EXPLORING THE CAUSES AND CONSEQUENCES OF EXTERNAL DEBT CRISES: AN ECONOMETRIC ANALYSIS – A CASE STUDY OF PAKISTAN

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CERTIFICATE

This is to certify that this thesis entitled **"Exploring the Causes and Consequences of External Debt Crises: An Econometric Analysis- A Case Study of Pakistan"** submitted by **Mr. Muhammad Nauman** is accepted in its present form by the School of Economics, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the degree in Master of Philosophy in Econometrics.

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At any time if my statement is found to be incorrect even after my Graduation the university has the right to withdraw my MPhil degree.

Date: 24/10/2024

Signature of Student

Muhammad Nauman

DEDICATED

To

My Parents, Siblings, and Family

رَّبِّ ارْحَمْهُمَا كَمَا رَبَّيَانِي صَغِيرًا

"My Lord! Be merciful to them as they raised me when I was young."

(Surah Al-Isra' 17:24)

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ABSTRACT

Several studies on external debt have solely focused either on its causes or how it affects the macroeconomic variable in a country (or a group of countries). This study investigates the causes and consequences of external debt in Pakistan. Therefore, the annual time series data has been obtained on external debt and macroeconomic variables, spanning from 1976 to 2022 to fully capture the interaction between the two. In this study, the system of equations is being developed for exploring the causes and consequences of external debt. To tackle the problem of simultaneity bias associated with the system of equation, the study utilizes the Three Stage Least Squares (3SLS) technique. The 3SLS is only appropriate when there is a correlation between error term across equations in the system. While analyzing the causes of external debt indicator, government expenditure and current account balance have a negative relationship with external debt, thus decreasing their foreign borrowings and improving the trade balance situation. However, Real GDP and Foreign Exchange reserves cause accumulation of external debt in Pakistan. Thus, the study shows that external debt has a significant adverse effect on government expenditure, balance on current account, and investment, meaning that high external debt levels discourage domestic investment and exports and government spendings. On the contrary, economic growth, foreign exchange reserves, and real effective exchange rate are positively affected by the accumulation of external debt. The significant correlation of the residuals of different equations in a system justifies the application of 3SLS model instead of the Two Stage Least Squares (2SLS) model since 3SLS gives more efficient estimates.

Keywords: External Debt, Government Expenditure, Current Account Balance, Foreign Exchange Reserves, Economic Growth, REER

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3SLS	Three Stage Least Square
2SLS	Two Stage Least Square
IDS	International Debt Statistics
IMF	International Monetary Fund
SBP	State Bank of Pakistan
WD	World Bank
WDI	World Development Indicators
SUR	Seemingly Uncorrelated Regression
ED	External Debt
FER	Foreign Exchange Reserves
IMP	Imports
EXP	Exports
CAB	Current Account Balance
FDI	Foreign Direct Investment
RGDP	Economic Growth
INF	Inflation
INV	Investment
REER	Real Effective Exchange Rate

CHAPTER 1

INTRODUCTION

1.1 Background

External debt (ED) crisis refers to a situation when a country faces significant difficulties in meeting its debt obligation. These crises normally arise when a nation accumulates an unsustainable level of external debt relative to its economic capacity to generate sufficient revenue for debt repayment. Anything causing external debt accumulation and reducing foreign exchange reserves can lead to a sovereign external debt crisis. There are rather abundant factors that trigger external debt crisis. These include debt structure, external sector of economy, domestic macroeconomic conditions, and prevailing political conditions. Numerous studies highlighted redundant factors causing debt crises. There are a wide range of factors that can potentially cause ED crises.

In the previous literature, on the cause of ED crises, there is no consensus on the hierarchal importance of variables. The research carried out by Alaminos et al. (2021) analyses various factors causing external debt crises in numerous region across the world. This analysis concludes that these factors varied across different regions. Manasse and Roubini (2009) highlight that all debt crises are not similar, and they can be different depending on the underlying challenges faced by the country, such as illiquidity, insolvency, and other macroeconomic conditions. Rather than using abundant variables in single equation, this study develops a system of equations that's help in exploring the major causes of external debt crises in Pakistan.

There are abundant factors that can cause and are affected by debt crises. Developing countries, like Pakistan, often face resources scarcity and low tax revenues to finance its expenditure and maintain external sector. To finance these deficits, the country has to rely on borrowing. Dawood et al. (2021) says there are few economies, who utilize their resources in an effective way to meet their required demand. Moreover, the Chenery and Strout (1966) developed a two-gap model which provides the motivation for the dependence of less developed countries (LDCs) on external debt. According to the two-gap model, domestic savings are not enough to fulfil the need for investment, and on the other hand, exports earning are not sufficient for financing imports (trade deficit). This gap forces the developing economy to borrow from the developed economies and international financial institutions (IFIs).

The accumulation of external borrowing over time is known as external debt. Koh et al. (2020) highlights the rapid accumulation episodes government debt of Pakistan (1962-1972, 1981-2001, 2007-2013, 2015-2018). Debt servicing turns out to be factor triggering external debt burden. The gradual rise in servicing of external debt occurs due to matured debt and interest payments on the new and expensive loans. According to IMF and rating agencies, Pakistan need $30 billion over the next three years to finance it needs, including $20-$25 billion for servicing its external debt obligations (Melka, 2023).

The relation between fiscal deficit of a country and its ED is complex. The change in both external debt and fiscal deficit can affect each other simultaneously. The rise in fiscal deficit arises due to the expansion in external debt (Folorunso, 2013). However, Awan et al. (2015) find that external debt in Pakistan increases significantly as the fiscal deficit widens. According to government budget constraint, the increase in current debt burden (domestic and external) depends on current fiscal deficit and current primary deficit, however, current fiscal deficit is increased by debt serving of previous debt, and current primary deficit (Shone, 2001). So, there occurs a two-way bond between ED and fiscal deficit.

Current account balance (CAB) of country covers all transactions of trade balance, primary income, and secondary income (current transfers). The country's current account balance encompasses all transactions related to trade balance, primary, and secondary income. Waheed (2017) finds that the increase in current account deficit increases country`s external debt, however, there current account deficit has a relatively low effect on ED compared to the effect of trade deficit. Moreover, countries with high trade openness experience a significant deterioration in CAB due to the rise in external debt (Awan et al., 2015; Ibhagui, 2018). On the contrary, the interest payment on external debt is accounted in primary income of the current account. Muli (2018) finds that the increase in external debt servicing put down-ward pressure on current account balance. The association between CAB and ED is complex because they mutually influence each other simultaneously.

Economic growth plays essential role in limiting ED accumulation and moderate debt crises. The linkages between ED and economic growth are complicated. There is a two-way relation between growth in the economy and its external debt. Several studies illustrate that economic growth dampen external debt burden (Waheed, 2017). Contrary to this, ED has both advantageous and harmful effect on a country's economic growth. The level of external indebtedness shapes the helpful and adverse effect of ED on economic growth (Casares, 2015). Moreover, the debt-overhang hypothesis postulate that the economic activity can be hindered

by a large external debt burden because the country doesn't have incentives to borrow more for new project even if it's too productive. Reinhart and Rogoff (2010) finds that the country faces a debt overhang when its external debt exceeds 90% and 60% of its GDP for advance and developing countries respectively. Additionally, economic growth suffers from the expansion of external debt (Kharusi & Ada, 2018; Malik et al., 2010).

Borrowing in international currencies is a worrying situation for the economy. Eichengreen et al. (2005) introduce the term "Original Sin" for countries borrowing in foreign currency. Cain et al. (2010) shows that in developing countries, government usually issue a substantial amount of its debt in foreign currency. As result, they Commit "Original Sin" and put the country in danger to exchange rate risks and exerts pressure on external debt to rise. Additionally, Augustine (2019) reveals that external debt increases substantially with the exchange rate depreciation in a country. Awan et al. (2015) finds that Pakistan's ED burden rises with the exchange rate depreciation'

Moreover, studies show the importance of political stability. The prevailing political conditions of a country are much more important for sovereign debt crises. Koh (2020) finds that political instability significantly causes debt crisis (Indonesia, Philippines, Turkey, Venezuela). Moreover, Trebesch (2019) highlights that government facing political instability is likely to exit debt crises.

In summary, Pakistan's stagnant foreign income and persistent accumulation of external debt, driven by government borrowing, trade imbalances, vulnerability to external shocks, and political instability, are causing external debt crises. However, the consequences of external debt extend to the increase in fiscal deficit and current account deficits, reduce investment and hindered economic growth etc. This highlights the complex connection between external debt and the macroeconomic indicators of the country.

1.2 Statement of Problem.

The existing debt crises in Pakistan cannot be attributed to any single factor or sector of country. Pakistan has been facing a debt crisis in each decade, primarily due to high levels of government borrowing (Fiscal and Primary deficit), a persistent trade deficit and current account deficit. Moreover, high debt servicing, unstable economic growth, exchange rate fluctuation and political instability are also responsible for debt crises. The existing literature on debt crises identifies abundant factors causing debt crises. On the flip side, the consequences

of high external debt are severe and complex. The widening fiscal deficit and deteriorating current account balance emerge as direct outcomes of high external debt levels. The fiscal deficit expands due to increased government spending to service the debt. Simultaneously, the current account deficit increases due to the substantial outflows associated with interest payments (debt servicing). Furthermore, the consequences extend to low/sluggish economic growth and exchange rate depreciation. The study aims to investigate the presence of bidirectional linkages between macroeconomic variables and external debt.

1.3 Research Questions.

The aim of this study is to explore the following research question.

1. How has the external debt profile of Pakistan evolved over time, and what factors have influenced these changes?

1.4 Research Objectives.

The objective of this study is as follows.

1. To develop a system of equations in capturing the causes and consequences of external debt crises.

1.5 Significance of Research

The Significance of this analysis is based on the fact that it covers various aspects of external debt causes and consequences in Pakistan, a country facing considerable economic challenges. This analysis will help the Pakistani policymakers by giving them some significant evidence on how the macroeconomic situation is distorted by the accumulation of external debt of the country. Moreover, this study will dig down the leading reasons behind the occurrence of external debt. This insight is very important for the country's stability and economic progress in order to limit and deal with the problems associated with external debt and devise appropriate measures to deal with them.

1.6 Research Gap

The current work on debt crises has mainly focused on classification (binary dependent variable) using panel data. This data approach has the advantage of a sufficiently large sample size. Conducting a country-specific analysis of external debt crises faces the challenge of a small sample. In this situation, classification limits the comprehensive understanding of factors triggering external debt crises. This approach does not effectively address the root cause of debt crises. Therefore, a need for the use of continuous variables arises that can accurately reflect the multifaceted causes of the external debt crisis. Moreover, earlier work on the factors influencing ED crises has focused on examining the direct effects of too many variables in a single equation. This study develops a system of equations that is superior in capturing the causes and consequences of external debt crises (using external debt) than a single equation. Systems of equations have the capability to provide more efficient and consistent parameter estimates compared to estimating each equation separately.

1.7 Organization of the study

The study is structured into six chapters. Chapter 1 introduces the research by providing background information, stating the problem, and outlining the research questions, objectives, significance, and the research gap. Chapter 2 delves into the history of Pakistan's external debt profile, examining various political eras and the relationship between external debt, debt servicing, and the trade deficit. Chapter 3 reviews the literature on debt crises and the responsiveness of macroeconomic factors to external debt. Chapter 4 describes the research methodology, including the research design, econometric methods, and data description. Chapter 5 presents and discusses the results of the study, including descriptive statistics, various tests, and regression results. Finally, Chapter 6 concludes the study with policy recommendations based on the findings.

CHAPTER 2

HISTORY OF PAKISTAN'S EXTERNAL DEBT PROFILE

2.1 1960s

In the 1960s, Pakistan pursued significant development projects under President Ayub Khan, focusing on industrialization and infrastructure, notably constructing major dams like Mangla[1] and Tarbela[2] to boost irrigation and hydroelectric power. Industrial growth was promoted through the installation of new industries. Despite these efforts, Pakistan's current account balance encountered persistent deficits. This deficit in current account balance was primarily due to increase in imports, driven by industrial needs, which always exceeded exports. The exports mostly consisted of agricultural goods and other primary products. Remittances didn't play a significant role throughout this period, but foreign aid, especially from the U.S., was important source of financing development projects and the balance of payments. In this period, Pakistan experienced as significant growth. However, political unrest within the country, and the 1965 war with India putted a strain on resources and caused the economy to slow down by the end of the decade. The political situation worsened, with growing opposition to Ayub Khan's dictator rule and rising tensions between East and West Pakistan over economic disparities.

2.2 1970s

In the 1970s, Pakistan experienced major economic changes in the form of nationalization. Through the Nationalization and Economic Reforms Order (NERO), the government of Pakistan takeover of large civil industries, banks and other companies. NERO badly affected investors' confidence and restrict the industrialization process. Additionally, the government initiated new mega development projects including the establishment of Pakistan Steel Mills and Port Qasim with the ongoing projects (Tarbela Dam). This careless fiscal policy due to massive increase in state activity (nationalization) significantly increased Pakistan's public debt and leaded to slower economic growth in the 1970s. In this decade, the average economic

[1] The construction of Mangla Dam cost 1.5 billion USD, and the construction spans from 1962 to 1967. This projected was funded by World Bank and the Asian Development Bank.
[2] The construction of Tarbela Dam cost 2.85 billion USD.

growth dropped to 4.8%. Moreover, due to political differences between East and West Pakistan, Bangladesh separated from Pakistan. This separation deteriorated the economy and led to a sharp decrease in exports. and. Additionally, the sharp increase in import bill due to oil prices hike (1973 oil crisis) coupled with reduction in exports drastically affected current account balance of Pakistan. Worker remittances played important role in offsetting some of the deficits. In the beginning of 1970s, Pakistan received substantial amount of foreign AID, but it declined after the global oil crisis in 1973. At the end of 1970s, Pakistan's external debt reached 8,92 billion USD, primarily due to the economic challenges following the 1971 war and the subsequent nationalization policies. The country relied heavily on foreign loans to finance its budget deficits and development projects.

