An Empirical Analysis of Short Run and Long Run Association between Debt Servicing and External Debt in Pakistan

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Abstract
Pakistan is at a crucial juncture where the escalating debt servicing cost of Rs 7.3 trillion is set to consume the majority of the projected revenue of Rs 9.2 trillion, which includes Rs 5.2 trillion allocated to the provinces. This study explores the interaction between debt servicing and external debt stock in Pakistan. It analyzes the impact of variables such as the debt service ratio, fiscal deficit, exchange rate, and globalization on external debt stock, using annual data from 1990 to 2020 obtained from the World Development Indicators (WDI) and the Pakistan Economic Survey. The stationarity of the variables is tested using the Augmented Dickey-Fuller (ADF) test. The Auto-regressive Distributed Lag (ARDL) bound test is utilized to investigate the long-term relationship among the endogenous and exogenous variables, and the Error Correction Model (ECM) is applied to study short-term dynamics. The findings indicate a negative long-term relationship between debt service and external debt, while fiscal deficit, exchange rate, and globalization show significant positive correlations with foreign debt. The study provides policy recommendations to alleviate the external debt burden.
Keywords: External-debt, debt service ratio, fiscal deficit, ARDL, Pakistan

1. Introduction

Pakistan's external debt problem is complex and presents serious obstacles to the growth and stability of the nation's economy. In Pakistan, external debt has mostly financed government spending rather than being used to increase public investment. This mishandling of debt has made it harder for the nation to pay off its debt and hasn't produced the anticipated economic gains (Iqbal, 2024). Pakistan's debt-to-GDP ratio, which was projected to be roughly 75% in 2022 and over the limit stipulated by the Fiscal Responsibility and Debt Limitation Act, has been a source of worry. This high ratio raises the danger of default and hinders economic growth because it shows a substantial debt load relative to the size of the economy (Wahid, 2023).

The impact of Pakistan's external debt, which amounted to 36.4% of GDP in 2023, on its economic performance is noteworthy. Although external debt can be a source of funding, managing it well is necessary to assure sustainability and prevent an undue dependence on borrowing. Significant obstacles to economic stability and progress are Pakistan's increasing national debt, poor use of resources, expanding population, high unemployment rates, energy crises, and circular debt problem. The long-term economic prosperity of Pakistan depends on addressing these issues. Pakistan must negotiate repayment arrangements and obtain additional funding from a variety of sources in order to meet its substantial debt service obligations. To prevent financial hardship, the nation's debt commitments, particularly those to bilateral lenders and international institutions, need to be carefully managed (Eng, 2024).

External debt is considered to be helpful in fuelling the economic growth and Development of a country but only up to a certain limit and proper checks and balances. If there is improved check and balances and limit is crossed then external debt becomes a serious crisis leading a country into economic destruction. Most studies favour external debt to be important especially for developing countries. External debt is one of the primary characteristics of developing countries, which helps them to escape out of poverty trap if amount of debt is properly used in most economic projects. In most of these countries internal management is not so good to use amount of loans properly. Economic growth poorly affected because of current account deficit and leads the country into debt trap (Hung, 2021).

There are various reasons for country to go for external debt, when home demand for goods and services in a country exceeds home supply of goods, services, imports are greater than exports leading negative trade balance decreasing the foreign exchange reserves, and thus economy suffers from budget deficit. This builds a basis n, which a country seeks, foreign aid. Nevertheless, these loans are as effective as internal policies of indebted country. Political instability in a country also leads to debt trap. Planners are also not so keen to understand critically grassroots effects of their policies. When amount of aid is not used properly or when used in non-economic Developmental projects, excess of government expenditure over government revenue, excess of savings over investment (saving investment gap), deteriorated terms of trade plunges a country into serious debt trap (Bunevich et al., 2020).

