



Dr. Muhammad Meraj<sup>1</sup>, Abida Malik<sup>2</sup>, Dr. Shoaib Khan<sup>3</sup>, Dr. Afaq Ali Khan<sup>4</sup>, Dr. Muhammad Noman<sup>5</sup>

## Abstract

The reliance on debt is not only essential but also a key factor in economic growth of poor countries like Pakistan because of a meager tax base and an annuity of fiscal deficit. Trade surplus is a common tool that covers the budget deficit but twin deficit makes the economic conditions worst. The excessive borrowing can stimulate the economic cycle in the short run but in the long-run it creates the issues of debt-overhang. This timely study is an attempt to investigate the short-run and long-run dynamics of debt on the economy of Pakistan. The empirical results (ARDL co-integration) suggests that long-run relationships exist among the variables under consideration such as Exports and Remittances have negative effects on debt, while other variables have positive effects. The Error-Correction-Model (ECM) analysis indicates mean-reverting behavior, where the dependent variable returns to its long-run equilibrium. Post-estimation tests support the model's assumptions. The Jarque-Bera test shows that residuals exhibit normal distribution. CUSUM and CUSUMsq tests indicate reliability and stability of the regression model. There is a long-run relationship between exports of goods and services (EGS), imports of goods and services (IGS), gross fixed capital formation (GFCF), net official development assistance (NOD), personal remittances (PRR), and debt in Pakistan. In the long-run, Exports of goods and services have a negative impact, Imports of goods and services have a significantly positive impact, Gross fixed capital formation has a positive impact, Net official development assistance has a positive impact, Personal remittances have a negative impact on debt respectively. However, Trade as a percentage of GDP has an insignificant impact on debt in the long run. The study also found that the impact of each variable on Debt is different in the short run. Overall, the study provides valuable insights into the factors that affect Debt in Pakistan.

**Keywords:** Debt Overhang, Economy, Pakistan

## 1. Introduction

In last few decades, a majority of countries in the world both developed and under-developed have achieved rapid economic growth. The case of developing countries differs a bit from developed countries as such the former one heavily rely on public debt. Reliance on debt is not only essential but also a key factor in their economic growth because of the absence of a large tax base and an annuity of fiscal deficit. Trade surplus is a common tool that covers the budget deficit but twin deficit makes the economic conditions worst. Excessive borrowing can stimulate the economic cycle in the short run but in the broader spectrum, or in the long-run it creates the issues of debt-overhang. The excessive borrowing gives negative signals to households and investors with the possibility of an increase in future tax rates. Such phenomenon not only crowds-out the short run economic stimulation but discourage private investment in the wake of excessive government expenditures. The developing countries with weak tax base system use public debt as an easy option (Owusu-Nantwi and Erickson, 2016; Mustafa, Nishat, & Abro, 2022; Hussain, ul Mustafa, Makhdum, & Ullah, 2022). In the context of Ricardian equivalence theorem, budget deficit urges the government to increase future taxes while keeping the public spending at the same level. Households reduce their current consumption to maintain the total tax burden unchanged (Greiner and Fincke, 2009, pp. 1). Pakistan is one such country that has weak tax base system and low tax to GDP ratios. According to Pakistan Economic Survey 2018-19 the tax to GDP ratio was 12.9%. The lower contribution of tax to the revenue results an increase in the budget deficit of the country. Thus, to finance the deficit like other developing economies, government has to rely on debt. While, the standard macroeconomic textbooks also suggest that the developing economies should borrow to finance their development projects. However, studies like Krugman (1988), pointed out that inefficient usage of borrowed capital could result into the failure of repayment of debt on time, and that will create the problem to acquire new credit to service the existing debt. This problem is stated as debt overhang in the existing literature. Debt overhang basically points out two primary issues (i) failure to repayment from the return on debt investment would led to borrow more for debt financing (ii) failure to meet the existing commitments would lose the creditors interest that could lead to less or no new debt for the new development projects.

Some of the earlier studies suggested that debt has no effect on growth or a very high level of public debt may deteriorate the growth, while other studies advocate the usage of debt to invest in development project to tap on growth. The empirical literature on relationship between indebtedness and growth in equivocal, hence, the objective of the study is adding up the empirical evidence of a developing country i.e. Pakistan to the inconclusive debate. Therefore, the study tends to find out whether higher indebtedness could drag the economy debt overhang or debt hinders the economic growth? Secondly, what is the impact of debt overhang on the development expenditures and overall economic growth of the economy?

This study is organized in a way that the section two reviews previous literature; section three highlights theoretical framework; section four describes data, variables and methodology; section five covers the empirical results; and the final section discusses conclusions.

## 2. Literature Review

The link between public debt and economic growth has become a focus of attention of contemporary researchers. Reinhart and Rogoff (2010) have studied inflation and economic growth at different levels of public debt by using forty-four countries' data of

<sup>1</sup> Corresponding Author, Associate Professor & Associate Dean, Faculty of Social and Basic Sciences & Head of Department (Economics), Mohammad Ali Jinnah University (MAJU), Karachi, Pakistan, [m.meraj@jinnah.edu](mailto:m.meraj@jinnah.edu), [mairu22@hotmail.com](mailto:mairu22@hotmail.com)

<sup>2</sup> Student of MS-Economics and Finance, Mohammad Ali Jinnah University, (MAJU), Karachi, Pakistan, [abidamalik2009@gmail.com](mailto:abidamalik2009@gmail.com)