2.3 1980s

In 1980s, Pakistan experienced went from nationalization to privatization and reduced state burden. The current account balance improved early in this decade but worsened by 1988 due to rising imports and stagnant exports. Exports, particularly in manufacturing and agriculture, grew, while remittances from overseas workers played a key role, though they declined towards the end of the decade. Foreign aid, particularly from the U.S. during the Cold War (Soviet-Afghan) war, supported the economy. During this period, Pakistan received around 5-7 billion USD from US and its allies for supporting and financing Cold War. The fiscal deficits persisted, with military spending consuming over 30% of government expenditure. Despite strong overall growth, high military spending, low tax revenues, declining remittances, and political instability made the economic boom unsustainable. During the 1980s, Pakistan's external debt rose significantly, from $8.9 billion in 1979 to $18.3 billion by 1989, primarily due to large fiscal deficits, debt servicing, and increasing trade deficit, financed through borrowing.

2.4 1990s

The 1990s were a challenging economic period for Pakistan, marked by rising external debt, declining remittances, and escalating fiscal deficits. By end of 1990s, Pakistan's external debt had reached to $34.2 billion. In the first half of the 1990s, the external debt was about 57.6% of GDP on average, whereas, in the second half, it increased to 62.3%. It rose to its highest level of 68.9% of GDP by the fiscal year 1998. These increasing debt burdens ended in a serious

debt crisis by the late 1990s. The public debt (as percent of GDP) increased drastically to 102% by 1999. Fears about external debt default emerged in 1996 and 1998. Pakistan faced sections imposed by the westerns due to nuclear tests in 1998. These sanctions led to a large outflow of capital. Throughout the 1990s, Pakistan's economy struggled with persistent challenges, including a widening current account deficit. Exports, particularly in textiles, stagnated due to global competition and domestic inefficiencies, while imports surged. This increased the reliance on external borrowing. Remittances from overseas workers were a key source of foreign currency, but they began to decline in the late 1990s. Foreign aid, particularly from the US, supported the economy early in the decade, but sanctions severely reduced this assistance. Moreover, this decade saw frequent changes in leadership between Benazir Bhutto and Nawaz Sharif, causing inconsistent policies and hindering economic recovery. Overall, the 1990s were stagnation period due to economic instability, accumulation of external debt and political unrest.

2.5 2000s

At the start of 2000, Pakistan's economy started to recover. GDP growth picked up, and many macroeconomic indicators improved. This growth was supported by debt relief, following Pakistan's participation in the war on terrorism. In this period, Pakistan joints the US partnership in the post 9/11 scenario which led to lot of foreign assistance and borrowing. The country managed to make its external debt more sustainable. External debt dropped to 52.1% of GDP in 2001 and further reduced to 28.3% by 2007. Thus, by the year 2007, Pakistan external debt increased to $42.6 billion. Till the mid of 2000s, Pakistan was facing fiscal deficit, but its primary balance was in surplus, however, fiscal deficit and primary deficit widen significantly in second half. In the first half of 2000s, Pakistan experiences a current account surplus for three years, followed by persistent deficit due to increasing trade deficit. The remittances increased significantly but failed to reduce the gap between current account deficit and trade deficit. During the end of 2000s, a significant increase in violence, corruption and poor economic policies led to enter Pakistan in a period of stagflation again. At the end of this decade, Pakistan external debt reached to 57 billion USD.

2.6 2010s

In the 2010s, Pakistan's economy encountered significant challenges, with external debt rising to $110 billion by the end of this decade. Pakistan's current account deficit peaked at $18.8 billion in 2018 due to high imports and stagnant exports. Exports were around $25 billion, while imports surged to $55 billion, worsening the trade imbalance. Remittances are a vital source of foreign exchange, increasing from $10.9 billion in 2009 to $24 billion by 2019. The fiscal deficits increased sharply compared to the previous decades. The increase in fiscal deficit is triggered by the increasing debt servicing. By 2018, despite earlier growth waves, Pakistan faced a major economic crisis with high inflation, currency depreciation, and a balance of payments issue. In the 2010s, Pakistan faced political instability and staged sit-ins by large political parties. Overall, while infrastructure and investment efforts were made, the economy remained vulnerable to both internal and external shocks throughout the decade.

2.7 2020s

In the 2020s, Pakistan faced significant economic challenges, with its external debt rising to approximately $131.4 billion by 2023. This accumulation is external debt is driven by number of factors. The external debt servicing increases drastically. In 2023, Pakistan serviced around $20 billion of its external debt obligations. The current account deficit persisted, largely due to high imports and stagnant exports. Pakistan experiences its highest trade deficit of $44.8 billion in 2022. Despite efforts to improve infrastructure and energy, economic growth remained low. Remittances, reaching $32 billion by 2023, provided vital foreign currency. Fiscal deficits reached 8.1 trillion PKR. During this period, Pakistan was on the edge of default due its high matured debt and interest payment with scarce foreign exchange reserves.

2.8 Historical Trends of Pakistan’s External Debt and Macroeconomic Variables

2.8.1 External Debt, Long-Term External Debt and Short-Term External Debt

Accumulation of borrowing from abroad over time is known as external debt. According to SBP (2023), “ED is to the gross sum of outstanding obligations that a country owes to

foreigners". During 2nd and 3rd quarter of fiscal year 2023, Pakistan was on the edge of default due to low foreign exchange reserves and high matured debt obligation that needs to be fulfilled. According to SBP (2023), the external debt of Pakistan reached to $131.4 billion (December 2023) compared to $126.92 billion (December 2022). During fiscal year 23, Finance Division (2023a) shows the increase in total public debt (Govt Domestic, External and debt from IMF) account for 13,64 trillion rupees, and of which external debt is around 5.91 trillion rupees (43.36% of total increase). The increasing trend in external debt burden of Pakistan is shown in figure 1. Moreover, Figure 1 illustrates the trends in Long-Term External Debt (EDLT), and Short-Term External Debt (EDST). In 21st century, external debt, EDLT, and EDST increase at much higher rate compared to the previous century. Since 2009, ESDT also shows increasing trend as shown in the following graph.

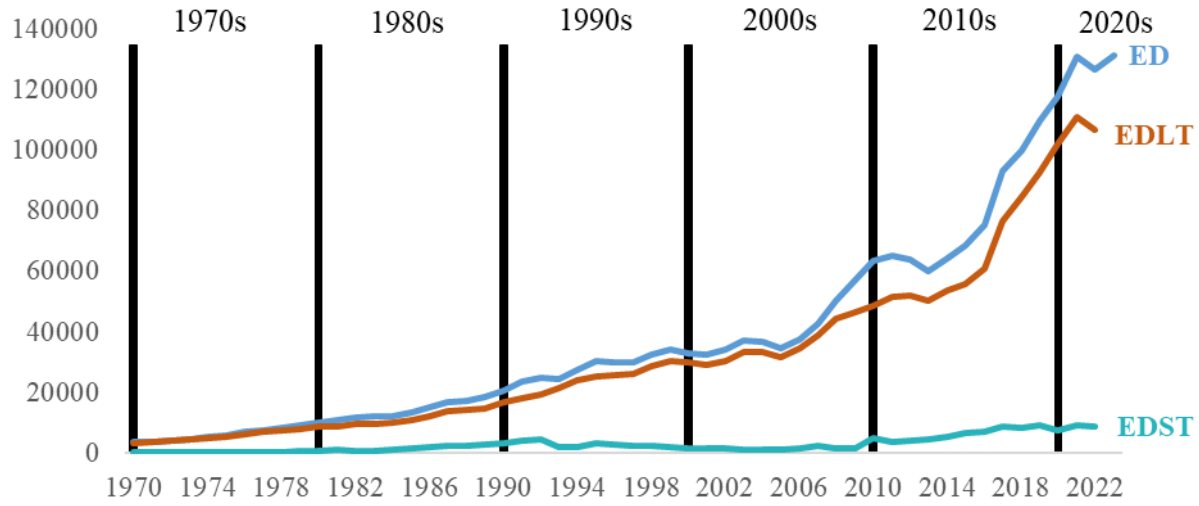

***Figure 2. 1*:** External Debt, Long-Term and Short-Term External Debt (Million USD)

2.8.2 External Debt Servicing, Interest Payment and Principal Payment

Figure 2 illustrates the trajectory of external debt servicing (EDDS), principal payments (EDPP), and interest payments (EDIP) over the decades. It highlights a significant upward trend from the 1970s to the 2020s. In the earlier decades (1970s-1980s), EDDS, EDPP and EDIP were relatively low and stable, showing manageable external debt obligations. However, starting in the mid-1990s and accelerating sharply from the 2000s onward, there is a significant increase in debt servicing and principal payments. This trend becomes even more pronounced

in 2010s and onward. Moreover, the interest payment on external debt (EDIP) increases gradually with time. During fiscal year 2023, Pakistan service $20.81 billion of its external debt, and of that $4.42 billion was interest where $16.39 billion was principal payment.

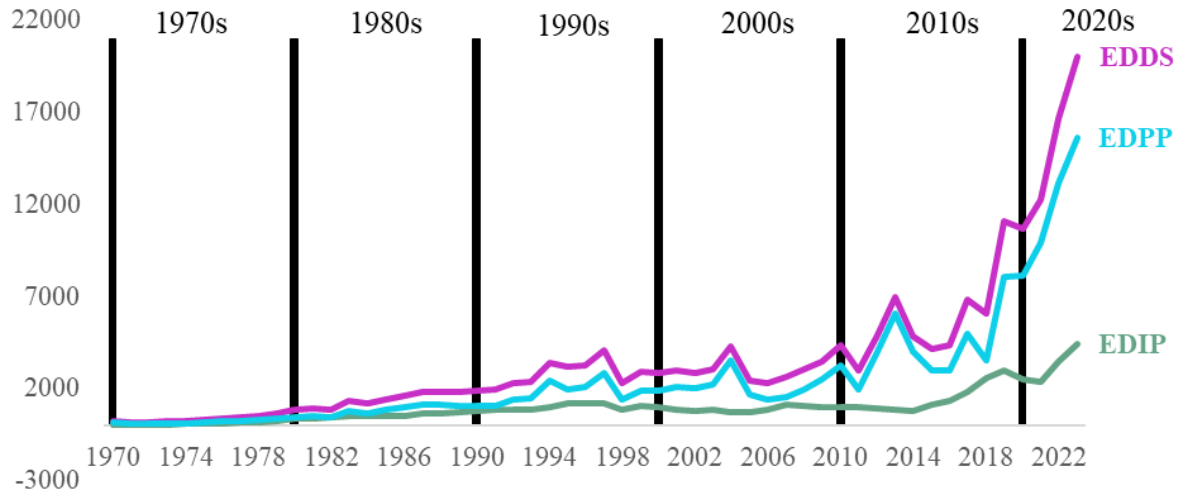

***Figure 2. 2*:** Debt Servicing, Principal Payment and Interest Payment on External Debt (Million USD)

2.8.3 Current Account Deficit and Trade Deficit

The CAD and trade deficit of Pakistan is following almost the same path. The exports and remittances earnings are not sufficient to finance the import bill. This imbalance often requires borrowing from foreign sources to cover the shortfall, thereby contributing to external debt accumulation. The graph shown below illustrates the trade deficit (TB) and current account deficit (CAD) of Pakistan. The current account deficit and trade deficit were moderate in the earlier decades (1970s-1990s). In 2000s, the Pakistan achieve current account surplus due to a significant increase in remittances and a decline in Trade deficit. Remittances play significant role in reducing the gap between CAD and TD. Since the mid-2000s, the trade balance has become more and more. In response to increasing TD, current account balance also gets worse. Pakistan's remittances have increased over time, but the increase remittances are relatively lower compared to the increase in trade deficit. This widens the gap between trade deficit and current account deficit over time.

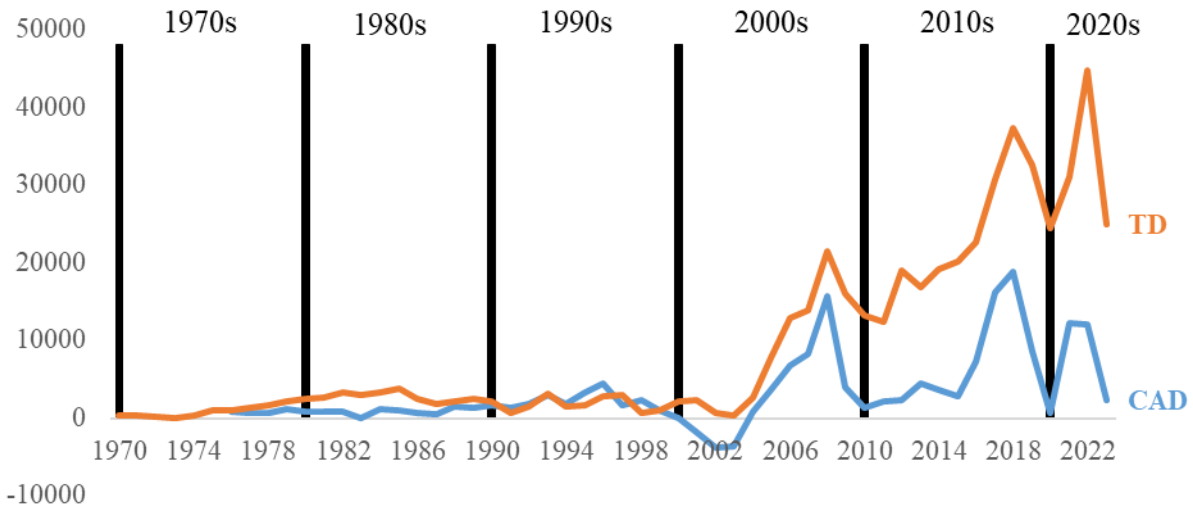

***Figure 2. 3*:** Current Account Deficit and Trade Deficit (Million USD)

2.8.4 Fiscal, Revenue and Primary

The figure depicts the trend of fiscal, revenue, and primary deficits of Pakistan's economy from 1976 to 2023. Initially, the deficits were minimal and relatively steady, without any dramatic fluctuations. However, from the 2000s onwards, all three deficits began to rise significantly. In 2020s, The sharp increase in the fiscal deficit and revenue deficit has been observed. The increase in government expenditure is relatively higher than the increase in its revenue, and least to the deterioration in fiscal health of Pakistan. Pakistan experiences large fiscal and revenue deficits due to a drastic increase in debt servicing over time. The dramatic rise in the fiscal deficit, in particular, indicates that the government's overall expenditure far exceeds its revenue, and the increasing primary deficit implies that even excluding interest payments on previous debts, the government is spending more than its income.

