exports as international products and services became more expensive, boosting domestic interest in domestic goods and decreasing imports.

Author contribution

Andleeb Zahra: introduction, review, writing—original draft
Saif ur Rahman: writing literature, conceptualization, data analysis—original draft
Nadia Nasir: writing—methodology and description and supervision
Sadia Idrees: explanation of results, proofreading

Conflict of Interests/Disclosures

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