<sup>3</sup> Assistant Professor, University of Ha'il, Kingdom of Saudi Arabia (KSA), [sm.khan@uoh.edu.sa](mailto:sm.khan@uoh.edu.sa)

<sup>4</sup> Assistant Professor, Department of Economics, Mohammad Ali Jinnah University (MAJU), Karachi, Pakistan, [afaq@jinnah.edu](mailto:afaq@jinnah.edu)

<sup>5</sup> Assistant Professor, Department of Economics, Mohammad Ali Jinnah University (MAJU), Karachi, Pakistan, [m.noman@jinnah.edu](mailto:m.noman@jinnah.edu)

about 200 years. Their findings revealed that the link between public debt and Gross Domestic Product (GDP) is weak for debt to GDP ratios below the threshold level of 90 percent. Checherita-Westphal and Rother (2012) study the average impact of government debt on per capita GDP growth for twelve euro areas countries, and found a non-linear hump shaped impact of high debt on growth. After a certain level, the negative effects tend to start through the channels of private savings, public investment, and total factor productivity. The maximum growth is achieved at the level of around 90% - 100% of debt-to-GDP ratios. Pattillo, Poirson, and Ricci (2002) reported the relationship between debt and growth by applying different nonlinear specifications and found that lowest i.e. 20% debt to GDP ratio contributes to growth. The link between public debt and economic growth varies country-to-country time per se (Reinhart and Rogoff, 2010; Herndon, Ash, and Pollin, 2014). Panizza and Presbitero (2014) study the link between public debt and economic growth by using the samples of Organization for Economic Cooperation and Development (OECD) countries. The initial results of their study confirm the negative correlation between debt and economic growth. Nevertheless, their results have significantly changed when the endogeneity is controlled. The conclusions based on corrected model find no significant evidence of the negative correlation between debt and growth. Balassone, Francese, and Pace (2013) found a negative connection between debt-to-GDP ratios and real per capita income growth. The study of Greiner and Fincke (2009) based on euro area countries found to have the evidence that the primary surplus increases in the initial phase of public debt in reaction to a sharp rise in debt. (pp. 37). Bilan and Ihnatov (2015) study the relationship between public debt and economic growth for a panel of 33 European countries for the period 1990-2011. Their main concern was to investigate the non-linear or quadratic relationship. The empirical results of their study found to have the existence of an ‘inverted U’ relationship with a maximum debt threshold level of about 94% of GDP. Through the channels of higher interest rates, public debt non-sustainability, and some budgetary measures, the relationship beyond 94% threshold of public debt tends to be negative with economic growth. Nevertheless, the results based on such threshold found to be twice lower in developing European countries than developed ones.

Like other economies, the empirical evidence on developing economies reported an inconclusive result. Schclarek (2004) study reveals a negative relationship between public external debt and economic growth in developing countries. The channels through which debt accumulation affects growth was capital accumulation growth. Little significance is found in relation between external debt and total factor productivity. Also, no significant relationship was found between gross government debt and economic growth for industrial countries. A recent study of Al-Refai (2015) on debt and economic growth of Jordan’s economy found that gross fixed capital formation and domestic debt have a positive relationship and labor force, external debt, and long-term debt have negative and insignificant relationship with economic growth in the case of Jordan’s economy. The study by Cordella, Ricci, and Ruiz-Arranz (2010) using the data of 79 developing country for the period between 1970-2002 reported that relationship between debt and growth is primarily influenced by the efficiency of the institutions and their effective policies. They found that countries with weaker institutions and institutions investment is not effected by the debt while the investment is negatively affected by debt in countries with strong institutions with efficient policies. They further concluded that quality and quantity of investment in economies with strong policies and institutions adversely reacts to indebtedness. Ferreira (2009), ul Mustafa, Abro, Hussain, & Ali, (2021), Ahmed, Issani, Mahar, & ul Mustafa, (2020) study the relationship between public debt and economic growth by using the granger causality method. The empirical results exhibit that the evidence of granger causality is prominent between the growth of the real GDP per capita and public debt. Also, a bi-directional causality implies that the public debt restrain economic growth but real GDP per-capita growth influence the evolution of public debt. A similar kind of study by Afonso and Hauptmeier (2009) on the annual data of 20 OECD countries for the period 1988 and 2001, found to have a bidirectional granger causality between the growth of real GDP per capita and economic growth.

Theoretically, the debt has an adverse impact on growth, however, it also suggests there are various factors that could neutralize these negative effects. Calderón, and Fuentes, (2013) study on the panel data set of 136 countries during the period of 1970 and 2010. Firstly, they reported robust and negative association between debt and growth, secondly the relationship is no linear, thirdly stated that there are structural factors that reduces the negative effect of debt on growth. These factors include development of financial markets, quality of domestic institutions, GDP per capita. They further found that quality of institutions significantly reduces the negative effect of debt on growth.

### 3. Theoretical Framework

The empirical and theoretical literature reviewed above exhibit the importance of theoretical framework design, to get the exact relationship between debt and economic growth. Barro (1979) explains that the foundation of public debt theory is based on the Ricardian invariance theorem as a first order proposition. In order to stabilize tax rate the debt are varied and gives a positive effect on debt with increase in government expenditures.