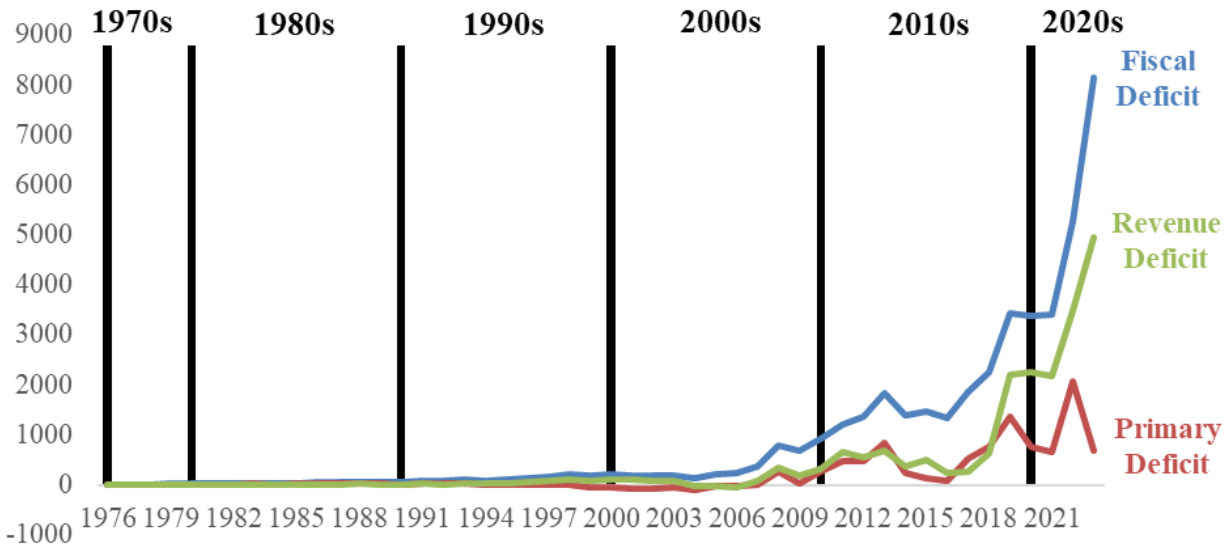

***Figure 2. 4*:** Fiscal, Revenue and Primary Deficits (Billion PKR)

2.8.5 Exchange Rate Movement

Despite the fact that exchange rate depreciation improves trade balance, its net impact on the economy is still harmful. Exchange rate has a significant effect on the cost and repayment of external debt of a country, thereby it plays vital role in defining the dynamics of the debt. According to Finance Division (2023), the depreciation of exchange rate increase public debt by 53% (7.246 trillion PKR) during fiscal year 2023 compared to 41% (3.815 trillion PKR) during fiscal year 2022. External debt makes a country prone to exchange rate shock. When a country is not earning much in foreign currency and has a large external debt obligation puts burden on the foreign reserves and ultimately causes a depreciation in exchange rate. Hence, depreciation of the exchange rate directly affects external debt it has in its own money. The following table shows external debt in domestic and foreign currency. During fiscal year 2023, the depreciation in exchange rate causes a 33.9% accumulation in external debt in domestic currency, despite the fact that external debt decreases by 4.39% in US dollars.

Table 2. 1: Exchange Rate Movement and Accumulation of External Debt

Exchange Rate Movement and Accumulation of External Debt					
	PKR/USD	**External Debt PKR Trillion**	**% Δ**	**External Debt USD Billion**	**% Δ**
FY21	159.6	19.238	1.22%	122.292	8.21
FY22	219.4	26.635	38.45%	130.32	6.56
FY23	281.0	35.682	33.97%	124.593	-4.39

CHAPTER 3

LITERATURE REVIEW

3.1 Introduction

This chapter aims to explore the previous literature that is relevant to our study. The factors responsible for sovereign debt crises have been explored by many researchers with same or different conclusions. In this chapter, we will explore the potential covariates of sovereign debt crises.

3.2 Sovereign Debt Crises

The previous work done on debt crises can be broadly categorized into theoretical models exploring sovereign default and crises, and empirical studies studying the determinants and utilizing different estimation techniques for estimating debt crises. Based on theoretical literature, many of these studies explore the determinants of debt crises. There are significantly abundant factors that can trigger sovereign debt crises.

Sovereign debt crises arise due to either one or both of the fundamental issues: a government's lack of capability-to-pay , and lack of willingness-to-pay (Bulow & Rogoff, 1989; Eaton & Gersovitz, 1981). The lack of ability to pay expresses as either illiquidity or insolvency. The lake of ability to pay can be due to either illiquidity or insolvency. The basic difference between "illiquidity" and "insolvency" is simple: illiquidity states the lack of ability to service its short-term debt and debt coming due of a country. Conversely, insolvency exhibits the inability of country to fulfill its debt obligations at time of maturity (Jedidi, 2013). Manasse and Roubini (2009) highlight that all debt crises are not similar, and they can be different depending on the underlying challenges faced by the country, such as illiquidity, insolvency, and other macroeconomic conditions. The study further state that a country can face debt crises due to illiquidity rather than insolvency. Detragiache (2001) explains the importance of liquidity in determining the ability of a country to repay its debt obligations and observes that countries with low liquidity are more vulnerable to default on their external debt obligations. Moreover, the study explains that due to self-fulfilling credit run (creditor doubt on borrower ability to repay its debt obligation), illiquidity may lead to insolvency, and this cause the nation to default even if it has the ability to meet its debt obligations. Additionally, Krugman (1988) argue that

the distinction between liquidity and solvency is not useful. The inability to attract funds arises from creditor doubt on country's solvency and this leads to illiquidity.

The willingness to pay can also be termed as strategic or rational default. Eaton and Gersovitz (1981) present a model grounded on the belief that a the decision of government to default on her debt is a strategic choice that depends on the costs and benefits of default. The cost of defaulting on debt can damage a country's reputation in international financial markets and make it more difficult and expensive to borrow in the future. So, a country that defaults cannot use international borrowing to manage its finances when its income varies over time. "*This model assumes that all borrowers possess an inherent tendency toward dishonesty, such that they will intentionally default on their obligations if it becomes advantageous to them*". On the other hand, the study also assumes that defaulting may provide short-term relief by avoiding repayment obligations, but it can also have long-term consequences such as facing a permanent embargo on future loans from private lenders. Bulow and Rogoff (1989) contradicts the assumption set by earlier models of sovereign lending that borrower has only two options: either default on their debt or fully repay it. The study emphases that the country has a third option—bargaining over repayments. Debt repudiation can significantly disturb either debtor or both, but bargaining is thought to be a more rational and feasible choice for debtor. Moreover, the study suggests that sovereign repudiation never occurs because debtor and creditor find it more efficient to reschedule.

In a net shell, there are various ability to pay indicators, including the short-term debt, ED ratio, export, and foreign reserves, showing the capability to service the debt obligations. Moreover, numerous willingness to pay indicators like trade openness and macroeconomic indicators (real GDP growth, fiscal balance, National saving), and Political stability, demonstrations the willingness to service debt. In section 2.1.2, we present all the possible factors that are responsible for external debt crises.

3.2.1 Importance of Studying Sovereign Debt Crisis

Sovereign debt crises were more common and frequent during the last quarter of the 20th century. Thus, Prediction of sovereign debt crises become more important for policymakers, investors, and lenders (Manasse et al., 2003). The policy maker can be benefited from predicting sovereign debt crises by taking preventive measures to stop or reduce these crises. They can improve debt structure by implementing sound policies (primary surplus, improve

export earnings, etc.) and reduce the risk of default (Borensztein et al., 2005). Moreover, Kristof (2021) emphasize that forecasting sovereign default risk can be helpful for foreign investors, lenders, and policymakers, to make rational decisions about lending to countries. Overall, studying sovereign debt crises is important for providing valuable insights into the dynamics underlying these critical economic events and informing policy decisions to prevent or mitigate their impact.

3.2.2 Factors Responsible for External Debt Crisis

The sovereign debt crisis is a significant challenge experienced by several sovereign entities. It usually occurs when a nation becomes incapable of serving its obligations. This phenomenon catches great significant interest in economic literature, reflecting the complex nature of this phenomenon. Extensive research has been conducted on the factors contributing to sovereign debt crisis. Here we present detailed literature on factors responsible for debt crises.

3.2.2.1 Debt Exposure

Debt overhang refers to the accumulation of debt to very high level. According to Reinhart et al. (2012), if the level of country`s public debt surpasses 90% of its GDP, for at least five years the debt-overhang occurs. Krugman (1988) suggests that "*A country experiences a debt overhang issue when the anticipated current value of potential future resource transfers is lower than its debt.*". Krugman (1988) present a debt-overhang model and shows that sovereign debt crisis can be led by a debt overhang, because it discourages investment and exports. The model describes the fact by examining the trade-off between forgiving and financing a debt overhang. A high level of debt means that a country cannot borrow more money leading to the occurrence of debt overhang. Creditors may then be unwilling to forgive the debt. This can result in a vicious cycle of indebtedness, where the country is unable to borrow more money to pay off its existing debts. The Krugman model suggests that the best way to resolve a debt overhang is to either finance the debt or forgive it. According to the Krugman model, the most helpful approach to tackle a debt overhang is either to provide financing for the debt or to grant forgiveness for it. Financing the debt involves providing the country with additional loans, while forgiving the debt involves writing off some or all the existing debt. Both options possess

its own advantages and disadvantages, and the decision between them is depending on the particular circumstances of the country.

Some studies investigate that how the occurrence of debt crises is shaped by the level of debt. The notion of debt intolerance was introduced by Reinhart et al. (2003), which refers to the failure of developing economies to efficiently manage its external debt levels that the developed countries can manage easily. Additionally, the study finds that emerging countries vulnerable to debt intolerance show surprisingly low "safe" external debt-to-GNP thresholds, possibly as low as 15 to 20 % in certain cases, and this threshold is highly depending on the default history of country. Usually, counties with large stock of external debt (% of GDP) can trigger debt crisis (Fuertes & Kalotychou, 2007; Jedidi, 2013), furthermore, a significant amount of foreign debt hinders the ability of a country to recover from a crisis. (Ciarlone & Trebeschi, 2005), and indicate the inability of country to pay its debt (Fuertes & Kalotychou, 2007).

Similarly, interest payment on external debt also plays a pivotal role in debt crises. Ciarlone and Trebeschi (2005) demonstrates that the interest payments a country pays on its external debt is a directly associated with the likelihood of facing a debt crisis. The Rise in interest rate payments elevate the possibility of experiencing a crisis. An increase in payment of interest rises the likelihood of entering a crisis. Additionally, Ciarlone and Trebeschi (2005) shows that debt crises are highly depending on short-term debt. Moreover country's liquidity factors, such as interest payments, debt servicing and short-term debt, play important role in causing external debt crises (Manasse & Roubini, 2009). Reliance on short-term debt can lead to liquidity crises if rollover of debt is not possible. Ciarlone and Trebeschi (2005) shows that debt crisis is caused by heavily depending on short-term debt. Moreover, Ahmad (2011) highlights that Pakistan's short-term external debt is increasing for many years. The short-term external debt (as percentage of exports earning) reached 100%, not primarily due to increase in short term liabilities but resulted due to stagnant exports earing.

Countries usually get assistance in a time of need from IMF. Credit from IMF reduces the risk of sovereign default, but it also acts as driver of debt crises. Ciarlone and Trebeschi (2005) finds that financial assistance provided be IMF usually reduces the probability of default (e.g. Turkey in 2001 and Brazil in 2002). Contrary to this, there is a positive link between the credit received from the IMF (% of exports) and the possibility of default. This is because countries facing issues in balance of payments are likely to request assistance from the IMF (Fuertes & Kalotychou, 2006). Contrary to this, to prevent default, suffering economies receive timely

financial assistance from the IMF. Alaminos *et al.* (2021) found that credit from IMF (IMFC) increases the probability of a debt crisis.

3.2.2.2 External (Foreign) Sector

Foreign reserves play a vital role in mitigating debt crises. A higher proportion of foreign reserves in relation to total ED decreases the likelihood of experiencing and becoming trapped in a debt crisis, and countries having large foreign exchange reserves amount of seem to be more protected from such crises (Ciarlone & Trebeschi, 2005).

Export growth reduces the possibility of a debt crisis and generates foreign exchange reserves for debt obligations. The decrease in likelihood of a country's debt crises is highly depending on the degree of openness to international trade, especially when exchange rate depreciation boosts exports and curtails imports (Ciarlone & Trebeschi, 2005). The indicator of total trade as a percentage of GDP is a reliable measure of trade openness and can effectively predict forthcoming crises. A significant large trade relative to the GDP signals the opportunity cost of default (Fuertes & Kalotychou, 2006, 2007). Moreover, Awan et al. (2015) confirms that greater trade openness contributes to the increase in Pakistan's external debt burden, indicating that changes in trade openness are a significant factor behind the rise in external debt. Export growth reduces the likelihood of a debt crisis and generates foreign exchange reserves for debt obligations (Ciarlone & Trebeschi, 2005). The higher the volatility of export growth increases a country's likelihood of being excluded from international financial market, and resulting in a greater decline in willingness to service the debt obligation of a country (Fuertes & Kalotychou, 2006).

In the short run, a CAD is found to mount the debt-GDP ratio, but it has an adverse effect on the debt-GDP ratio in the long run. It implies that utilizing the internal resource of a country, generate a significant domestic revenue rather than depending on foreign debt , can help in financing deficits and ultimately leads to mitigate the likelihood of a debt crisis (Nath, 2023). Moreover, Manasse et al. (2003) illustrate that countries maintaining a substantial surplus in their current account are less likely to experience a crisis. Meanwhile, the current account deficit increases one year before entering into the debt crisis dynamically stabilizes during the crisis and then improves in the year before exiting from the crisis. 1n late 1990s, the debt crises in Pakistan was triggered by unsustainable current account deficits and their mode of financing (mainly consists of short-term debt) (Hasan et al., 1999).