Since debt servicing is closely connected to external debt of the economy, which entails paying back both the principal borrowed and the interest accumulated on external debt obligations, it is intimately associated with external debt. Repaying borrowed money involves paying back the principal amount as well as any interest that has accrued. This process is known as debt servicing. It is essential to controlling external debt since it guarantees that nations fulfill their financial commitments to foreign creditors (Iqbal, 2024). In order to achieve external debt sustainability, a nation must manage its debt levels so that it can fulfill its debt service commitments without having to take on further debt relief or postpone payments. Sustaining external debt sustainability, preventing the buildup of arrears, and promoting economic growth all depend on efficient debt servicing. Preserving a nation's solvency and liquidity requires proper debt servicing. A nation's creditworthiness, financial stability, and general economic health can all be negatively impacted by neglecting to pay off its external debt, which can also result in solvency and liquidity issues. One of the most important aspects of managing a nation's exposure to hazards associated with debt is debt servicing.

The primary aim of the study is to analyse the impact of debt servicing and macroeconomic-determinants (fiscal deficit, exchange rate, GDP per capita and trade openness) on external debt stock in Pakistan from 1990 to 2020 using time series data taken from World Bank WDI.

Next, second section discusses the review of literature. Third section represents the theoretical framework, data sources, and methodology of the study. Fourth section presents results of the estimation of the model and finally conclusion and recommendations are presented in the fifth section.

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2. Literature Review

Different researchers used different types of data time series, cross sectional and panel data and their empirical results were different regarding the factors of external debt. Several studies have examined foreign indebtedness over the years, according to the literature. Among the first to claim that external factors could a nation became vulnerable and insolvent following the 1980s foreign debt crisis. In the initial wave of the financial crisis, the majority of these studies try to examine the factors that contributed to difficulty in servicing debt. According to Ajayi, (1991), there are two main categories of factors that contribute to debt accumulation: internal and external. It is important to note that external influences have a significant impact on domestic events. According to Loser, (2004), the real effective exchange rate, inflation, output growth, and net international reserves were among the ED indicators. Trade terms, interest rates, monetary indicators, export and import patterns, fiscal imbalance, and lending to the public sector. On the other hand, Qiu, (2010) defines ED as capital borrowed from an external source, where the government obtains the loans through the issuance of government bonds, securities, and bills. In this study, he discovered that the accumulation of EDs in developing nations is primarily brought on by an irrational debt structure, improper debt use, and a worsening foreign trade environment that results in a sharp reduction in export revenue.

Mohey-Ud-Din, (2006), Stambuli, (1998) and Hasan et al., (1999) discussed the debt crises, researcher found that exchange rate appreciation, increased interest rates, deflation in product prices are main reasons of debt crises in least developed countries.

Greenidge et al., (2010), Zafars, et al., (2008) examined the determining factors of external debt using panel data spanning 1987-2005. External debt as dependent variable and cost of borrowing and come, real effective exchange rate and government expenditure were independent variables. Panel co-integration and dynamics ordinary least square techniques were used and results reveals that external debt positively affected by government expenditure divergence from its inclination value and real exchange rate, real cost of borrowing, exports and output gap were negatively related to external debt.

Awan et al., (2011) analysed the effect of fiscal-deficit, exchange-rate and terms of trade on external-debt in Pakistan and used the time-series-data spanning 19972-2008, Johansen co-integration approach used for long-run and short run-analysis between variables of study. One-way long-run causality found from Fiscal-deficit to external-debt and terms-of-trade to exchange-rate in Pakistan. Carrol, (2013) studied impact of external-debt on the growth of economy and used data spanning 1970-2010 time series analysis. External debt, Gross domestic product, government expenditure and foreign private investment were the variables in which Gross domestic product as a dependent variable. Results of ordinary least square method (OLS) revealed that external debt was statistically significant and negatively affected Nigerian economic growth. Culha, (2006) in Turkey also found similar results.

Curtasu, (11) and Ezike and Mojekw, (2011) analyzed the sustainability of public debt in European economies from 1970 to 2012. They used actual public debts, actual government revenue, actual government spending, and actual interest rates. The investigation made use of the Fiscal Reaction Function test and the Cointegration test. The findings showed that determining the sustainability of public debt is highly challenging and that there is no right path to take in order to draw a precise conclusion.