### 4. Data and Methodology

#### 4.1. Data

The data for this study is collected through Pakistan Economic Survey 2016-17 published by the Ministry of Finance, Government of Pakistan. All data series are in (constant 2005) US dollars unless indicated otherwise. Economic growth is measured by ‘gross domestic products’ (GDP), volume of trade is measured through exports and imports, gross investment, foreign assistance (measured by official development assistance), remittances, and trade as a percentage of GDP are also used to check the robustness of the models. The details of the data are provided in summary statistics in table-1 below:

#### 4.2. Model

The general specification of ARDL for the estimation of Granger Causality in ECM is listed below:

$$\Delta y_t = \alpha_0 + \sum_{i=1}^n \beta_i \Delta y_{t-i} + \sum_{i=1}^n \psi_i \Delta x_{t-i} + \emptyset ECT_{t-i} + \varepsilon_t \text{-----} (1)$$

#### 4.2.1. ARDL specification

The following specification of the ARDL model is used for this study:

$$\Delta Ldebt_t = \gamma_0 + \sum_{i=1}^n \gamma_{1i} \Delta Ldebt_{t-i} + \sum_{i=1}^n \gamma_{2i} \Delta Lex_{t-i} + \sum_{i=1}^n \gamma_{3i} \Delta Lim_{t-i} + \sum_{i=1}^n \gamma_{4i} \Delta Linv_{t-i} + \sum_{i=1}^n \gamma_{5i} \Delta Lod_{t-i} + \sum_{i=1}^n \gamma_{6i} \Delta Ltrd_{t-i} + \sum_{i=1}^n \gamma_{7i} \Delta Lrmt_{t-i} + \alpha_0 Ldebt_{t-1} + \alpha_1 Lex_{t-1} + \alpha_2 Lim_{t-1} + \alpha_3 Linv_{t-1} + \alpha_4 Lod_{t-1} + \alpha_5 Ltrd_{t-1} + \alpha_6 Lrmt_{t-1} + \varepsilon_t \quad (2)$$

#### 4.2.2. Error Correction Model in Vector Auto Regressive Framework

From the equation (2), the following error correction model is derived:

$$\Delta Ldebt_t = \gamma_0 + \sum_{i=1}^n \gamma_{1i} \Delta Ldebt_{t-i} + \sum_{i=1}^n \gamma_{2i} \Delta Lex_{t-i} + \sum_{i=1}^n \gamma_{3i} \Delta Lim_{t-i} + \sum_{i=1}^n \gamma_{4i} \Delta Linv_{t-i} + \sum_{i=1}^n \gamma_{5i} \Delta Lod_{t-i} + \sum_{i=1}^n \gamma_{6i} \Delta Ltrd_{t-i} + \sum_{i=1}^n \gamma_{7i} \Delta Lrmt_{t-i} + \alpha_0 Ldebt_{t-1} + \alpha_1 Lex_{t-1} + \alpha_2 Lim_{t-1} + \alpha_3 Linv_{t-1} + \alpha_4 Lod_{t-1} + \alpha_5 Ltrd_{t-1} + \alpha_6 Lrmt_{t-1} + \lambda_0 EC_{t-1} + \varepsilon_t \quad (3)$$

### 5. Empirical Results and Findings

**Table 1: Description of Modeled Variables**

S. No.	Variable	Notations	Measurement		Data Source	Description
1	Debt	Debt	(constant US\$)	2015	World Development Indicator	“The national debt is the total amount of money that a country owes creditors. It represents the sum of past deficits.”
2	Exports of goods and services	EGS	(constant US\$)	2015	As above	“Exports of goods and services are the total value of goods and services produced domestically that are sold to foreign buyers.”
3	Imports of goods and services	IGS	(constant US\$)	2015	As above	“Imports of goods and services are the total value of goods and services produced in foreign that are purchased by domestic buyers.”
4	Gross Fixed capital formation	GFCF	(constant US\$)	2015	As above	“GFCF is the total value of purchases of new capital goods, such as machinery, equipment, buildings, and infrastructure, during a period of time.”
5	Net official development assistance and official aid received	NOD	(constant US\$)	2015	As above	“Net official development assistance (ODA) and official aid received is the total amount of ODA and official aid received by a country, less any repayments of principal on ODA loans. It is a measure of the financial resources that are available to a country to support its development efforts.”
6	Personal remittances, received	PRR	(constant US\$)	2015	As above	“Personal remittances, received are the inflows of money that migrant workers send to their home countries.”
7	Trade as a Percentage of GDP	TRGDP	(% of GDP)		As above	“Trade as a percentage of GDP is calculated by dividing the aggregate value of imports and exports over a period by the gross domestic product for the same period.”

Source: Author’s own compilation

**Table 2: Correlation Coefficient Matrix**

Variables	Debt	EGS	IGS	GFCF	NOD	PRR	TRGDP
Debt	1.0000	0.9048	0.9672	0.9089	0.3173	0.9581	-0.4189
EGS	0.9048	1.0000	0.9167	0.9514	0.3300	0.8289	-0.2959
IGS	0.9672	0.9167	1.0000	0.9237	0.2318	0.9076	-0.2997
GFCF	0.9089	0.9514	0.9237	1.0000	0.2373	0.8303	-0.3197
NOD	0.3173	0.3300	0.2318	0.2373	1.0000	0.4558	-0.4346
PRR	0.9581	0.8289	0.9076	0.8303	0.4558	1.0000	-0.4651
TRGDP	-0.4189	-0.2959	-0.2997	-0.3197	-0.4346	-0.4651	1.0000

Source: Author’s own compilation

The table shows 7 economic indicators, their notations, measurements, data sources, and descriptions.