3.2.2.3 Domestic Macroeconomic Fundamentals and Debt Crisis

GDP is an aspect of economic growth that is extremely important in a nation's determination of vulnerability to its external debt crises. Thus, strong and long-run economic growth can also contribute to the formation of conditions that limit the ability of a country to enter into such crises (Fioramanti, 2008). Besides, an expanding economy increases the nation's income and helps to meet the state's fiscal obligations. Thus, reducing the risk of default. Additionally, a growing economy often signifies a better environment for investment which in turn is able to pull-in foreign capital that can contribute positively to the balance of payments. Contrary to this, REER and national savings are some of the variables that have a negative relation with External Debt Crises. High REER implies that the country's export has gained competitiveness in the international markets and could hence result in a better trade balance (Manasse & Roubini, 2009). In Pakistan, the fluctuations in the exchange rate lead to an increase in external debt burden (Awan et al., 2015). Moreover, increased national savings offers insurance against external shock, hence it is easy for the country to manage its debts obligations (Jedidi, 2013). In other words, healthy REER and increased national savings serve as protective factors that help the country avoid the occurrence of external debts crises.

However, some of the other macroeconomic variables have an inverse relationship to external debt crises` probability. Fiscal deficit, government consumption expenditure, inflation rate and supply of money, and exchange rate directly increase the probability of external debt crises. Governments running persistent fiscal deficits may resort to increased borrowing, raising concerns about their ability to service debt (Nath, 2023). Additionally, Awan et al. (2015) demonstrates that an increase in fiscal deficit is associated with a rise in Pakistan's external debt burden. Similarly, a rapidly expanding money supply can lead to inflation, eroding the real value of debt and potentially triggering a crisis (Alaminos et al., 2019, 2021). Furthermore, an unfavorable exchange rate, characterized by a depreciating national currency, can increase external debt challenges by raising the burden of ED in local currency. The principal and interest payments on external debt dominated in international currency is directly influenced by the change in exchange rate (Nyambuu, 2016).

3.2.2.4 Political and Institutional Stability

Political and Institutional Stability measures the willingness to pay of government. Manasse and Roubini (2009) highlight that country with moderate debt level is more likely to face a significant risk of default due liquidity crises caused by the joint effect of political uncertainty, short maturity, and exchange rate. Moreover, the joint effect of these three variables is expected to raise the probability of crisis by 41%. Political certainty and political freedom (index) show importance in predicting sovereign default (Manasse et al., 2003). Additionally, for Africa, Middle East, South and East Asia, the political factor (polity, measuring democracy and autocracy) is an important determinant of sovereign debt crisis, while, for Latin America, SFI (state frugality) is a significant driver of debt crisis (Alaminos et al., 2019).

Trebesch (2019) analysis shows that domestic political instability, often termed as 'political risk,' significantly predicts negotiation delays in sovereign debt crises, even when macroeconomic conditions are controlled. Government crises and instability delay the negotiation process. Debt restructuring delays due to a number of factors like challenges in establishing in new government, the resignation of important cabinet members, and political scandals. Similarly, the negotiation process is also hindered by anti-government marches, enormous protests, and street riots. The evidence suggests that countries facing political instability struggle to efficiently navigate and resolve debt crises, leading to prolonged defaults. A greater political risk (index) is linked with to reduce possibility of reaching a settlement in a given year. According to the study, a rise of one-unit in political risk (index) decreases the probability of escaping from default by 4%. The study emphasizes that political instability, especially arising from government turnover and democratic street protests, poses serious obstacles to the crisis resolution process. Particularly, other variables like country wealth, previous debt restructurings, and population volume are not statistically significant predictors of negotiation delays.

3.2.3 Estimation Techniques for Predicting Sovereign Debt Crises.

The table below summarizes important information from different research studies. It includes the names of authors, data span, the nature of dependent variable, the number of regressors, and the adopted estimation techniques.

Table 3. 1: Summary of Literature Review

Author (Year)	**Data**	**Econometric Technique**	**DV**	**IVs**	**Results**
Manasse *et al.* (2003)	1970-2002, 47 economies	LOGIT, CART	Binary	47	**Increasing Debt Crises**. High External Debt burden, High Short-term debt, High Interest Payments, High External Debt-service, IMF Credit, Govt expenditures High Inflation, Money Supply, Imports, Political Instability **Reducing Debt Crises** High Current Account Balance, Real GDP growth, Exports, FDI, National Savings **Dual Effect**
Manasse and Roubini (2005)	1970-2002, 47 economies	Binary Recursive Tree	Binary	50	
Fuertes and Kalotychou (2007)	1983-2000, 75 countries	LOGIT	Binary	28	
Fioramanti (2008)	1980-2004, 46 countries	Artificial Neural Network (ANN)	Binary	34	
Manasse and Roubini (2009)	1970-2002, 47 economies	Classification and Regression Tree (CART)	Binary	50	
Kang and Hu (2010)	1991-2006, 54 countries	BP Neural Network	Binary	8	
Jedidi (2013)	1973-2010, 60 countries	Panel Logit Model, (PCA, EWS)	Binary	15	

Markovic (2013)	1976-2010, 59 countries	CART, Random Forests, Gradient Boosting	Binary	34	Trade openness,
Dawood, Horsewood, and Strobel (2017)	1980-2012, 38 countries	Binary logit model, Dynamic signal extraction approach, Multinomial logit model	Binary	17	
Alaminos *et al.* (2019)	1970-2017, 50 countries	Fuzzy Decision tree	Binary	30	
Alaminos *et al.* (2021)	1970-2017, 115	Multilayer Perceptron Random Forests, SVM, Deep Belief Network, Fuzzy Decision Trees, Deep Neural Decision Trees, AdaBoost, and XGBoost,	Binary	29	

3.3 Responsiveness of Macroeconomic Factors to External Debt.

In the previous section where we highlight the causes of external debt crises potentially leading to high external debt burden. Here the study tries to focus on the presence of high external debt can have adverse effects on various macroeconomic variables, influencing the economic well-being of a nation. The burden of servicing external debt through interest payments and principal repayments can strain government finances, potentially leading to fiscal imbalances and current account imbalance. Moreover, economic growth is significantly prone to it, the increase in levels of external debt may divert resources away from productive investments, limiting the

capacity for sustainable economic expansion. Furthermore, external debt can contribute to currency depreciation, affecting exchange rates. All this is explained in detail in this section.

3.3.1 Fiscal Deficit and External Debt

In earlier literature, numerous studies investigate the nexus between fiscal imbalances and debt. Folorunso (2013) discovers that fiscal balance and public debt have a two-way relationship with each other. The causality is running from ED to fiscal balance. Fiscal deficit is significantly affected by both domestic and ED, whereas the effect of domestic debt is more dominant compared to external debt on fiscal deficit. Mawejje and Odhiambo (2022) finds the short run positive relation between servicing of debt and fiscal deficit in Tanzania and Burundi. Contrary to this, the GDP deflator, debt servicing and grants can mitigate fiscal deficit in ling run. Kasongo (2023) finds that the volume of government debt, growth in GDP, money supply, and rate of interest as factors responsible for fiscal deficit. With positive impacts of government debt and is negatively influenced by the supply of money economic growth, and interest rate on fiscal deficits.

Maltritz and Wüste (2015) studies that primary balance, in 27 European countries, is positively influenced by government debt. It indicates that high debt levels may incentivize fiscal responsibility and reduce deficits. Gnimassoun and Santos (2021) focus on developing countries and employ the extreme bound approach and find that public debt, external shocks, financial progress, and a democratic government has a substantial influence on public deficits. Kalim and Hassan (2013) research on Pakistan reveals that debt, money supply, and trade have significant effect on fiscal deficit. Moreover, there is a short-term association between economic growth and fiscal deficit, but it becomes insignificant in the long run. Murwirapachena et al. (2013) identifies macroeconomic indicators that include government investment, unemployment, GDP growth, and foreign reserves have a positive influence on fiscal deficits, but ED has an adverse effect on it. The study emphasizes the importance of considering government debt in understanding fiscal balance.

3.3.2 Current Account Balance and External Debt

Ibhagui, (2018) study shows that countries with high openness witness a notable expansion of current account deficits due to increases in ED. The study highlights the significant role

performed by ED in shaping the behavior and adjustment process of CAD in Sub-Saharan Africa (SSA). Specifically, a high degree of openness for a country, CAD experience substantial growth with the escalation of external debt. Interestingly, the research disregards the importance of ED on the current account, emphasizing the immediate influence ED has completely captured its effects. The effect of lagged ED is statistically insignificant and is small and economically negligible. Notably, even after controlling endogeneity, the study finds that external debt maintains strong significance across most sample periods. Furthermore, a consistent adverse relation persists between ED and CAD in SSA.

Conversely, the subject of Bulut (2011) analysis concentrates on the link ED and changes in the CAB. The empirical analysis aims to assess the effect of ED on current account. Furthermore, it reveals that the obtained coefficient of ED variable is negative in nature, indicating that ED contributes to the reduction of current account imbalances. The study shows that developing economies experience a 2.7% CAD on average, if it is not negatively affected by external debts. Consequently, a vital role is played by ED in reducing current account imbalances. The results highlight the stabilizing effect of ED on current account dynamics in developing nations, emphasizing its role in supporting investment and saving patterns. Thus, the results obtained revealed the ability of external debt to balance the current accounts of developing countries and have stressed its importance in supporting the behavior of investment and saving.

Kwalingana and Nkuna (2009), and Jawaid and Raza (2013) highlight the factors influencing current account dynamics in particular countries. Concerning the current account for Malawi, Kwalingana and Nkuna (2009) discusses how the external factors include openness, the terms of trade as well as the stock of external liabilities affect CAB. The long-run coefficient exhibits a positive sign, indicating that the decrease in the current account is attributed to the increase in debt over time. In short-term, ED stock, degree of openness, and terms of trade determine CAB. The impulse response functions describe that innovations in external debt instantly worsen the current account deficit and persist for approximately four years. On the contrary, Jawaid and Raza (2013) specifically examine Pakistan and discover a strong significant long-term connection between the CAB and the fiscal deficit, exchange rate, and trade deficit. Additionally, they examine a significant inverse correlation between ED and private saving. Granger-causality tests show a two-way causal link between the ED and exchange rate with the CAB. Additionally, there is a one-way causative relationship from the CAD to the trade

deficit and savings. These studies jointly aid to understand the complex relationship of various economic variables affecting CAB.

However, Jawaid and Raza (2013) restricted their study only to Pakistan and the outcomes showed a long run cointegration between CAD and trade deficit, exchange rate, and fiscal deficit. They also observe the adverse and significant association of CAB with ED and saving. Through granger-causality tests, it was evident that both the exchange rate as well as ED Granger-cause the CAD with equal strength in the process; while the CAD granger-cause both trade deficit and private savings in the process. All of these papers combined help to build up the understanding about how and why numerous and diverse economic factors affect CA balances in certain countries.

3.3.3 External Debt Growth Nexus

External debt can have both beneficial and adverse impacts on economic growth. On one hand, it can provide countries with necessary funds for investment in infrastructure and development projects, stimulating economic expansion. However, excessive external debt may also pose challenges, by increasing the burden of debt servicing and leads to stagnant economic growth

Multiple studies have investigated the complex linkages between ED and economic growth across different regions and income levels countries. (Mumba & Li, 2020) focus on 28 emerging Asian countries, utilizing panel data from 1995 to 2019. They discovered that ED has a beneficial effect on economic growth in the short run but turns is harmful the long run. (Qureshi & Liaqat, 2020) investigate 123 countries globally, categorizing them by income levels. Their findings revealed that ED in lower and middle-income countries is beneficial for economic growth, with the overall effect being harmful. Tarawalie and Jalloh (2021) utilizes a panel co-integration models, and found a non-linear correlation between ED and RGDP. Epaphra and Mesiet (2021) examines 45 African countries, concluding that the impact of ED on RGDP is depending the amount of the debt-to-GDP ratio, suggesting that a low debt-to-GDP ratio is helpful economic growth. East African countries from 2011 to 2019, revealing a lack of a long-run relationship, however, in the short run there is an inverse association between ED and growth (Jama, 2021). In Zaghdoudi (2020) study, an examination is conducted on low and middle-income nations spanning from 2002 to 2016. The study establishes a statistically significant association between ED and growth, with positive effects in low income and negative effects in middle-income countries.

Numerous studies discover the adverse effect of ED on economic growth across various regions and time periods. Omotor et al. (2020) reveals that economic growth is hindered by ED while emphasizing the positive role of institutional quality. Similar studies by (Azolibe, 2022) studies 20 Sub-Saharan African countries from 1990 to 2017, confirming the adverse impact of ED on economic growth. (Makun, 2021) focus on the Pacific Islands from 1980 to 2018, discovers a harmful effect of ED on economic growth. (Karadam, 2018) revealed a nonlinear association ED and economic growth in 135 countries, transitioning from supportive to adverse effects. (Shkolnyk & Koilo, 2018) studies 10 emerging countries from 2006 to 2016, emphasizing the importance of non-linearity, with ED adversely affecting economic growth. (Senadza et al., 2017) finds an injurious impact of ED on the economic growth of Sub-Saharan Africa, particularly pronounced in middle-income. (Lau et al., 2022) studies 16 developing countries in Asia from 1980 to 2016, reveals that economic growth is significantly prone to external debt, and emphasizing on the importance of fiscal discipline. Dawood et al. (2021) assert a beneficial effect of total ED on economic growth, provided it is allocated to productive sectors. However, they note the adverse impact of public ED, attributing it to governments borrowing excessively for budget and current account deficits. Furthermore, private ED is observed to have a less pronounced harmful effect on economic growth related to public ED.