Awan et al., (2014) used time-series-data spanning 1975 to 2010 to examine the macroeconomic-determinants of external-debt in Pakistan. Results showed they exchange-rate, Fiscal-deficit and trade-openness were statistically-significant in determining external debt of Pakistan. There was also evidence of long-run relationship between exchange rate and external debt burden and Fiscal deficit and external debt. Foreign aid was positive but statistically insignificant. Terms of trade had negative effect on external-debt and was not statistically significant. The study recommended that there should be effective debt management policies.

Sa'ad et al., (2017) in Nigerian study researcher used time series data from 1973 to 2013. An ARDL co-integration technique used to study the relationship between variables of study. The long run relationship between external debt and its determinant consumer price independent, interest payments on external debt, GDP and M2 checked by co-integration. Results showed that log of GDP and log of CPI are negatively related to external debt. Among log of interest payments on external debt (ln IR) and log of M2 (lnM2) had positive relationship with log of dependent variable (ln ED). Among all independent variables only GDP was statistically significant at 10% level. Insaidoo, (2017) analysed the determinants of short-term external-debt stock in Ghana, employing time-series-data spanning 1970-2012. Bound test was conducting in order to check the influence of determining factors of external debt. Results showed that decreased regulations restrictions on external borrowing, greater difference between domestic and international-interest-rates, performance of economic-growth and domestic-financial-deepening were statistically significant and positively related to short term external-debt stock in short-run and in long-run. Trade openness was statistically significant and negatively related to short-term external-debt stock in Ghana.

The Ethiopian study spanning 1881-2016 using autoregressive distribution lag bound Approach, results revealed that trade deficit, Fiscal deficit, saving investment gap and debt services were statistically significant and positively related to external debt in Ethiopia. GDP Growth rate, inflation rate and trade openness were statistically significant and negatively affected Nigerian external debt (Beyene and Kotosz, 2020).

The literature review on external debt explores various factors influencing debt accumulation across different countries and regions, utilizing diverse data types and methodologies. Studies have identified internal and external determinants of external debt vulnerability, including fiscal deficits, exchange rates, and trade imbalances. However, there remains a gap in understanding the precise relationship between these factors and external debt dynamics, particularly in terms of causality and long-term sustainability. Additionally, while some studies have focused on specific countries like Pakistan, Nigeria, Ghana, and Ethiopia (Awan et al., 2014; Beyene et al., 2020), there is a need for further research to analyse external debt dynamics comprehensively across various contexts, considering both short-term and long-term implications. Effective debt management policies are recommended based on these findings to address the challenges associated with external borrowing.

3. Data and Methodology
3.1. Theoretical Framework
3.1.1. External Debt

The word debt is derived from Latin word "debere" which means "to owe". Debt is considered as money resource to an organization which is not directly contributed by organization's owner and it's OKoh.

As per Umaru et al., (2013), debt is classified as domestic-debt, external-debt, productive-debt, and dead-weight-debt.

3.1.2. External-debt causes

There are several reasons behind countries' borrowing money. To finance transitory balance of payments (BOPs) deficit and macroeconomic requirements are two main reasons contributing to countries' need to borrow money.

According to Soludo once initial debt stock of a country cross certain threshold then it becomes problematic for a nation to pay it back and becomes a burden on it and nation finds it unable to serve the debt leading to downturn in investment and thereby in economic- growth and development (Okeke et al., 2022).

According to Tiruneh, (2004), poverty , global economic policy changes, decreased rate of returns and shocks to oil prices are the main causes of external-debt. However external-debt is one among the main factors helping developing nations to escape out of the poverty trap and to fight with their financial problems. Pakistan is one of those resorted to external debts in order to secure liquidity to finance budget deficits. Government accumulate external debt in order to finance and support public and profitable investment projects. With the help of external debt, government is above to smooth and redistribute tax path across generations and over time. Developing countries are generally unable to generate large amount of tax revenue and thus forced to borrow from external sources. High indebtness reflects poor economic growth. According to Elmendorf and Mankiwe external debt can be analysed with the help of conventional view or with Ricardian equivalence theory. Conventional view States that external debt is important but Ricardian view States that external debt is ineffective because it reflects that if government is cutting taxes means there is increasing debt burden and it will retire it with future higher taxes (Czerkawski and Czerkawski, 1991). Therefore, people save more. All this coincide with government budget constraint and permanent income Hypothesis.