The table shows that all of these indicators are measured in constant 2015 US dollars. This means that the values have been adjusted for inflation so that they can be compared over time.

The data source for all of the indicators is the World Development Indicators, which is a database published by the World Bank.

The descriptions of the indicators are taken from the World Development Indicators.

The correlation matrix shows the correlation coefficients between the 7 economic indicators. A correlation coefficient is a measure of the linear relationship between two variables. The correlation matrix shows that there are strong positive correlations between Debt, EGS, IGS, GFCF, NOD and PRR. This means that these variables tend to move in the same direction. This means that these variables tend to move in the same direction, but not as strongly as the other variables.

There is a weak negative correlation between TRGDP and the other variables. This means that these variables tend to move in opposite directions.

**Table 3: ADF & PP Unit Root Tests**

Variables	ADF Test		PP Test	
	Computed-t	Prob.	Computed-t	Prob.
$\ln Debt_t$	-2.5820	0.2899	-1.8337	0.6719
$\ln EGS_t$	-2.1483	0.5091	-2.2942	0.4306
$\ln IGS_t$	-3.0357	0.1313	-2.9150	0.1651
$\ln GFCF_t$	-4.3273*	0.0054	-4.5064*	0.0032
$\ln NOD_t$	-3.7361**	0.0271	-3.6172**	0.0364
$\ln PRR_t$	-1.4276	0.8394	-1.8261	0.6757
$\ln TRGDP_t$	-2.4274	0.3623	-2.4094	0.3713
$\Delta \ln Debt_t$	-4.5138*	0.0040	-4.2035*	0.0092
$\Delta \ln EGS_t$	-8.3008*	0.0000	-8.2915*	0.0000
$\Delta \ln IGS_t$	-6.9703*	0.0000	-7.8629*	0.0000
$\Delta \ln GFCF_t$	-9.8285*	0.0000	-9.9126*	0.0000
$\Delta \ln NOD_t$	-7.6290*	0.0000	-15.0201*	0.0000
$\Delta \ln PRR_t$	-5.5944*	0.0002	-5.5944*	0.0002
$\Delta \ln TRGDP_t$	-8.3260*	0.0000	-8.5111*	0.0000

Source: Authors' estimation; Note: \*=1%, \*\*=5% and \*\*\*=10% significance levels. Optimal lag order for ADF and bandwidth for PP unit root tests is determined by Schwert (1989) formula.

The table shows the results Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests for the variables understudy. All the variables is nonstationary at level except  $\ln GFCF_t$  and  $\ln NOD_t$ . Which are stationary at 1% and 5%. The remaining variables become stationary after differencing once.

**Table 4: The ARDL Co-integration Analysis**

Estimated Model				
Optimal lag structure			(1,2,2,2,1,0)	
F-statistics			11.086615*	
Significant level			Critical values ( $T = 32$ )#	
Asymptotic: n=1000		Lower bounds, $I(0)$		Upper bounds, $I(1)$
	10%			2.94
	5%			3.28
	1%			3.99
Actual Sample Size 43				Finite Sample: n=40
	10%	2.218		3.314
	5%	2.618		3.863
	1%	3.505		5.121
				Finite Sample: n=45
	10%	2.188		3.254
	5%	2.591		3.766
	1%	3.54		4.931
R <sup>2</sup>				0.6781
Adj. R <sup>2</sup>				0.5953
F-statistics				8.1913*
D-W-statistics				1.97

Source: Authors' estimation; "Note: \*=1%, \*\*=5% and \*\*\*=10% significance levels."

Table 4 shows the results of the ARDL co-integration analysis. The F-statistic bound test is used to test the null hypothesis that there is no cointegration between the variables, which means that they do not have a long-run relationship. The alternative hypothesis is that there is cointegration between the variables, which means that they do have a long-run relationship.

The F-statistic bound test is conducted by comparing the F-statistic of the ARDL model to the critical values for the bound test. The critical values are different for different sample sizes and significance levels. In this case, the sample size is 43 and the significance level is 1%. The critical value for the bound test is 3.314.

The F-statistic of the ARDL model is 11.086615, which is greater than the critical value of 3.54. This means that we can reject the null hypothesis and conclude that there is cointegration between the variables.

The other results of the ARDL co-integration analysis, such as the R-squared and adjusted R-squared, also suggest that the model is a good fit and that the residuals are not autocorrelated.

In conclusion, the results of the ARDL co-integration analysis suggest that there is a long-run relationship between the variables. This means that the variables move together in the long run.

**Table 5: ARDL Long Run Dynamic Estimates**

Dependent Variable: Debt					
Variable	Coefficient	Std. Error	T-Statistic	Prob. Value	
<i>lnEGS</i>	-1.1537	0.6022	-1.9158	0.0629	
<i>lnIGS<sub>t</sub></i>	1.2346	0.4687	2.6338	0.0121	
<i>lnGFCF<sub>t</sub></i>	2.9561	1.0941	2.7019	0.0102	
<i>lnNOD<sub>t</sub></i>	0.8397	0.3964	2.1185	0.0407	
<i>lnPRR<sub>t</sub></i>	-0.3363	0.2071	-1.6238	0.1127	
<i>lnTRGDP<sub>t</sub></i>	0.2013	0.4958	0.4060	0.6870	
Constant	-60.4645	22.4566	-2.6925	0.0105	
R <sup>2</sup>	= 0.6781				
Adj. R <sup>2</sup>	= 0.5953				
D-W statistic	= 1.97				
F-Statistic	= 8.1913*				

Note: Authors' estimation

Table 5 shows the results of the ARDL long-run dynamic estimates. The ARDL long-run dynamic estimates are used to estimate the long-run coefficients of the model.