Studies examining the nexus between ED and economic growth in Pakistan present various findings. Several research investigating the link between ED and economic growth in Pakistan reveals diverse outcomes. Rauf and Khan (2017) finds a long-term negative effect of ED on economic growth, utilizing the ARDL, while short-term effects are positive. Besides, Malik et al. (2010) suggest that ED and debt servicing is a threat for the growth of Pakistan's economy. Akram (2011) confirms the presence of debt overhang in Pakistan showing that public external debt significantly deteriorated economic growth (GDP per capita), both in long run and in short run. Butt and Hassan (2008) utilize the ARDL approach and obtain that economic growth is not statistically influenced by total debt. In addition, Ud-Din et al. (2020) develops an adverse association between ED and growth, meaning external loans and debt repayment discourage growth in Pakistan's economy. Similarly, contrary to economic growth, Awan and Qasim (2020) describe a negative impact of external debt and debt servicing on economic growth, and stress the importance of debt reduction, as well as resource formation generated by tax revenue and efficiency. In aggregate, these papers provide a variety of viewpoints regarding increased external debts' effect on economic growth in Pakistan.

3.3.4 Exchange Rate and External Debt

Several studies explore the impact of ED on the exchange rate. Imoagwu et al. (2023) establish that ED has an insignificant impact on the exchange rate. Besides, the study establishes that there is long run adverse effect arising from balance of trade, ED servicing and government spending on the exchange rate, while in the short run only the external debt servicing is insignificant. Saheed et al. (2015) help in showing the reasons for variation in the foreign exchange rate. The paper establishes that ED, debt service payment and foreign reserves influence the fluctuations of exchange rate, however, the most influential component of them is the debt service payment. Aderemi et al. (2020) also investigates the link between ED and exchange rate in short run and they state that ED, debt paying service, and foreign reserves are positively related with exchange rate.

Saeed et al. (2012) have studied that increase in the debt has a serious impact on the nominal exchange rate in Pakistan. The deficits and development projects financing through borrowings have been a major driver for PKR depreciation against the US Dollar. The authors suggest that policy measures aimed to reduce the deficits can contribute to currency stability. Mendoza and Gonzalez (2022) focus on the Philippines and investigate the effect of ED accumulation on exchange rates. Their findings indicate a positive relation between ED, debt services, and exchange rates, while foreign reserves exhibit a negative correlation. Additionally, Uddin et al. (2013) shows that the exchange rate is positively influenced by the stock of money and debt, while foreign exchange reserves show a negative correlation. Collectively, these studies highlight the complex nature of the relationship between ED and exchange rates.

3.4 Summary

The existing literature on external debt crises mainly centers around classification efforts, where various studies employ statistical and machine learning techniques to predict the occurrence of external debt crises using categorical variable. These studies have effectively identified numerous factors contributing to external debt crises. These studies use large sample size (panel data) without facing the issue of high dimensionality and small sample size. There is a need to explore the country specific factors causing external debt. Contrary to this, some literature shows the unidirectional effect of ED on macroeconomic indicators without thoroughly exploring the reciprocal relationships. There is a noticeable gap in exploring the

bidirectional connections between external debt and macroeconomic indicators using a system of equation that can better portray the transmission channel of external debt causes and consequences.

3.5 Conceptual Framework

The conceptual framework of this study is developed from a thorough literature review.

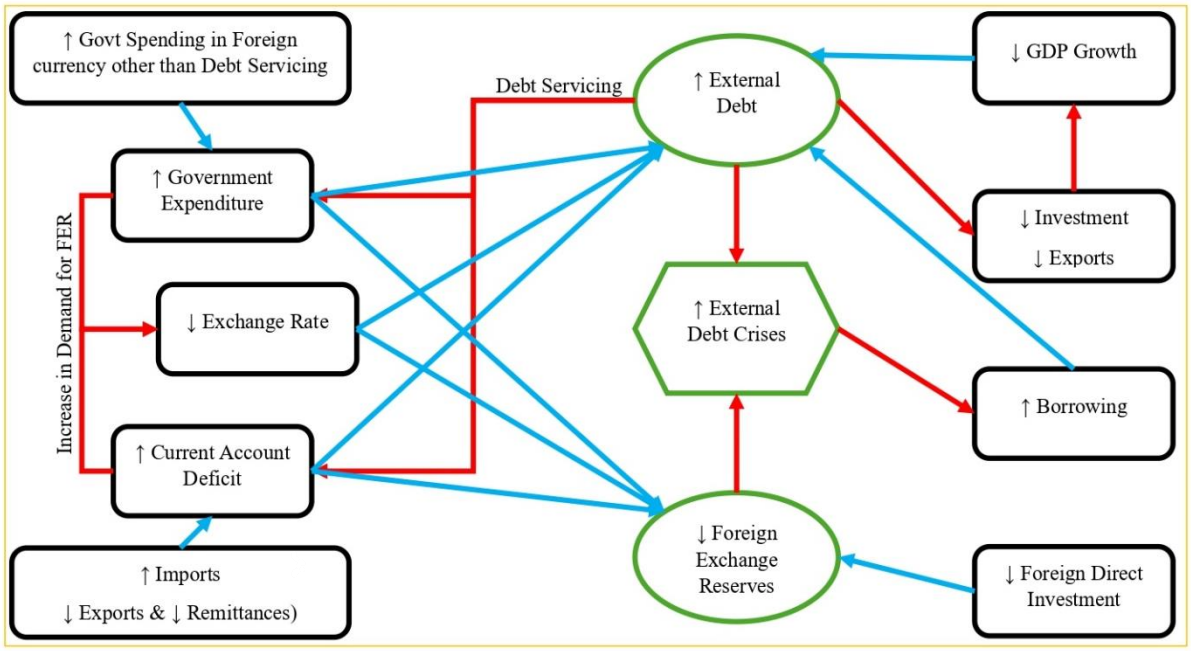

Figure 3. 1: Conceptual Framework

Red arrows illustrate the effect of external debt on macroeconomic variables. The escalation of external debt can exert a significant effect on both government spending and current account deficits, primarily through the burden of debt servicing and interest payments respectively. As the debt accumulates, a larger portion of the government's budget must be allocated towards servicing this debt, thereby limiting the funds available for essential public expenditures. At the same time, a rise in ED increases the demand for foreign exchange reserves (FER) and leads to a depreciation of the exchange rate (Mundell Fleming Model). Furthermore, the consequences of high accumulated external debt extend to hinder economic growth and to decreases investment opportunities, as resources are diverted towards debt repayment rather than productive ventures (debt overhang hypothesis).

Light blue arrows illustrate the impact of macroeconomic variables on ED and foreign exchange reserves (leading to ED crises). On the flip side, the increase in government spending (especially when denominated in foreign currency other than for debt servicing purposes) and widening the current account deficit can significantly lead to the accumulation of ED. When government spendings exceed revenue streams, borrowing becomes a necessity, often in foreign currencies, thereby amplifying external debt burdens. Furthermore, the depreciation of the exchange rate increases external debt levels, there is a proportion of external debt that is linked with the exchange rate (Special Drawing Writes). Additionally, a reduction in investment and sluggish economic growth further increases external debt levels. When investment levels decline and economic growth falters, revenue generation diminishes, making it harder for governments to meet debt obligations without resorting to further borrowing.

The escalation of government spending (in foreign currency), along side with increasing current account deficits, can lead to a reduction in foreign exchange reserves. Moreover, the depreciation of the exchange rate reduces reserves. The depreciation often leads to increase demand for foreign currency and exert pressure on foreign exchange reserves. the central bank needs to intervene in the foreign exchange market to stabilize the exchange rate. This intervention involves selling off foreign exchange reserves to purchase domestic currency, thereby depleting reserves. To sum-up, the Accumulation of external debt and reduction in foreign exchange reserves can trigger external debt crises.

CHAPTER 4

RESEARCH METHODOLOGY

4.1 Introduction

This chapter discusses the framework through which the objective of the study is carried out. This chapter explains the research methodology including research design, method of data collection, variables, analytical models, and econometric methodology.

4.2 Research Design

A research design serves as the blueprint for conducting a study. It lays out the overall strategy for addressing your research question or testing your hypothesis. The aim of this research is to analyze the causes and consequences external debt for Pakistan. The study is going to achieve this objective by collecting rich data for both explanatory variables and response variables (4.4 Description of data) from various data banks. To achieve our objectives, the study develops a system of equations that helps in capturing the effect of external debt on macroeconomic variables and vice versa.

4.3 Econometric Method

In this section, we demonstrate various models which are all regarding the causes and consequences of external debt (crises). The first two equations record the effect of various independent variables on ED and foreign exchange reserves, which are the source of causing external debt crises. While the rest of five equations captures the impact of ED (crises) on macroeconomic variables, representing the consequences of external debt crises. In this study, we estimate a system equation by employing the estimation technique developed by Zellner and Theil (1962), known as three stage least square or the seemingly unrelated regression with endogenous variables. The SUR model needs a system of multiple equations (M), wherein each equation has a single dependent variable and single/multiple independent (exogenous/endogenous) variables. The SUR model estimates multiple regression equations simultaneously while allowing for contemporaneous correlation between error terms across equations (Baltagi, 2011).

$$ED_t = \alpha_{11}GE_t + \alpha_{12}CAB_t + \alpha_{13}RGDP_t + \alpha_{14}FER_t + \alpha_{15}POL5_t + \alpha_{16}EDST_t + u_{EDt} \quad \textbf{(3.1)}$$

$$FER_t = \alpha_{21}ED_t + \alpha_{22}GE_t + \alpha_{23}CAB_t + \alpha_{24}REER_t + \alpha_{25}EDDS_t + \alpha_{26}FDI_t + u_{FERt} \quad \textbf{(3.2)}$$

$$GE_t = \alpha_{31}ED_t + \alpha_{32}RGDP_t + \alpha_{33}FA + \alpha_{34}M2_t + u_{GEt} \quad \textbf{(3.3)}$$

$$CAB_t = \alpha_{41}ED_t + \alpha_{42}REER_t + \alpha_{43}GE_t + \alpha_{44}EDIP_t + \alpha_{45}EXP_t + \alpha_{46}IMP_t + u_{CABt} \quad \textbf{(3.4)}$$

$$INV_t = \alpha_{51}ED_t + \alpha_{52}RGDP_t + \alpha_{53}GE_t + \alpha_{54}INT_t + u_{INVt} \quad \textbf{(3.5)}$$

$$RGDP_t = \alpha_{61}ED_t + \alpha_{62}GE_t + \alpha_{63}EXP_t + \alpha_{64}LF_t + u_{RGDPt} \quad \textbf{(3.6)}$$

$$REER_t = \alpha_{71}ED_t + \alpha_{72}GE_t + \alpha_{73}CAB_t + \alpha_{74}RGDP_t + \alpha_{75}INF_t + u_{REERt} \quad \textbf{(3.7)}$$

4.3.1 Seemingly Unrelated Regression with Endogenous Independent Variables (3SLS)

While analyzing the factors that lead to external debt crises, previous literature has used different methodologies, such as binary regression and other types of binary machine learning to identify possible its determinants (Alaminos et al., 2021; Dawood et al., 2017; Fioramanti, 2008; Manasse & Roubini, 2009). Moreover, empirical research work that has investigated the effect of external debt on the macroeconomic indicators have largely relied on the econometrics methods like OLS, ARDL and VECM (Kwalingana & Nkuna, 2009; Rauf & Khan, 2017; Saeed et al., 2012; Uddin et al., 2013). To analyze the causes and consequences of external debt, this work employs the system of equation. To estimate the system of equations and aid the simultaneous analysis of several equations sharing an independent variable, this study employs Seemingly Unrelated Regression with endogenous variables (3SLS).

Zellner (1962) presented the concept of Seemingly Unrelated regression and this constitutes a significant advancement in econometric modeling. This technique is, in fact, a generalization of a standard linear regression model. It accommodates multiple regression equations, each with its distinct dependent and explanatory variables. Unlike traditional regression analysis, which treats each equation independently, SUR allows and utilizes potential correlations between the errors across equations. By simultaneously estimating the regression coefficients for each equation while considering the contemporaneous correlation between the error terms, SUR enhances the accuracy of the parameter estimates. The significance of SUR is in its capacity to effectively address the correlated errors among different regression models. Moreover, SUR proves helpful in situations where common independent variable/variables appear in different equations.

In In this study, several explanatory variables are endogenous. The SUR model assumes the exogeneity of regressors, but this assumption cannot hold in our case. This violation from SUR's assumption needs an alternative strategy. This violation from SUR's assumption requires an alternative approach. To address endogeneity issue in system of equation, the study will adopt the Three Stage Least Squares SUR (3SLS-SUR) model. 3SLS-SUR (Three-Stage Least Squares - Seemingly Unrelated Regressions) is an extension of the SUR model that addresses both endogeneity and cross-equation correlation among the error terms (Zellner & Theil, 1962). It is particularly useful when dealing with multiple equations that are related but may have endogenous variables.

The process of estimating the model parameters in the Three-Stage Least Squares Seemingly (3SLS) involves the following three steps.

1. Compute the predicted values of each endogenous variable. This process involves doing a regression analysis where each endogenous variable is regressed against all exogenous variables included in the system of equations.
2. The predicted value of endogenous variable is substituted as regressor in the structural equation. Calculate the variance of residuals by equation and estimate the covariance of residuals across equation. Estimate the variance-covariance matrix of residuals.
3. Re-estimate the structural equation using the Seemingly Unrelated Regression (SUR) model. Incorporate the estimated variances and covariances of the residuals obtained from step 2.