3.2. Model, Methodology and Data Sources

3.2.1. Model specification

Following literature (Awan et al., (2014; Sa'ad et al., 2017; Arsh et al., 2024a; Arsh et al., 2024b; Naheed et al., 2024), we have developed the following econometric model;

$$Y_t = \alpha_0 + \beta_1 X_t + \beta_2 K_t + \mu_t ....(1)$$

Where Y_t is representing dependent variable at time period t. X_t captures independent variable, which is debt-service ratio. K_t is vector of control variables. μ_t is white noise error term satisfying all standard OLS assumptions. Subscript t shows time period from 1990-2020.

$$ED_t = f(DS_t, FD_t, EF_t, TO_t, GDP_t).....(2)$$

These are defined as;

ED_t = External-debt

FD_t = Fiscal-deficit

TO_t = Trade-openness

DS_t = Debt-services

GDP_t = GDP per capita

In order to study the relationship among external-debt and macroeconomic variables such as debt services, fiscal-deficit, nominal-exchange-rate, trade-openness, and GDP per capita following model is specified;

$$ED_t = \alpha_0 + \beta_1 DS_t + \beta_2 FD_t + \beta_3 EF_t + \beta_4 TO_t + \beta_5 GDP_t + \mu_t).....(3)$$

Expected hypothesized signs of beta coefficients are as $\beta_1(-)$, β_2 (+), $\beta_3(\pm)$, $\beta_4(+)$, $\beta_5(-)$.

Variables are estimated in the form of logarithm and following empirical-estimating-model is as;

$$LnED_t = \alpha_0 + \beta_1 LnDS_t + \beta_2 LnFD_t + \beta_3 LnEF_t + \beta_4 LnTO_t + \beta_5 LnGDP_t + \mu_t).....(4)$$

Ln ED= log of external debt, Ln FD = log of fiscal deficit, Ln ER = log of exchange rate, Ln DS = log of debt service, Ln GDP = log of GDP pc.

3.2.2. Data-sources

The current study uses annual data over the period 1990-2020 from secondary sources containing variables external debt in billions of rupees as dependent variable & trade-openness percentage of GDP, Fiscal-deficit percentage of GDP, Nominal exchange rate, GDP per capita and debt services percentage of exports, imports and income payments as independent variables. For estimation, diagnostic tests, this study used Eviews 10. Results for diagnostic test are presented in appendix (see Table A1). Table 1 shows variables and their measurements.

Table 1

Variable	Indicator	Source
Dependent	External debt billions of rupees	WDI database
Independent	Debt services percentage of exports, imports and income payments	WDI database
Independent	Fiscal deficit percentage of GDP	Pakistan Economic Survey
Independent	Trade openness percentage of GDP	WDI database
Independent	Nominal Exchange rate	WDI database
Independent	GDP per capita (2015 US$)	WDI database

3.2.3. Methodology

A unit root indicates whether a variable is stationary or non-stationary in statistics. A stationary variable has a unit root. The ADF (Augmented-Dickey-Fuller) test was utilized in this instance to verify the stationarity of the variables at various levels.

The use of unit root testing is the first step in research methodology. The empirical literature makes considerable use of the ADF unit root test. Unfortunately, a major drawback of this test is that it ignores the endogenous structural discontinuities present in the series (Nasreen and Anwar, 2020). As a result, their results lead to false conclusions. We have used the ADF with breakpoint unit root test, which takes into account the structure break in the series, to get around this flaw.

This study has used Autoregressive Distributed Lag (ARDL) bound testing Approach introduced by Shin and Pesaran, (1999), after checking for stationarity through Augmented Dickey-Fuller unit root test. ARDL approach is adopted because it advantageous over several convention co-integration approaches. Johansen co-integration approach is complex as it requires all variables must be integrated of order one. At first difference I(1) and in small samples are not much helpful. Johansen co-integration also gives biased long run model estimation when some of the explanatory variables are determined inside the model. ARDL allow for the mix order of integration of variables. Bound testing approach is used for the analysis of the long-run relationship and dynamic interaction between the variables under consideration.