The table shows that the coefficient of *lnEGS* is negative and significant, which means that exports of goods and services have a negative impact on debt in the long run. A negative and significant coefficient for *lnEGS* suggests that a strong export sector is associated with a reduction in debt, indicating a potentially healthier financial position driven by positive trade balances and foreign exchange earnings.

The coefficient of *lnIGS* is positive and significant, which means that imports of goods and services have a significant impact on debt in the long run. A positive and significant coefficient for *lnIGS* implies that, in the long run, an increase in imports is associated with a significant impact on debt. This relationship could be driven by trade deficits, borrowing to support economic growth, or policy choices that prioritize imports.

**Table 6: ARDL ECM Estimates**

Dependent Variable: Debt					
Variable	Coefficient	Std. Error	T-Statistic	Prob. Value	
<i>ECT<sub>t-1</sub></i>	-0.1876	0.0178	-10.5293	0.0000	
<i>ΔlnEGS<sub>t</sub></i>	-0.0216	0.0566	-0.3817	0.7050	
<i>ΔlnEGS<sub>t-1</sub></i>	0.0851	0.0509	1.6712	0.1036	
<i>ΔlnIGS<sub>t</sub></i>	-0.0068	0.0562	-0.1212	0.9042	
<i>ΔlnIGS<sub>t-1</sub></i>	-0.1402	0.0604	-2.3192	0.0263	
<i>ΔlnGFCF<sub>t</sub></i>	0.2589	0.1045	2.4781	0.0182	
<i>ΔlnGFCF<sub>t-1</sub></i>	-0.2382	0.1177	-2.0243	0.0506	
<i>ΔlnNOD<sub>t</sub></i>	0.0302	0.0161	1.8746	0.0692	
<i>ΔlnNOD<sub>t-1</sub></i>	-0.0510	0.0172	-2.9691	0.0054	
<i>ΔlnPRR<sub>t</sub></i>	-0.0088	0.0318	-0.2771	0.7833	
R <sup>2</sup>	0.6781				
Adj. R <sup>2</sup>	0.5953				
D-W statistic	1.97				
F-statistic	8.1913*				

Note: Authors' estimation

The coefficient for *lnGFCF* is 2.9561 with a p-value of 0.0102, suggesting a statistically significant positive impact on debt. The positive impact of Gross Fixed Capital Formation on debt could be explained by businesses strategically using debt to fund capital investments with the expectation that these investments will contribute to future revenue and overall growth.

The coefficient of *lnNOD* is positive and significant, which means that net official development assistance and official aid received have a significant impact on debt in the long run. This relationship may be driven by borrowing to finance development projects and budgetary needs.

The coefficient of *lnPRR* is positive and significant, which means that personal remittances, received has a positive impact on debt in the long run. This relationship may be driven by the use of remittances to directly repay debt and reduce the overall reliance on borrowing.

The coefficient of *lnTRGDP* is positive and insignificant, which means that trade as a percentage of GDP has not impact on debt in the long run. A positive and insignificant coefficient for *lnTRGDP* suggests that, based on the available data, there is not enough

statistical evidence to confidently conclude that trade as a percentage of GDP has a positive impact on debt in the long run. The relationship might be present, but the data does not allow for a robust statistical determination of its significance.

The R-squared is 0.6781, this indicates that the model explains 67.81% of the variance in the dependent variable (Debt). The Adjusted R-squared 0.5953, this is the  $R^2$  adjusted for the number of predictors in the model. The D-W statistic is 1.97, which is close to 2. This indicates that the residuals of the model are not autocorrelated.

In conclusion, the results of the ARDL long-run dynamic estimates suggest that exports of goods and services and personal remittances, received have negative impacts on Debt in the long run. However, other independent variables have positive impacts on Debt in the long run.

Table 6 shows the results of the ARDL ECM estimates. The ARDL ECM estimates are used to estimate the short-run coefficients of the model and the error correction term.

The table shows that the coefficient of  $ECT_{t-1}$  is negative and significant, which means that the error correction term is negative. This means that the model is mean-reverting, which means that the dependent variable will eventually return to its long-run equilibrium.

The other coefficients in the table are the coefficients of the lagged differences of the independent variables. These coefficients show how the independent variables affect the dependent variable in the short run.

In conclusion, the results of the ARDL ECM estimates suggest that the model is a good fit for the data and that the error correction term is negative. This means that the model is mean-reverting, which means that the dependent variable will eventually return to its long-run equilibrium.