Justification

Three-Stage Least Squares (3SLS) is often considered superior in simultaneous equation models for the following reasons:

- **Orthogonality Condition:** Unlike other estimation methods, 3SLS does not require the prior assumption of orthogonality between error terms across equations in the system. This flexibility makes 3SLS more appealing for estimating simultaneous systems where strict assumptions about structural error orthogonality may be unrealistic. Many econometric models consist of multiple equations where the error terms in these equations are often contemporaneously correlated. This is because of unobserved factors that affects the disturbance term in one equation and are likely to affect the others as well (Zellner, 1962).
- **Efficiency:** As the 3SLS accounts for the contemporaneous correlation between error across different equation in the system. By estimating all the equations simultaneously, 3SLS achieves greater efficiency compared to the single equation estimation technique which ignores the contemporaneous correlation between error (Zellner, 1962).
- **Simultaneous Structural Equation Models:** 3SLS is specifically designed for simultaneous structural equation models, where endogenous variables are determined within the system and potentially appear as explanatory variables in multiple equations.
- **Large Systems:** In large system where the number of equations increase, 3SLS can efficiently handle large system compared to other dynamic models. 3SLS is not restricted to have all endogenous variables or its lag(s) in an equation. In the system, some equations may contain no endogenous variables, not even their lagged values. On the contrary, consider a system of 20 endogenous variables, with 4 lags, a VAR model requires estimation of at least 80 coefficients in each equation. As more variables are added to VAR, the degrees of freedom shrink. This phenomenon can be described as the "*vanishing degrees of freedom*" problem, where the number of unknown coefficients quickly approaches the available sample size. (Johnston & Dinardo, 1997)**.**
- **Exogenous Variables:** 3SLS does not require that all equations share the same exogenous variables. Each equation in the system can have its own distinct set of exogenous variables. It provides flexibility in modelling real-world systems where different equations may involve unique explanatory variable(s), rather than requiring a uniform set across all equations.

This combination of flexibility, efficiency, and ability to handle complex systems of equations makes 3SLS particularly more suitable for many econometric applications involving simultaneous equations.

4.4 Description of data

This study utilizes secondary data for the empirical analysis. The data on the bunch of variables is collected from the data banks of the World Bank (WB) and International Monetary fund (IMF), particularly the World Development Indicators (WDI) and International Debt Statistics (IDS) offered by the World Bank and International Financial Statistics (IFS) by IMF. These databases offer a wide range of economic indicators. The time series data on these indicators ranges from 1976 to 2022.

Table 4. 1: Description of Variables.

Variable	**Symbols**	**Description**	**Unit**	**Source**
External Debt	ED	External debt refers to the sum of money which a sovereign state owes to those who are not residents of that country, being repaid in money, services, and goods	USD	WDI
Foreign Exchange Reserves	FER	Foreign exchange reserves consist of total reserves excluding gold. These reserves include SDR, reserves held by the IMF members at the IMF, and foreign exchange holdings managed by monetary authorities.	USD	WDI
Imports	IMP	Imports are goods and services purchased by a country from foreigners located outside its borders for consumption, investment, or other purposes.	USD	WDI

Exports	EXP	Exports refer to the total value of all locally produced goods and services that are sold to the foreigners	USD	WDI
Current Account Balance	CAB	Current account balance (CAB) of country covers all transactions of trade balance, primary income, and secondary income (current transfers).	USD	WDI
Foreign Direct Investment	FDI	An investment where an investor from one country gains a lasting interest and considerable control over a business located in another country.	USD	WDI
Economic Growth	RGDP	Economic growth therefore refers to the process through which a country's economy expands in terms of its value addition of final products and services produced domestically with time.	USD	WDI
Inflation	INF	Inflation is a sustained rise in the overall price level of goods and services in an economy.	Ratio	WDI
Investment	INV	Gross Fixed Capital Formation (GFCF) is commonly used as measure of investment. GFCF refers to the total volume of investments made in fixed assets within an economy during a given period.	USD	WDI
Real Effective Exchange Rate	REER	REER is an index that quantifies the worth of a nation's currency relative to a weighted average of multiple foreign currencies, adjusted for inflation.	Rate	WDI
Government Expenditure	GE	Government spending refers to the total spendings made by a government on goods and services, transfer payments, subsidies, and other public programs and initiatives during a fiscal year.	USD	WDI

Labor Force	LF	The labour force consists of individuals aged 15 and older who are either employed or seeking job.		WDI
Broad Money Growth	M2	Broad money growth is the rate at which the total stock of broad money expands within a given time period.	Ratio	WDI
Political Stability	POL5	The political stability in a country estimated by polity 5 ranges from -10 (autocracy) to 10 (democracy)	Ratio	Polity5
Interest Rate	INT	The call money rate, which is usually adopted as the interest rate, is the rate at which short-term funds are bought and sold in the interbank market.	Ratio	IFS
Short Term External Debt	EDST	The short-term external debt is stock of a country's debt that is owed to the foreign creditors with a maturity of 1 year.	USD	IDS
Debt Serving on External Debt	EDDS	External debt servicing refers to the total payments (principal and interest) that a country must pay to foreign creditors within a in specific time period.	USD	IDS
Interest Payment Serving on External Debt	EDIP	Interest payment on external debt is the total interest accrued on borrowed funds.	USD	IDS
Foreign Aid	FA	Foreign Aid comprises loans provided on concessional conditions and grants from official agencies and multilateral institutions with the aim of promoting economic development and welfare in recipient nations recognised by the Development Assistance Committee (DAC).	USD	WDI

CHAPTER 5

RESULTS AND DISCUSSION

5.1 Introduction

This chapter illustrates the estimated analysis of the study. The influence of Macroeconomic indicators on external, and external debt on macroeconomic variables (FER, GE, CAB, investment, real GDP, and REER). In this study, the integration status of variables is explored by utilizes the augmented dicky fuller (ADF) and Phillips–Perron (PP) unit root tests. Moreover, the presence of endogeneity is tested by using Durbin Wu-Hausman. To achieve our objective, of exploring external debt's causes and consequences, we apply 3SLS to the system of equations. Finally, we compare the 2SLS and 3SLS results under the presence of correlation between the residuals across equations.

5.2 Descriptive Statistics

The most basic type of statistics is descriptive statistics that identifies certain features of the data. These statistics provide a meaningful summary and description of the data, it is easier in understanding its characteristics. The commonly used descriptive statistics are measure of central tendency (mean), and measure of dispersion (standard deviation, range). Mean is the arithmetic average of a variable for a set of observations. While standard deviation is the average of deviation from the mean of that data, while the minimum and maximum then refer to the highest and the lowest figures in the data set respectively. The descriptive statistics of the variables used in this study is as given in the following table.

Table 5. 1: Descriptive Statistics

Variables	Obs	Mean	Std. Dev.	Min	Max
In Million					
ED	47	42180	33380	6802	130900
FER	47	5985	6203	213	19650
GE	47	14280	12180	1450	39300
CAB	47	-3332	4801	-18860	3854
RGDP	47	132200	115800	13170	374700
INV	47	19280	15900	2300	54700
IMP	47	25610	22090	2644	76510
EXP	47	15100	11380	1438	38970
FDI	47	1127	1333	8.2	5590
EDST	47	3097	2634	180	9256
EDDS	47	3619	3269	386.4	16650
EDIP	47	1030	708.7	157.4	3497
FA	47	1444	906	500.6	3764
LF	47	44.9	18.06	19.5	78.86
Ratio and Rate					
INF	47	0.084	0.039	0.025	0.203
REER	47	133.757	44.333	96.49	237.53
M2	47	15.517	6.906	4.314	42.909
POL5	47	1.766	6.455	-7.000	8.000
INT	47	8.611	2.325	2.139	12.472

The table 5.1 displays the descriptive statistics derived from a sample size of 47 observations for the variables used in this study. The mean value of external debt (ED) is $42.18B (billion), and its standard deviation is $33.38B, with minimum and maximum value of $6.80B to $130.90B respectively. The mean value of foreign exchange reserves (FER) is approximately $5.99B, have a standard deviation of $6.20B. The range of FER values is from $213 million to $19.65B. The average Government Expenditure (GE) is $14.28B, with a standard variation of $12.18B. The least value is $1.45B, while the largest value is $39.30B. The mean current account balance (CAB) is -$3.33B, indicating a deficit, and its standard deviation is $4.80B.

CAB ranges from -$18.86B to $3.85B. The average value of real GDP is $132.20B, having a standard deviation of $115.80B, and its minimum value is $13.17B and maximum value is $374.70B. The mean investment (INV) is $19.28B, with a $15.90B standard deviation. Investment ranges from $2.30B to $54.70B. The average value of imports (IMP) is about $25.61B, with a $22.09B standard deviation, and ranges from $2.64B to $76.51B. The average Exports (EXP) are $15.10B, having a standard deviation of $11.38B, with a minimum value of $1.44B and maximum value of $38.97B. The average foreign direct investment (FDI) is $1.13B, with a $1.33B standard deviation. The range of foreign direct investment is from $8.22 million to $5.59B. The mean short-term external debt (EDST) is $3.10B, with a of $2.63B standard deviation. The range of EDST is from $180 million to $9.26B. The mean value of debt service on external debt (EDDS) is $3.62B, having a standard deviation of $3.27B, with a minimum value of $386.4 million and a maximum value of $16.65B. The average value of interest payment on external debt EDIP is $1.03B, with a $708.7 million standard deviation. EDIP ranges from $157.4 million to $3.50B. The mean foreign aid is $1.44B, having a standard deviation of $906 million, with a minimum value of $500.6 million and maximum value of $3.76B. The average labour force is 44.89 million people, with a standard deviation of 18.06 million. The lower and upper values are around 19.46 million and 78.86 million, respectively.

The average value of inflation is 8.4%, with a 3.9% standard deviation. The minimum and maximum value of inflation is 2.5% and 20.3% respectively. The mean REER is 133.76, with a standard deviation of 44.33. The range of the REER values is from 96.49 to 237.53. The mean of M2 is 15.52%, with a 6.91standard deviation, ranging from 4.31% to 42.91%. The average political stability score is 1.77, with a standard deviation of 6.46. The scores range from -7 to 8. The average interest rate is 8.61%, having a standard deviation of 2.33%, with a minimum value of 2.14% and maximum value of 12.47%. Overall, the data show significant variability in all indicators, reflecting diverse economic conditions across the observations.

5.3 Unit Root Test

The findings of ADF test and Phillips-Perron test are stated the following table. The null hypotheses are that series has unit root. The optimal number of lags was determined based on the automatic selection of the Schwarz Information Criterion (SIC). The values in ‘order of integration’ column indicate whether the data is stationary at the level (0) or first difference (1).

Table 5. 2: ADF and PP Unit Root Tests Results

	Level				Order of Integration		First Difference				order of Integration	
	ADF		PP				ADF		PP			
	t-Stat	Prob	t-Stat	Prob	ADF	PP	t-Stat	Prob	t-Stat	Prob	ADF	PP
ED	4.48	1.00	5.57	1.00	**1**	**1**	-3.10	0.00	-2.99	0.00	**0**	**0**
FER	0.53	0.83	-1.30	0.17	**1**	**1**	-7.85	0.00	-5.52	0.00	**0**	**0**
CAB	-1.90	0.06	-1.73	0.08	**0**	**0**	-6.83	0.00	-9.07	0.00	**0**	**0**
GE	3.73	1.00	4.43	1.00	**1**	**1**	-5.22	0.00	-5.25	0.00	**0**	**0**
INV	2.50	1.00	4.14	1.00	**1**	**1**	-4.89	0.00	-4.28	0.00	**0**	**0**
RGDP	4.11	1.00	4.82	1.00	**1**	**1**	-2.03	0.04	-4.36	0.00	**0**	**0**
EDDS	3.68	1.00	3.75	1.00	**1**	**1**	-6.48	0.00	-6.78	0.00	**0**	**0**
EDIP	3.29	1.00	2.79	1.00	**1**	**1**	-5.15	0.00	-3.52	0.00	**0**	**0**
EDST	0.81	0.88	1.38	0.96	**1**	**1**	-8.36	0.00	-8.28	0.00	**0**	**0**
EXP	2.64	1.00	2.64	1.00	**1**	**1**	-5.83	0.00	-5.88	0.00	**0**	**0**
FA	0.24	0.75	-0.98	0.29	**1**	**1**	-7.78	0.00	-7.94	0.00	**0**	**0**
FDI	-3.05	0.13	-1.42	0.14	**1**	**1**	-4.77	0.00	-4.51	0.00	**0**	**0**
IMP	3.20	1.00	4.15	1.00	**1**	**1**	-5.86	0.00	-6.84	0.00	**0**	**0**
INF	-5.01	0.00	-2.86	0.06	**0**	**0**	-7.36	0.00	-7.36	0.00	**0**	**0**
INT	-2.76	0.07	-2.94	0.05	**0**	**0**	-6.60	0.00	-6.60	0.00	**0**	**0**
LF	5.07	1.00	8.92	1.00	**1**	**1**	-7.34	0.00	-7.40	0.00	**0**	**0**
M2	-2.24	0.03	-2.08	0.04	**0**	**0**	-8.20	0.00	-20.84	0.00	**0**	**0**
POL5	-1.97	0.05	-2.25	0.03	**0**	**0**	-8.07	0.00	-8.01	0.00	**0**	**0**
REER	-1.99	0.05	-2.32	0.02	**0**	**0**	-4.90	0.00	-4.82	0.00	**0**	**0**

The table 5.2 depicts the results of unit root tests. Based on the order of integration column, the variables stationary at the level (I(0)) are CAB, INF, INT, M2, POL5, and REER, as indicated by '0'. These variables do not require differencing to achieve stationarity. On the other hand, the variables stationary at the first difference (I(1)) include ED, FER, GE, INV, RGDP, EDDS, EDIP, EDST, EXP, FA, FDI, IMP, and LF, as indicated by '1'. These variables require differencing once to become stationary. Therefore, CAB, INF, INTM, M2, POL5, and REER are stationary, while the remaining variables are non-stationary at the level and become stationary after first differencing.

5.4 Durbin Wu-Hausman Test

The Durbin-Wu-Hausman (DWH) test is a statistical test to check if there is an endogeneity problem within the model, or simply if the independent variable is correlated with the error term in a regression analysis.

H_0: The regressors are exogenous.

This means that there is no relation between the error term and the explanatory variables, and using OLS will yield consistent results. The rejection of null hypothesis suggests that the regressors are endogenous, indicating that instrumental variable techniques, such as 3SLS, are necessary to obtain consistent estimates.