Based on the findings of the unit root test, the Autoregressive distributed lag model (ARDL) is applied. ARDL has a dynamic benefit in time series frameworks when calculating the long- and short-term relationships between variables. Lag values for both dependent and independent variables are included in the ARDL model. The autoregressive distributed lag model acknowledges the presence of serial correlation, endogeneity, and other complexities in time series data by integrating lag values the independent and dependent variables' values (Nkoro & Uko, 2016). The autoregressive distributed lag model acknowledges the presence of serial correlation, endogeneity, and other complexities in time series data by integrating lag values (Nkoro & Uko, 2016).

ARDL model is represented as follows;

$$\Delta LnED_t = \alpha_0 + b_i \Delta LnDS_t + c_i \Delta LnFD_{t-i} + d_i \Delta LnEF_{t-i} + d_i \Delta LnTO_{t-i} + e_i \Delta LnGDP_{t-i} +$$

$$\delta_1 \Delta LnDS_{t-i} + \delta_2 \Delta LnFD_{t-i} + \delta_3 \Delta LnEF_{t-i} + \delta_4 \Delta LnTO_{t-i} + \delta_5 \Delta LnGDP_{t-i} + \mu).....(5)$$

- μ = Error term.
- b_i, c_i, d_i, e_i, f_i = Parameters of short-run.
- $\delta_1, \delta_2, \delta_3, \delta_4, \delta_5$ = long run parameters.

4. Results and Discussion

Table 2: Descriptive Analysis

	LnED	LnFD	LnER	LnDS	LnGDP	LnTO
Mean	7.736	1.753	4.1447	3.167	1.042	3.450
Median	7.618	1.766	4.1026	2.986	1.312	3.483
Maximum	9.481	2.251	5.0271	12.227	1.959	3.650
Minimum	5.932	0.832	3.1696	2.067	-1.856	3.108
Std. Dev	0.974	0.327	0.517	1.759	0.835	0.138
Skewness	-0.116	-0.658	-0.230	4.745	-1.693	-0.573
Kurtosis	2.137	3.407	2.189	25.069	6.1131	2.584
Jarque-Bera	0.996	2.3757	2.1891	721.43	26.4609	1.862
Probability	0.607	0.3048	0.580	0.000	0.000	0.394
Sum	232.09	52.602	124.34	95.032	31.280	103.52
Sum Sq. Dev	27.545	3.106	7.767	89.826	20.240	0.559
Observations	30	30	30	30	30	30

4.1. Unit Root Results

Here the dependent variable i.e. Ln ED is integrated of orders 1, which is the pre-requisite for implication of ARDL model. LnFD, LnER and LnTO are integrated of order one and LnGDP per capita is integrated of order zero (level stationary) (see Table 3). After unit root with breakpoint test of stationarity results remained the same in terms of order of integration of the variables (see Table 4).

Table 3: ADF Unit-root Results

Variable	Level	1st difference	Stationarity	Order of integration
LnED	-0.5024* (0.8769)	-3.3969* (0.021)	Stationary at first difference	I(1)
LnDS	-5.3787* (0.000)	-4.0798* (0.005)	Stationary at level	I(0)
LnFD	-2.4291* (0.142)	-6.1027* (0.000)	Stationary at first difference	I(1)
LnER	-1.0000* (0.738)	-4.1108* (0.003)	Stationary at first difference	I(1)
LnGDP	-3.7010* (0.009)	-7.1019* (0.000)	Stationary at level	I(0)
LnTO	-1.3994* (0.568)	-4.8840* (0.000)	Stationary at 1ST difference	I(1)

Note: *** significant at 1 % level, * significant at 5 % level, ** significant at 10 % percent level.