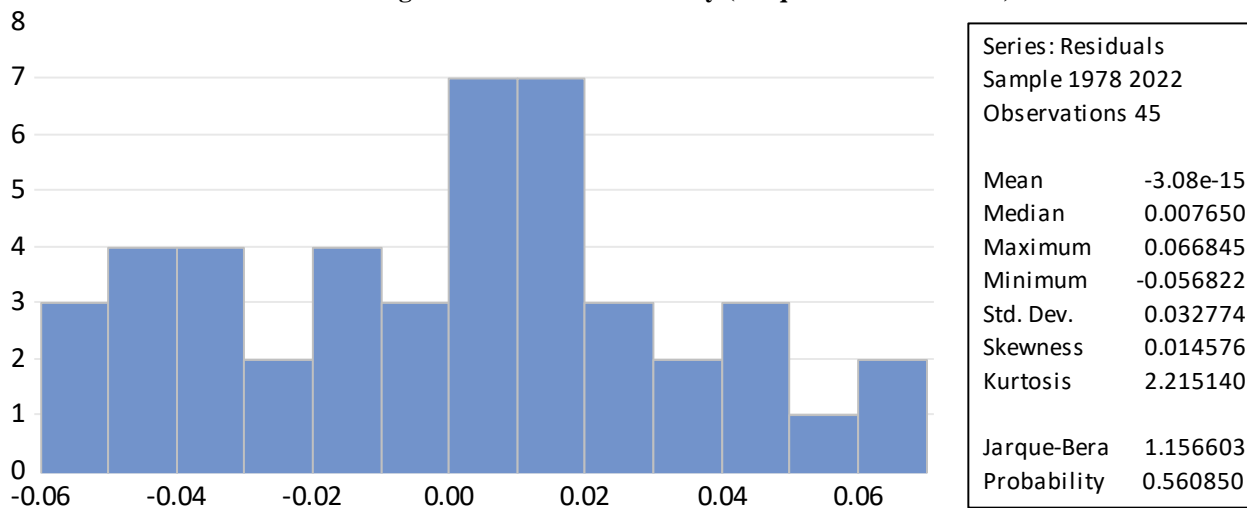
**Table 7: Post Estimation Tests**

Test	F-statistic	Obs*R <sup>2</sup>	Prob. F	Prob. $\chi^2$
B-G LM (Serial Correlation)	0.4654	1.5553	0.6330	0.4595
B-Pagan-G (Heteroskedasticity)	0.5946	11.4135	0.9613	0.7833
Harvey (Heteroskedasticity)	0.7219	13.1421	0.7499	0.6623
Glejser (Heteroskedasticity)	0.6448	12.1165	0.8201	0.7359
ARCH (Heteroskedasticity)	0.0927	0.0969	0.7622	0.7555
White (Heteroskedasticity)	0.5954	11.4249	0.8607	0.7825

Source: Authors' estimation, B= Breusch, G= Godfrey

Table 7 shows the results of the post-estimation tests. The post-estimation tests are used to test the assumptions of the model. Based on these diagnostic tests, there is no strong evidence of serial correlation or heteroskedasticity in the residuals of your regression model. In conclusion, the results of the post-estimation tests suggest that the assumptions of the model are not violated.

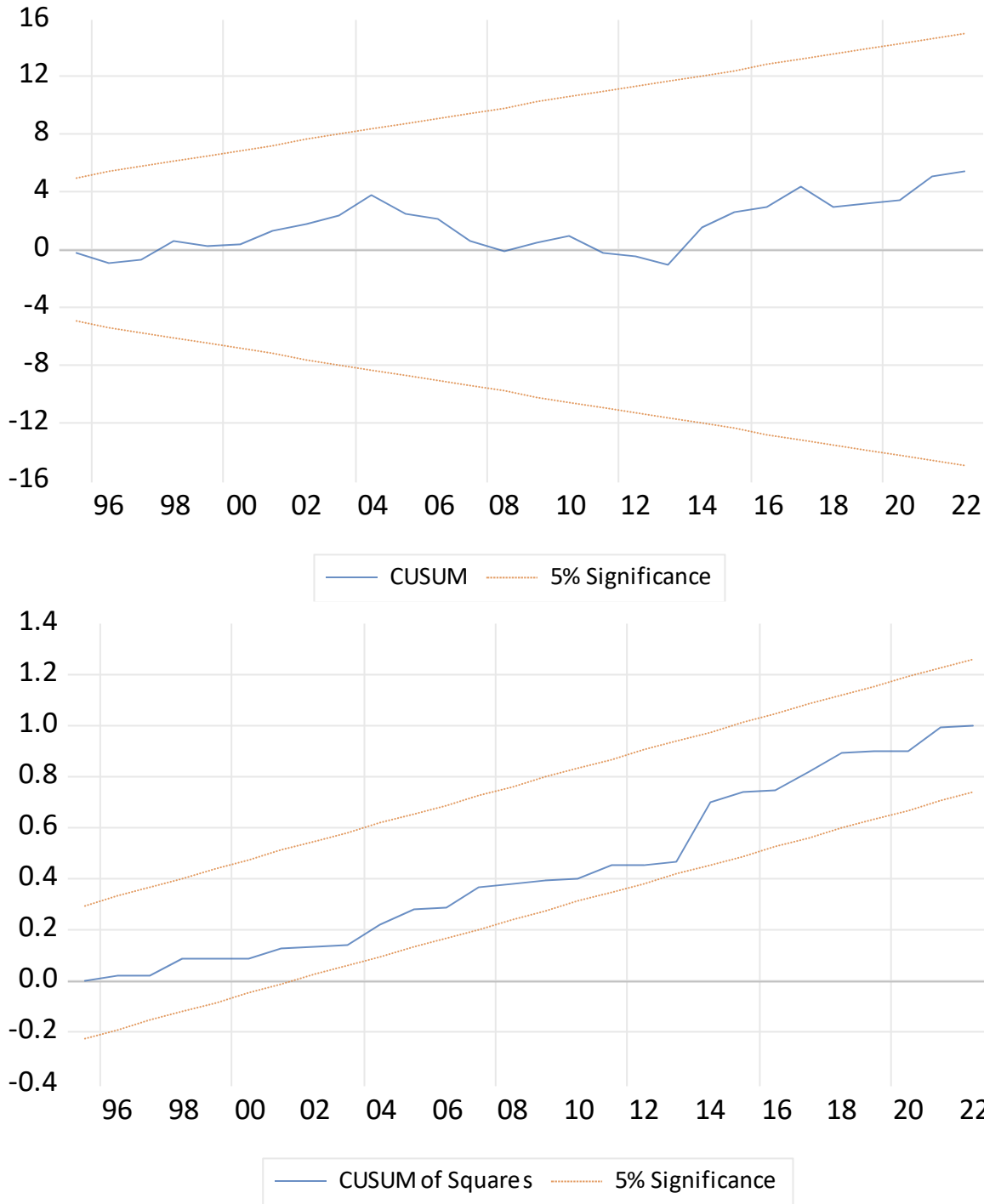
**Figure 1: Residuals Normality (Jarque-Bera estimation)**