Table 5. 3: Durbin Wu-Hausman Test Results

	Durbin		**Wu-Hausman**	
Equations	**Chi²**	**P value**	**F**	**P value**
ED	8.2327*	0.0834	1.9643	0.1203
FER	9.5755**	0.0482	2.3667*	0.0705
GE	4.6021*	0.1002	2.2252	0.1209
CAB	7.2562*	0.0642	2.3126*	0.0915
INV	7.8855**	0.0484	2.6880*	0.0592
RGDP	8.2855*	0.0159	4.3873*	0.0188
REER	10.099*	0.0388	2.600*	0.0513

*,**, and *** represent the level of significance at 10%, 5% and 1% respectively

The Durbin Wu-Hausman test results reveal about the exogeneity of the variables in above table. The p-value of Durbin statistic and Wu-Hausman shows that the covariates of External

Debt (ED) equation is endogenous at 8.3% and 12% level of significance, respectively. Though the Wu Hausman p-value is a bit higher from 10% level of significance, but on theoretical basis, this study considers the independent variables of External Debt (ED) equation as endogenous variables. For foreign exchange reserves equations, the p-value of Durbin statistic and Wu-Hausman shows that the independent variables are endogenous at 4.8% and 7% level of significance, respectively. Same goes with government expenditure equation. The independent variables of GE equation are endogenous, with the p-value of Durbin statistic and Wu-Hausman, at 10% and 12%, respectively. The Durbin statistic and Wu-Hausman of CAB equation indicate that the independent variables are endogenous at 6.4% and 9.1% level of significance, respectively. The covariates of investment equations are endogenous, based on the p-value of Durbin statistic and Wu-Hausman, at 4.8% and 5.9% level of significance, respectively. For economic growth (RGDP) equations, the p-value of Durbin statistic and Wu-Hausman shows that the independent variables are endogenous at 1.5% and 1.8% level of significance, respectively. The Durbin and Wu-Hausman of REER equation indicate that the independent variables are endogenous at 3.9% and 5.1% level of significance, respectively.

The Durbin Wu-Hausman test results indicate that the independent variables of all seven equations are endogenous at significance levels ranging from 2% to 12.1%. Despite two p-values being slightly above the 10% threshold, the study considers these variables as endogenous based on theoretical basis.

5.5 Three Stage Least Square Results

The causes and consequences of external debt is estimated using system equation model. This study adopts three stage least square to estimate all seven equations simultaneously. The findings of 3SLS estimates for system of equations is presented in the following table. The values in the parenthesis are the P-value cross-ponding to each coefficient of a variable, representing the level of significance.

***Table 5. 4*:** System of Equations Results

	EQUATIONS						
	ED	**FER**	**GE**	**CAB**	**INV**	**RGDP**	**REER**
ED		1.019*** (0.000)	-0.102 (0.120)	-0.678*** (0.000)	-0.103 (0.107)	0.767* (0.059)	1.36e-08*** (0.009)
GE	-0.864** (0.031)	-0.387 (0.273)		0.825 (0.293)	1.269*** (0.000)	7.029*** (0.000)	7.07e-08*** (0.000)
CAB	-0.651*** (0.000)	0.776*** (0.000)					9.16e-09** (0.015)
RGDP	0.094** (0.024)		0.099*** (0.000)		0.099*** (0.000)		-5.19e-09*** (0.003)
FER	0.606*** (0.000)						
POL5	3.23E+07 (0.472)						
EDST	0.014 (0.963)						
REER		6.281e+06*** (0.007)		-1.168e+07** (0.039)			
EDDS		-0.368 (0.116)					
FDI		0.657** (0.040)					
FA			-0.305 (0.118)				
M2			1.58e+07* (0.069)				
EDIP				-10.213*** (0.000)			
EXP				1.080** (0.038)		1.692*** (0.000)	
IMP				-0.661** (0.019)			
INT					-6.16e+07** (0.020)		
LF						17.57 (0.956)	
INF							1,180.4*** (0.000)

*,**, and *** represent the level of significance at 10%, 5% and 1% respectively

5.5.1 External Debt Equation

Government Expenditure (GE)

The coefficient for Government Expenditure (GE) is -0.864, and the P-value is 0.031, which is less than the significance level of 0.05. This indicates that the coefficient is statistically significant. Therefore, there is evidence to suggest that an increase in GE is associated with a significant decrease in External Debt (ED). Specifically, for every one-unit increase in GE, ED is expected to decrease by 0.864 units, holding other variables constant. The decrease in external debt due to the increase in government expenditure can be attributed to external debt servicing. During FY22 and FY23, Pakistan serviced $15.1 and $20.822 billion external debt, respectively (SBP Statistical Bulletin). Moreover, financing fiscal deficit needs both domestic and external sources. The government of Pakistan is trying to reduce it dependence from external source (borrowing in foreign currency) in financing it expenditure. The external financing of government expenditure as a percent of total financing is 39.3%, 22.4%, and -10.4% in FY21, FY22, and FY23, respectively (SBP Statistical Bulletin). This significant decline in dependence on borrowing from external sources for government expenditures can also decrease Pakistan's external debt.

Current Account Balance (CAB)

The coefficient for Current Account Balance (CAB) is -0.651, and the P-value is 0.000, which is below the significance level of 0.01. This indicates that the coefficient is statistically significant. Consequently, an increase in CAB significantly decreases external debt. Specifically, for every one-unit increase in CAB, ED is expected to decrease by 0.651 units, holding other variables constant. The betterment in CAB is likely to come from an increase in exports or a decrease in impots and interest payment on external debt can assist is reducing external debt burden[3]. The reduction in external debt by an improvement in current account balance can reduce the risk of external debt crises (Manasse et al., 2003).

Real GDP (RGDP)

[3] See: 4.6.4 Current Account Balance Equation

The coefficient for Real GDP (RGDP) is 0.094, and the P-value is 0.024, which is less than the significance level of 0.05. This indicates that the coefficient is statistically significant. Therefore, an increase in RGDP is associated with a significant increase in ED. Specifically, for every one-unit increase in RGDP, ED is expected to increase by 0.094 units, holding other variables constant. The increase in external debt due to increase economic growth can be caused by import. According to import-led growth hypothesis, especially in developing economies, imports play pivotal role in stimulating economic activity. The economic growth in Pakistan is import dominated than exports (Mujahid et al., 2019). Pakistan imports a wide range of capital goods, raw materials, and intermediate goods that are used in production process. This import dominated growth triggers external debt in Pakistan.

Foreign Exchange Reserves (FER)

The coefficient for Foreign Exchange Reserves (FER) is 0.606, and the P-value is 0.000, which is well below the significance level of 0.01. This indicates that the coefficient is highly statistically significant. Thus, an increase in FER is significantly associated with an increase in ED. Specifically, for every one-unit increase in FER, ED is expected to increase by 0.606 units, holding other variables constant. The increase in foreign exchange reserves is typical due to three reasons; (1) increase in foreign earnings (current account surplus, FDI, Portfolio investment); (2) buying foreign exchange reserves from foreign exchange market buy central bank, and (3) borrow from external sources. Pakistan's foreign earnings are not even sufficient to finance current account deficit. The increase in Pakistan foreign exchange primarily comes from central bank intervention and borrowing. The increase in foreign exchange reserves is dominated by external borrowing, then foreign income, can eventually increase external debt.

Political Stability (POL5)

The coefficient for Political Stability (POL5) is 3.23E+07, and the P-value is 0.472, which is greater than the significance level of 0.05. This indicates that the coefficient is not statistically significant. Therefore, there is no evidence to suggest that changes in POL5 have a significant impact on ED.

Short-term External Debt (EDST)

The coefficient for Short-term External Debt (EDST) is 0.014, and the P-value is 0.953, which is greater than the significance level of 0.05. This indicates that the coefficient is not statistically significant. Therefore, there is no evidence to suggest that changes in EDST have a significant impact on ED.

5.5.2 Foreign Exchange Reserves Equation

External Debt (ED) and Debt Service on External Debt (EDDS)

The coefficient for External Debt (ED) is 1.019, and the P-value is 0.000, which is well below the significance level of 0.01. This indicates that the coefficient is highly statistically significant. Therefore, there is strong evidence to suggest that an increase in ED is associated with a significant increase in Foreign Exchange Reserves (FER). Specifically, for every one-unit increase in ED, FER is expected to increase by 1.019 units, holding other variables constant. The impact of external debt on foreign exchange reserves can be positive, negative, or both. Positive impact, an increase in external debt increases foreign exchange reserves because Pakistan uses foreign loans to maintain its foreign exchange reserves. On the contrary, an increase in external debt is likely to increase external debt servicing (EDDS) which ultimately put a downward pressure on FER and ultimately reduces foreign exchange reserves. Our results establish the negative effect of EDDS on foreign exchange reserves at 11.6% level of significance. This indicates that the increase EDDS can reduce foreign exchange reserves.

Government Expenditure (GE)

The coefficient for Government Expenditure (GE) is -0.387, and the P-value is 0.273, which is greater than the significance level of 0.05. This indicates that the coefficient is not statistically significant. Therefore, there is no evidence to suggest that changes in GE have a significant impact on FER. This is so, because the increase in government spending (in foreign currency) is financed through loans rather than reducing foreign reserves, the FER remains unaffected.

Current Account Balance (CAB)

The coefficient for Current Account Balance (CAB) is 0.776, and the P-value is 0.000, which is well below the significance level of 0.01. This indicates that the coefficient is highly

statistically significant. Consequently, an increase in CAB is significantly associated with an increase in FER. Specifically, for every one-unit increase in CAB, FER is expected to increase by 0.776 units, holding other variables constant. A rise in CAB is one the major sources of foreign earnings. The increase in CAD is likely to increase FER by increasing exports and remittances or by reducing imports and interest payments.

Real Effective Exchange Rate (REER)

The coefficient for Real Effective Exchange Rate (REER) is 6.281e+06, and the P-value is 0.001, which is less than the significance level of 0.05. This indicates that the coefficient is statistically significant. Therefore, an increase in REER is associated with a significant increase in FER. Specifically, for every one-unit increase in REER, FER is expected to increase by 6.281e+06 units, holding other variables constant. For time being (short time), an appreciation in REER can improve trade balance which may increase FER, but in long run, this appreciation in REER worsens trade balance and ultimately leads to a decline in FER.

Foreign Direct Investment (FDI)

The coefficient for Foreign Direct Investment (FDI) is 0.657, and the P-value is 0.040, which is below the significance level of 0.05. This suggests that there is strong evidence to suggest that an increase in FDI is associated with an increase in FER. Specifically, for every one-unit increase in FDI, FER is expected to increase by 0.657 units, holding other variables constant. FID can have both direct and indirect affect on FER. The direct effect of FDI on FER is due to increase in capital inflow while the indirect can be due to an increase in exports.

5.5.3 Government Expenditure Equation

External Debt (ED)

The coefficient for External Debt (ED) is -0.102, and the P-value is 0.120, which is slightly above the significance level of 0.10 but still close to being significant. This suggests that there is weak evidence to suggest that an increase in ED might be associated with a decrease in Government Expenditure (GE). Specifically, for every one-unit increase in ED, GE is expected to decrease by 0.102 units, holding other variables constant. With the rise in external debt,

government expenditure is expected to rise with rise due to the increase in debt servicing on external debt. But on the contrary, an increase in external debt forces the government to substitute its expenditure (Health, Education and Development etc.) other than debt servicing through fiscal consolidation policy (it aims to reduce fiscal deficit and accumulation of debt). Government always faces scarcity of resources; it cannot increase all its expenditure except debt obligations. The result our study suggests the net impact of increase in external debt is negative[4]. An increase in external debt compels the government to compromise on its other expenditure (Health, Education and Development etc.) (Miningou, 2023).

Real GDP (RGDP)

The coefficient for Real GDP (RGDP) is 0.099, and the P-value is 0.000, which is well below the significance level of 0.01. This indicates that the coefficient is highly statistically significant. Therefore, there is strong evidence to suggest that an increase in RGDP is associated with a significant increase in GE. Specifically, for every one-unit increase in RGDP, GE is expected to increase by 0.099 units, holding other variables constant. The increase in national income (RGD) increase GE because it provides more domestic earning opportunities for the government (Kasongo, 2023). The results of this study support Wagner's hypothesis suggesting that government expenditure rise with an increase in national income.

Foreign Aid (FA)

The coefficient for Foreign Aid (FA) is -0.305, and the P-value is 0.118, which is greater than the significance level of 0.05. This indicates that the coefficient is not statistically significant. Therefore, there is no evidence to suggest that changes in FA have a significant impact on GE (Ullah, 2022). The insignificant impact of foreign AID on government spendings can be due to its allocation for development purpose. The share of development expenditure to total expenditure is very low.

Money Supply (M2)

[4] Net impact of external debt: increase in external debt servicing minus decrease in other government expenditure.

The coefficient for Money Supply (M2) is 1.58e+07, and the P-value is 0.069, which is less than the significance level of 0.10. This indicates that the coefficient is statistically significant. Therefore, an increase in M2 is associated with a significant increase in GE. Specifically, for every one-unit increase in M2, GE is expected to increase by 1.58e+07 units, holding other variables constant. The increase in M2 is likely to reduce interest rate and make it more appealing for the government to borrow from domestic market. There is an indirect impact of M2 in increasing government spendings. On the contrary, increase in M2 widens fiscal deficit by depleting the real value of tax revenue through inflation (reduce the purchasing power of tax revenue).

5.5.4 Current Account Balance Equation

External Debt (ED) and Interest Payment on External Debt (EDIP)

The coefficients for External Debt (ED) and Interest Payment on External Debt (EDIP) are both negative and highly statistically significant, with P-values well below the 0.01 significance level. For ED, a one-unit increase leads to a 0.678 unit decrease in the Current Account Balance (CAB), while for EDIP, a one-unit increase results in a 10.213 unit decrease in CAB, holding other variables constant. These findings strongly suggest that increases in ED and EDIP significantly reduce CAB. The interest payment on external play significant role in worsening current account balance. Pakistan's interest payment is increasing by the year (FY22 $2,98B and FY23 $4.43B)[5], and it is accounted in current account. Moreover, according to debt overhang hypothesis, increase in external debt reduces exports and ultimately cause a decrease in current account balance (Krugman, 1988).