Table 4: ADF Breakpoint Test

Variables	Level	1st difference	Stationarity	Order of integration
LnED	-3.0297* (0.6691)	-4.4139* (0.05)	Stationary at 1st difference	I(1)
LnDS	-5.6841* (<0.01)	-25.7801* (<0.01)	Stationary at level	I(0)
LnFD	-3.2470* (0.5372)	-7.4414* (<0.01)	Stationary at 1st difference	I(1)
LnER	-2.3262* (0.9419)	-5.6987* (<0.01)	Stationary at 1st difference	I(1)
LnGDP	-4.6142* (0.0315)	-8.8300* (<0.01)	Stationary at level	I(0)
LnTO	-2.6500* (0.8502)	-8.8200* (<0.01)	Stationary at 1st difference	I(1)

Note: Value in parenthesis are probability values. ******* Significance at 1 % level, ***** significant at 5 % level, ****** significance at 10 % percent level.

4.2. ARDL Bounds Test Results

ARDL stands for "Autoregressive Distributed Lag Model" and this model is used because the variables have mix integration order. Some variables are level-stationary and some are at first-difference. Therefore, this study has been applied ARDL approach to co-integration, which demonstrates the long-term association between the factors. Table 5 presents the estimated results of ARDL bound test confirming the existence of co-integration among variables since the computed F-statistics (18.912) is greater than the upper bound critical values at all significance level as shown in Table 4 and thus rejecting the null-hypothesis of no long-run relationship among variables under consideration.

Table 5: ARDL-Bounds Results

Test-statistics	Value	K	Level of significance	Critical Value Bounds	
				I(0)	I(II)
F statistics	18.912	5			
			10%	2.08	3.00
			5%	2.39	3.38
			1%	3.06	4.15

4.3. ARDL Results

Akaike information criteria (AIC) has been used in order to select the appropriate lag length in this study. Table 6 shows the long-run results of the estimated model and ARDL model (2, 1, 0, 0, 2, 0) is selected.

Table 6: ARDL Long Run Results

Variable	Coefficients	Probability
LnDS	-0.079	0.000
LnFD	0.179	0.027
LnER	1.962	0.000
LnGDP	-0.032	0.012
LnTO	0.320	0.065
Constant	-1.585	0.031

According to long run ARDL results, debt services ratio, fiscal-deficit, exchange rate, and trade-openness are statistically significant in long run and positively associated with external debt stock except debt services which are shown here to be negatively associated with external-debt stock in Pakistan. GDP is statistically significant and has negative effect on external-debt burden. Changes in LnFD, LnER, LnTO cause changes in external-debt stock in Pakistan in the same direction. 1 % increase LnDS leads to decreases external debt by 0.07%. 1 % increase in fiscal-deficit causes 0.179 percent increase in external-debt burden, 1 %increase in exchange-rate causes 1.96 percent increase in external-debt. 1 % increase in trade openness causes 0.32 percent increase in external-debt as indicated by significant p value.

The ECM (Ect(-1)) value is -0.7364. The negative sign reveals the convergence of model towards equilibrium and the value reflects the model's adjustment speed. It manifests that disequilibrium previous year's speed of adjustment to current year is 73%.

Table.7; ECM Results ARDL-model (2, 1, 0, 0, 2, 0)

Variables	Coefficients	Probability
D(LnED (-1)	0.177	0.012
D(LnFD)	0.002	0.934
D(LnER)	1.596	0.000
D(LnDS)	-0.030	0.000
D(LnDS(-1))	0.018	0.000
DLnGDP	0.003	0.701
DLnGDP(-1))	-0.037	0.000
Ect (-1)	-0.736	0.000