The Jarque–Bera test is a statistical test of whether the residuals of a regression model are normally distributed. The test statistic is calculated from the skewness and kurtosis of the residuals. The null hypothesis of the test is that the residuals are normally distributed. The alternative hypothesis is that the residuals are not normally distributed.

In the above table, the Jarque–Bera test statistic was found to be 1.156603. The p-value of the test was 0.560850, which is greater than the significance level of 0.05. Therefore, we cannot reject the null hypothesis that the residuals are normally distributed. In other words, the data in the residuals do not exhibit any significant skewness or kurtosis, which suggests that they are normally distributed. This is a desirable property for the residuals of a regression model, as it means that the model is not making any unusual assumptions about the distribution of the data.

**Figure 2: CUSUM and CUSUM-SQ Tests**



The cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMsq) tests were applied to assess the reliability of the regression model under observation (Pesaran & Shin, 1999). The results of the tests, as shown in Figure 1 and Figure 2, jointly support the hypothesis that the regression equation is correctly specified (Bahmani-Oskooee & Nasir, 2004). Therefore, it can be concluded that the estimated parameters of the model are reliable and stable.

The results of the CUSUM and CUSUMsq tests in Figure 1 and Figure 2 show that the residuals do not exhibit any significant deviations from a horizontal line. This suggests that there are no structural breaks in the regression model.

## 6. Conclusions and Policy Recommendations

### 6.1. Conclusions

Based on our empirical analysis, this study concludes that the ARDL co-integration technique suggests that long-run relationships exist among the variables under consideration such as Exports and Remittances have negative effects on Debt while other variables have positive effects. The ECM analysis indicates mean-reverting behavior, where the dependent variable returns to its long-run equilibrium. Post-estimation tests support the model's assumptions. Jarque–Bera test shows that residuals exhibit normal distribution. CUSUM and CUSUMsq tests indicate reliability and stability of the regression model.

There is a long-run relationship between exports of goods and services (EGS), imports of goods and services (IGS), gross fixed capital formation (GFCF), net official development assistance (NOD), personal remittances (PRR), and debt in Pakistan. Exports of

goods and services have a negative impact on Debt in the long-run. Imports of goods and services have a significantly positive impact on debt in the long run. Gross fixed capital formation has a positive impact on debt in the long run. Net official development assistance has a positive impact on debt in the long run. Personal remittances have a negative impact on Debt in the long run. Trade as a percentage of GDP has an insignificant impact on debt in the long run. The study also found that the impact of each variable on Debt is different in the short run. Overall, the study provides valuable insights into the factors that affect Debt in Pakistan. Undoubtedly, the findings of this study assert that the government and other stakeholders should play their active role in policy making to enhance the living standard of the people of Pakistan.

## 6.2. POLICY RECOMMENDATIONS

Based on our empirical findings and conclusions of this study we urge the government and other stakeholders to devise policies to promote exports of goods and services, increase net official development assistance, and encourage personal remittances in order to reduce the reliance on long-term Debt. Also, an enormous import-bill drains the main energy of the economy in terms of external. The government can also try to reduce the impact of imports of goods and services and gross fixed capital formation on debt. The following are some recommendations that can help inform policy and decision-making in Pakistan:

- i. Promote Export-Oriented Growth: Given the positive impact of exports on industrial wages, policymakers should continue to support and incentivize export-oriented industries. This could involve providing export subsidies, reducing trade barriers, and enhancing the competitiveness of Pakistani goods in international markets.
- ii. Encourage Remittances and Worker Mobility: Personal remittances were found to positively impact industrial wages. Encouraging overseas Pakistani workers to send remittances back home can be beneficial. Additionally, policies that facilitate skill development and labor mobility can further enhance remittance inflows.
- iii. Support Trade Expansion: While trade as a percentage of GDP had a negative impact on industrial wages in the long run, it is essential to strike a balance. Policymakers should focus on trade policies that minimize potential negative effects on employment in certain sectors. Promoting diversification of the industrial base can help mitigate these challenges.
- iv. Invest in Human Capital: The negative impact of gross fixed capital formation on industrial wages underscores the need for careful investment in capital goods. Policymakers should prioritize investments in industries that create jobs and enhance worker skills. This could involve targeted investments in education and training programs.
- v. Monitor Economic Stability: Given the mean-reverting nature of the model, policymakers should be vigilant about maintaining economic stability. Instability in economic conditions can disrupt the equilibrium and affect industrial wages negatively. Maintaining macroeconomic stability through prudent fiscal and monetary policies is crucial.
- vi. Long-term Planning: Policymakers should adopt a long-term perspective when designing economic policies. Short-term fluctuations can have repercussions on the long-run equilibrium, as indicated by the error correction model. Policymakers should consider how policy changes may affect the long-term dynamics of the economy.
- vii. Continued Research: Economic relationships are complex and can evolve over time. Continuously monitoring and researching the interactions between economic variables and industrial wages can provide insights for adjusting policies as needed.
- viii. Regional Development: Consider regional disparities when formulating economic policies. Different regions of Pakistan may experience varying impacts from economic policies and international trade. Tailoring policies to address regional disparities can help distribute the benefits of economic growth more evenly.
- ix. Labor Market Reforms: Assess and implement labor market reforms to ensure that workers are adequately protected and receive fair wages. Reforms should aim to balance the interests of both workers and employers while promoting job creation.
- x. Diversification and Innovation: Encourage economic diversification and innovation within industries. Diversification can reduce the vulnerability of specific sectors to economic shocks, while innovation can lead to productivity gains and job creation.