4.4. Discussion

Repaying debt principal and interest has inverse effect on external debt. This is known as debt servicing. Repaying debt principal as well as interest helps lower the total amount owed and preserves the nation's reputation among creditors (Daniel and Ibrahim, 2021). On the other hand, excessive debt servicing can put a strain on a nation's finances, making it harder to pay other debts and impeding economic expansion. Fiscal deficit has direct impact on external debt in case of Pakistan. There is a complex relationship between external debt and fiscal deficit. Fiscal deficits can raise external debt even if they might have short-term beneficial effects on the economy by encouraging investment and expenditure that leads to economic growth. The economy may have trouble with debt sustainability and economic stability because of this rise in external debt in the long run (Chien et al., 2022). Our finding is consistent with Afonso et al., (2011), Flororunso, (2013), and Awan et al., (2014). Direct impact on trade openness on external debt is consistent with Awan et al., (2014). Trade openness affects economic growth and can facilitate capital inflows, the flow of commodities and services into a nation, and foreign investment. The connection between trade openness and foreign debt is nuanced, though. Increased external debt can result from high trade openness, particularly in situations where a nation purchases many goods or finds it difficult to balance its trade deficits. Trade openness can boost economic growth, but in order to maintain financial stability and sustainability, nations must efficiently control their levels of external debt (Awan et al., 2014; Chien et al., 2022).

Since LnER is also significant and has positive impact on LnED, therefore we concluded that higher exchange rate leads to increase foreign debt of a nation. A nation's exports may become more competitive in foreign markets and maybe increase in value when its currency depreciates in relation to other currencies. An increase in export revenue may contribute to the creation of additional foreign exchange that may be utilized to pay off external debt. Furthermore, a decline in the value of the national currency might lower the cost of the nation's exports for overseas consumers, boosting export demand and income. These elements may have a beneficial effect on external debt by strengthening the nation's capacity to produce foreign exchange to pay off debt (Tille, 2005). Finally, a growing GDP boosts a country's revenue generation capacity, allocates resources for debt servicing, attracts foreign investment, boosts exports, and reduces external borrowing (Iqbal, 2024). It also improves fiscal health, enabling effective debt management and potentially decreasing the debt-to-GDP ratio.

5. Conclusion and Recommendations

The aim of this study is to analyse the effect of debt service ratio and fiscal deficit on the external debt of Pakistan over the period of 1990-2020. To this end, this study employed ARDL model after testing for whether variables are cointegrated through ARDL bounds test. Results confirmed that there exists long run relation among variables. Fiscal-deficit, exchange-rate and trade-openness were significantly and positively related with external-debt while debt service and GDP ware significantly but negatively affected external debt in this study. Short run results from error correction model confirms that debt services (positive), exchange rate (positive) and GDP per capita (negative) were statistically significant. 1 % increase in debt-service causes decrease in external-debt by 0.07 and 1% increase in exchange rate leads to increase external debt by 1.96 percent. ECM value is negative and between zero and one (0 & 1). This means that model was not at equilibrium in the short-run and it converges to the equilibrium in the long-run at speed of adjustment of 73 percent. Our research leads to several policy suggestions base on research findings. A prudent debt management strategy is imperative to avoid exceeding borrowing limits, as excessive foreign loans can impede the attainment of economic growth objectives. Government borrowing should prioritize productive and commercially viable ventures, facilitating the generation of adequate resources for easy repayment. Policy makers must implement measures aimed at minimizing fiscal deficits to effectively address the challenge of burdensome external debt. It is essential to formulate an appropriate exchange rate policy to mitigate the impact of external debt burden. Policy makers should focus on implementing strategies that bolster exports and curtail the importation of luxury goods to alleviate the burden of debt.

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Appendix
Results of diagnostic tests

To determine whether or not there is an issue with the model that has been presented, diagnostic tests were utilized in this study. We also see that every test is precisely defined, and the outcomes demonstrate the stability of our model. To verify the stability of our model, we have employed multiple tests such as serial correlation, heteroskedasticity, normality test, and CUSUM & CUSUM square test.
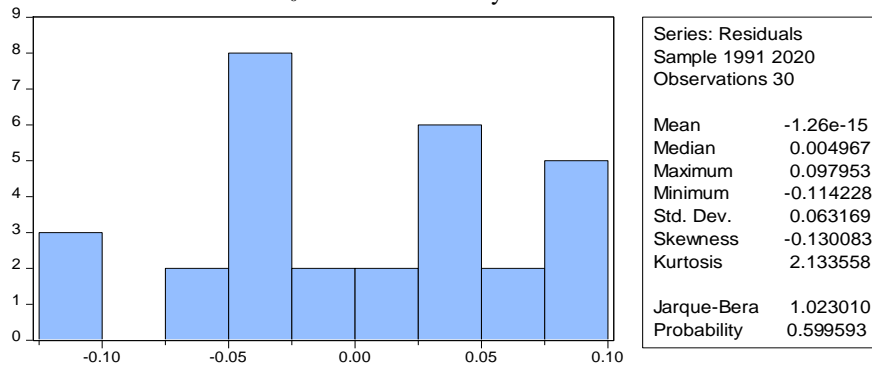
Table A1: Autocorrelation, Heroskedasticity, and JB test

R^2	0.9980
Adj. R^2	0.9969
F-Statistics	847.4847
Test	Probability
Breusch Godfrey LM test	0.2128
White-heteroskedasticity test	0.5201
J-B Normality test	0.5995

Table A2 shows that R^2 value is quite high showing 99 percent of joint variations in dependent-variable (external-debt) is explained by all independent-variables. Value of adjusted R^2 is also very high. This means that model is best fit.

Normality Test
H_0: Data are normally distributed

Series: Residuals	
Sample 1991 2020	
Observations 30	
Mean	-1.26e-15
Median	0.004967
Maximum	0.097953
Minimum	-0.114228
Std. Dev.	0.063169
Skewness	-0.130083
Kurtosis	2.133558
Jarque-Bera	1.023010
Probability	0.599593

The above graph shows that p-value of Jarque Bera is more than the significance value 0.05 so we may accept the null hypothesis.

Stability tests

CUSUM stands for cumulative sum test used for checking the systematic change in parameters and CUSUM cumulative sum of square test is used to see sudden change in regression coefficients. Stability tests revealed that parameters are stable. Figure A1 sows that model is stable as residuals lie between two straight lines. (Appendix-B)

CUSUM & CUSUM Square

The cumulative sum test, or CUSUM test, is used to evaluate the parameter constancy. The red lines represent the upper and lower bound values of 5%. If the center line falls within the upper and lower bound lines, it indicates that the results are stable. If the middle line crosses either line, it indicates that the parameters are not stable.
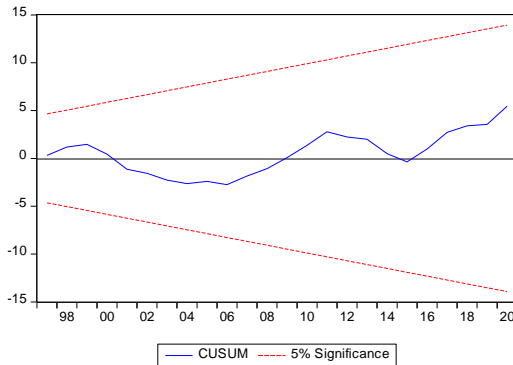
Figure A1

CUSUM

CUSUM Square
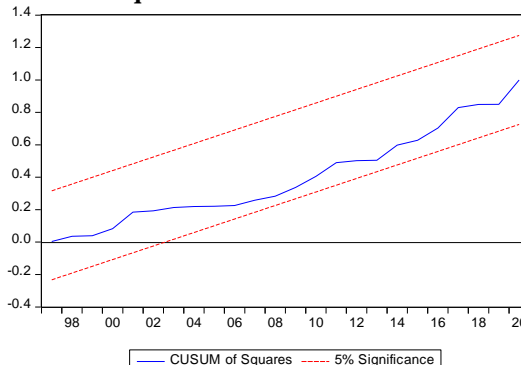
Table A2: Correlation Analysis

	LnED	LnFD	LnER	LnGDP	LnDS	LnTO
LnED	1.0000					
LnFD	-0.0102	1.0000				
LnER	0.9965	-0.0381	1.0000			
LnGDP	0.0641	0.2502	0.0964	1.0000		
LnDS	-0.0413	-0.3909	-0.0385	0.0019	1.0000	
LnTO	-0.6340	0.3431	-0.6494	0.0618	-0.0992	1.0000