These recommendations are intended to provide a broad framework for policymakers to consider when developing economic policies in Pakistan. It is important to continually assess the economic landscape and adjust policies as needed to reduce debt and improve the well-being of the people of Pakistan.

## References

- Afonso, A., & Hauptmeier, S. (2009). *Public Debt and Economic Growth: a Granger Causality Panel Data Approach* (No. 2009/24). ISEG-School of Economics and Management, Department of Economics, University of Lisbon.
- Ahmed, N., Issani, M., Mahar, S. A., & ul Mustafa, A. R. (2020). Social Media and Social Entrepreneurship: Two Brothers on Same Mission. *International Journal of Management (IJM)*, 11(12).
- Al-Refai, M. F. (2015). Debt and Economic Growth in Developing Countries: Jordan as a Case Study. *International Journal of Economics and Finance*, 7(3), 134.
- Balassone, F., Francese, M., and Pace, A. (2013). Public Debt and Economic Growth: Italy's First 150 Years. *The Oxford Handbook of the Italian Economy since Unification*, OUP.
- Barro, R. J. (1979). On the determination of the public debt. *Journal of political Economy*, 87(5, Part 1), 940-971.
- Bilan, I., and Ihnatov, I. (2015). Public debt and economic growth: a two-sided story. *International Journal of Economic Sciences*, 4(2), 24-39.
- Calderón, C., & Fuentes, J. R. (2013). *Government debt and economic growth* (No. IDB-WP-424). IDB Working Paper Series.
- Checherita-Westphal, C., and Rother, P. (2012). The impact of high government debt on economic growth and its channels: An empirical investigation for the euro area. *European Economic Review*, 56(7), 1392-1405.
- Cordella, T., Ricci, L. A., & Ruiz-Arranz, M. (2010). Debt overhang or debt irrelevance? *IMF Staff Papers*, 57(1), 1-24.



- Ferreira, M. C. (2009). Public debt and economic growth: a Granger causality panel data approach. *Working papers No. WP 24/2009/DE/UECE*.
- Greiner, A., and Fincke, B. (2009). *Public debt and economic growth* (Vol. 11). Springer Science & Business Media.
- Herndon, T., Ash, M., and Pollin, R. (2014). Does high public debt consistently stifle economic growth? A critique of Reinhart and Rogoff. *Cambridge journal of economics*, 38(2), 257-279.
- Hussain, T., MUSTAFA, A. R. U., Makhdum, M. I., & Ullah, K. (2022). Defense Expenditures, Fiscal Deficit And Debt Servicing Nexus: A Case Study Of Pakistan. *Bulletin of Business and Economics (BBE)*, 11(2), 74-83.
- Khan, A. A., Inam, S. G., & Ghaffar, A. (2020). Impact Of Foreign Direct Investment On Export Of Primary Sector: Evidence From Pakistan. *Journal of Business Strategies*, 14(2), 104.
- Krugman, P. (1988). Financing vs. forgiving a debt overhang. *Journal of development Economics*, 29(3), 253-268.
- Mujahid, H., Khan, A. A., & Ghaffar, A. Nexus Between Remittances, Corruption And Poverty: A Case Of Pakistan.
- Owusu-Nantwi, V., and Erickson, C. (2016). Public Debt and Economic Growth in Ghana. *African Development Review*, 28(1), 116-126.
- Pakistan Economic Survey 2022-23. Source: [www.finance.gov.pk](http://www.finance.gov.pk) (accessed on 1<sup>st</sup> January 2024).
- Panizza, U., & Presbitero, A. F. (2014). Public debt and economic growth: is there a causal effect?. *Journal of Macroeconomics*, 41, 21-41.
- Pattillo, C. A., Poirson, H., & Ricci, L. A. (2002). External Debt and Growth. *IMF Working Papers*, 2002(069).
- Reinhart, C. M., and Rogoff, K. S. (2010). *Growth in a Time of Debt* (No. w15639). National Bureau of Economic Research.
- Schclarek, A. (2004). Debt and economic growth in developing and industrial countries. *Lund University Department of Economics Working Paper*, 2005, 34.
- ul Mustafa, A. R., Abro, A. A., Hussain, T., & Ali, S. R. (2021). Populism, seigniorage and inequality dilemma in perspective of Pakistan. *Academy of Accounting and Financial Studies Journal*, 25, 1-14.
- ul Mustafa, A. R., Nishat, M., & Abro, A. A. (2022). Social protection spending in context of structural and institutional performance: A global empirical analysis. *Social Indicators Research*, 163(2), 875-899.