Real Effective Exchange Rate (REER)

The coefficient for Real Effective Exchange Rate (REER) is -1.168e+07, and the P-value is 0.039, which is less than the significance level of 0.05. This indicates that the coefficient is statistically significant. Therefore, an appreciation in REER is associated with a significant decrease in CAB. Specifically, for every one-unit increase in REER, CAB is expected to decrease by -1.168e+07 units, holding other variables constant. According to J-curve, the

[5] Interest payment during fiscal year 22 and 23 are presented in the parenthesis

depreciation of REER can have both negative and positive effect on trade balance (based on the elasticity of demand for exports and imports) and current balance. In case of Pakistan, the effect of REER's appreciation is negative on current account balance (imports become cheaper for the local and exports become expensive for foreigners). Current account balance worsens (deficit increases) with the appreciation in real effective exchange rate because exports become less comitative and import rises.

Government Expenditure (GE)

The coefficient for Government Expenditure (GE) is 0.825, and the P-value is 0.293, which is greater than the significance level of 0.05. This indicates that the coefficient is not statistically significant. Therefore, there is no evidence to suggest that changes in GE have a significant impact on CAB. Government usually demands both domestic and foreign goods. The increase in government demand for foreign goods widens trade deficit and cause a decline in current account balance. In case Pakistan, we failed to build this relationship.

Exports (EXP) and Imports (IMP)

The coefficient for Exports (EXP) is 1.080 with a P-value of 0.038, indicating strong evidence that an increase in EXP can lead to a 1.080 unit increase in the Current Account Balance (CAB), holding other variables constant. Conversely, the coefficient for Imports (IMP) is -0.661 with a P-value of 0.019, showing significant evidence that an increase in IMP results in a 0.661 unit decrease in CAB, holding other variables constant. Both trade balance variable (exports and imports) got theoretical signs with a significant impact on current account balance in Pakistan.

5.5.5 Investment Equation

External Debt (ED)

The coefficient for External Debt (ED) is -0.103, and the P-value is 0.107, which is almost equal to the significance level of 0.1. The level of significance of external debt is not very high form 10% significance level. The impact of external debt on investment is considered to be significant. At the 10.7% significance level, the negative external debt coefficient supports the idea of the debt overhang. According to this result, Pakistan experiences a crowding out

because of its high accumulated external debt. An increase in the external debt stock is anticipated to result in a decline in the domestic investment.

Real GDP (RGDP)

The coefficient for Real GDP (RGDP) is 0.099 and the P-value is 0.000, which is well below the significance level of 0.01. This indicates that the coefficient is highly statistically significant. Therefore, there is strong evidence to suggest that an increase in RGDP is associated with a significant increase in INV. Specifically, for every one-unit increase in RGDP, INV is expected to increase by 0.099 units, holding other variables constant. The increase in economic This supports the economic rationale that investment is stimulated by economic growth.

Government Expenditure (GE)

The coefficient for Government Expenditure (GE) is 1.269, and the P-value is 0.000, which is well below the significance level of 0.01. This indicates that the coefficient is highly statistically significant. Therefore, there is strong evidence to suggest that an increase in GE is associated with a significant increase in INV. Specifically, for every one-unit increase in GE, INV is expected to increase by 1.269 units, holding other variables constant. According to crowding-out hypothesis, an increase in government expenditure can have an adverse effect on investment[6]. On the contrary, government spendings can also stimulate investment in the country. The increase in Government spending, particularly in areas such as public infrastructure etc., stimulate demand for goods and services. To meet the increased demand for goods and services, private investor finds it more attractive to invest and eventually cause and increase in private investment.

Interest Rate (INT)

The coefficient for Interest Rate (INT) is -6.16e+07, and the P-value is 0.020, which is less than the significance level of 0.05. This indicates that the coefficient is highly statistically significant. Therefore, there is strong evidence to suggest that an increase in INT is associated

[6] The adverse effect of government spendings on investment is discussed in Interest Rate section.

with a significant decrease in INV. Specifically, for every one-unit increase in INT, INV is expected to decrease by 6.16e+07 units, holding other variables constant. The increase in the cost of borrowing (Interest rate) can reduce investment. Investors find borrowing more expensive and expect low return on new investment, and this leads to significant decline in investment. For the case of Pakistan, government is competing with investors for borrowing from commercial banks. The increase in demand for borrowing increases interest rate. Commercial banks find lending safer to government than the investors. Eventually this leads to significant decline in investment.

5.5.6 Economic Growth Equation

External Debt (ED)

The coefficient for External Debt (ED) is 0.767, and the P-value is 0.059, which is well below the significance level of 0.1. This indicates that the coefficient is statistically significant. Therefore, there is strong evidence to suggest that an increase in ED is associated with a significant increase in Real GDP (RGDP). Specifically, for every one-unit increase in ED, RGDP is expected to increase by 0.767 units, holding other variables constant. This study finds the positive of external debt on economic growth. external debt can have both positive and negative impact on economic growth. Rauf & Khan (2017) finds a long-term negative impact of external debt on economic growth, while short-term effects are positive. The negative impact of external debt on economic growth is explained through investment channel in the following section.

Government Expenditure (GE)

The coefficient for Government Expenditure (GE) is 7.029, and the P-value is 0.000, which is lower than the significance level of 0.05. This indicates that the coefficient is statistically significant. Therefore, there is strong evidence to suggest that change in GE has a significant impact on RGDP. The government spending, in Pakistan, boosts economic growth by enhancing infrastructure, investing in development projects, and stimulating demand. The increase in such government expenditure is likely to increase economic growth.

Exports (EXP)

The coefficient for Exports (EXP) is 1.692, and the P-value is 0.000, which is less than the significance level of 0.05. This indicates that the coefficient is statistically significant. Therefore, an increase in EXP is associated with a significant increase in RGDP. Specifically, for every one-unit increase in EXP, RGDP is expected to increase by 1.692 units, holding other variables constant. Exports plays key role in stimulating economic growth in the country. Exports in Pakistan stimulate economic growth but the problem with Pakistan`s exports is that it consists to many primary and intermediate goods. Pakistan needs to be exports final goods as much as possible, and this will lead a high increase in economic growth.

Labor Force (LF)

The coefficient for Labor Force (LF) is 17.57, and the P-value is 0.956, which is greater than the significance level of 0.05. This indicates that the coefficient is not statistically significant. Therefore, there is no evidence to suggest that changes in LF have a significant impact on RGDP. The lake of skills and education can be one of the major reasons leading to insignificant impact of labour force on economic growth in Pakistan.

5.5.7 Real Effective Exchange Rate Equation

External Debt (ED)

The coefficient for External Debt (ED) is 1.36e-08, and the P-value is 0.009, which is less than the significance level of 0.05. This indicates that the coefficient is statistically significant. Therefore, there is evidence to suggest that an increase in ED is associated with a significant increase in the Real Effective Exchange Rate (REER). Specifically, for every one-unit increase in ED, REER is expected to increase by 1.36e-08 units, holding other variables constant. The increase in external debt usually causes an increase in demand for foreign exchange reserves and puts a downward pressure on REER. This downward pressure causes a depreciation in REER. But in the case of Pakistan, an increase in external debt increase appreciates exchange rate. According to SBP, since 1999, Pakistan has implemented a market-driven flexible exchange rate system. The exchange rate is influenced by the demand and supply factors in market. In case Pakistan, SBP continuously is intervening in foreign exchange market and the thus exchange rate is intentionally managed by state bank rather then determined by market

forces (Jalil, 2021). The intervention by SBP in foreign exchange market has change the expected effect of external debt on exchange rate.

Government Expenditure (GE)

The coefficient for Government Expenditure (GE) is 7.07e-08, and the P-value is 0.000, which is well below the significance level of 0.01. This indicates that the coefficient is highly statistically significant. Therefore, there is strong evidence to suggest that an increase in GE is associated with a significant increase in REER. The rise in government expenditure with scarce resource (revenue) increase the demand for borrowing in domestic market. This increase in demand for borrowing increase domestic interest rates. The rise in interest rate increases capital inflow and ultimately increases the demand for domestic currency in international market and eventually cause an appreciation in REER.

Current Account Balance (CAB)

The coefficient for Current Account Balance (CAB) is 9.16e-09, and the P-value is 0.015, which is less than the significance level of 0.05. This indicates that the coefficient is statistically significant. Therefore, an increase in CAB is associated with a significant increase in REER. Specifically, for every one-unit increase in CAB, REER is expected to increase by 9.16e-09 units, holding other variables constant. The increase in current account balance indicates an increase in capital inflow and leads to the increase in demand for domestic currency in foreign market. This increase in demand of domestic currency ultimately causes an appreciation in real effective exchange rate.

Real GDP (RGDP)

The coefficient for Real GDP (RGDP) is -5.19e-09, and the P-value is 0.003, which is less than the significance level of 0.01. This indicates that the coefficient is highly statistically significant. Therefore, there is strong evidence to suggest that an increase in RGDP is associated with a significant decrease in REER. Specifically, for every one-unit increase in RGDP, REER is expected to decrease by 5.19e-09 units, holding other variables constant. As mentioned above, the economic growth in Pakistan is dominated by import (Mujahid et al., 2019). Moreover, the increase in economic growth (RGDP) can increase demand for goods and

services. As demand increases, there's a potential rise in imports to meet this demand. The rise in imports lead to depreciation of the domestic currency and the real effective exchange rate.

Inflation (INF)

The coefficient for Inflation (INF) is 1,180.4, and the P-value is 0.000, which is well below the significance level of 0.01. This indicates that the coefficient is highly statistically significant. Therefore, there is strong evidence to suggest that an increase in INF is associated with a significant increase in REER. Specifically, for every one-unit increase in INF, REER is expected to increase by 1,180.4 units, holding other variables constant. Theoretically, the increase in inflation, due to domestic shock, the domestic currency loses its value relative to foreign currency. This increase in inflation causes a depreciation in REER. But in the case of Pakistan, the results depicts that the increase in inflation leads to the appreciation in exchange rate. This positive impact of inflation on REER can be attributed to continuous intervention by state bank in foreign exchange market in managing its exchange rate.

5.6 Estimation Diagnostics

After estimating a model, it is important to perform diagnostic tests to assess its validity. Two crucial post-estimation tests include Autocorrelation and Heteroscedasticity tests. The Autocorrelation test checks whether the residuals (errors) from the model are correlated over time. The Heteroscedasticity test, on the other hand, assesses whether the variance of the residuals is constant across all observations.

Autocorrelation

The table 5.5 presents the results of the autocorrelation test (Harvey LM test) with their P-values and are compared to 10% level of significance. In following table, Rho represent the coefficient of AR(1) process of residuals series.

Ho: No Autocorrelation - Ha: Autocorrelation

Table 5. 5: Autocorrelation Test

Equations	LM Test Statistic	Rho	P value > Chi^2
ED	0.9445	0.0201	0.3311
FER	0.6222	0.0132	0.4302
GE	0.0544	0.0012	0.8156
CAB	2.4368	0.0518	0.1185
INV	0.9709	0.0207	0.3245
RGDP	0.6582	0.0140	0.4172
REER	1.8194	0.0387	0.1774

*,**, and *** represent the level of significance at 10%, 5% and 1% respectively

The autocorrelation test results show that for the ED equation, the P-value of 0.3311 indicates no significant autocorrelation. Similarly, the FER equation has a P-value of 0.4302, suggesting no significant autocorrelation. Moreover, the GE equation, with a P-value of 0.8156, shows no signs of autocorrelation. For the CAB equation, the P-value of 0.1185 also exceeds the 0.05 threshold, implying that autocorrelation is not present in the residuals. The INV equation, with a P-value of 0.3245, shows no autocorrelation. The **RGDP equation yields a P-value of 0.4172, which indicates no significant autocorrelation. Lastly, the REER equation has a P-value of 0.1774, showing no significant autocorrelation in its residuals. Overall, none of these equations exhibit autocorrelation, meaning the error terms in the models are independent over time.

Heteroscedasticity

The table 5.6 shows the results of the heteroscedasticity test (LM test), where the P-values are compared to a significance level of 0.10.

Ho: Homoscedasticity - Ha: Heteroscedasticity

Table 5. 6: Heteroscedasticity Test

Equations	**LM Test Statistic**	**P value > Chi^2**
ED	0.3334	0.5637
FER	0.2724	0.6017
GE	0.5213	0.4703
CAB	0.0006	0.9808
INV	0.0244	0.8760
RGDP	0.7017	0.4022
REER	0.0608	0.8053

*,**, and *** represent the level of significance at 10%, 5% and 1% respectively

The heteroscedasticity test results indicate that the residuals of ED equation, with P-value of 0.5637, shows no significant heteroscedasticity. Moreover, The FER equation has a P-value of 0.6017, showing no heteroscedasticity. The GE equation, with a P-value of 0.4703, also shows that the model does not exhibit heteroscedasticity. For the CAB equation, the P-value of 0.9808, which is very high, clearly suggests no heteroscedasticity. The INV equation, with a P-value of 0.8760, also indicates no signs of heteroscedasticity. Moreover, the RGDP equation has a P-value of 0.4022, confirming that the residuals have constant variance. Lastly, the REER equation's P-value of 0.8053 suggests no heteroscedasticity, implying that the model's residuals maintain consistent variance. In summary, none of the equations display heteroscedasticity, meaning the assumption of homoscedasticity (constant variance) holds true for all equations in the system.

In a net shell, the results of the diagnostic tests confirm that none of the equations exhibit autocorrelation or heteroscedasticity. This indicates that the residuals across all equations are independent identically distributed (IID). It means that the residuals of all equations in the system are time independent and have constant variances.

5.7 Residual Correlation

The following table shows the correlation between the residuals of equations used in the system of equation.

Table 5. 7: Correlation Between the Residual of Different Equations in the System

Variables	ED	FER	GE	CAB	INV	RGDP	REER
ED	1.000						
FER	-0.743*	1.000					
GE	0.424*	-0.138	1.000				
CAB	0.363*	-0.238*	-0.039	1.000			
INV	0.024	-0.208	-0.243*	-0.043	1.000		
RGDP	-0.539*	0.382*	-0.677*	-0.033	0.071	1.000	
REER	-0.219*	-0.103	-0.499*	0.252*	0.341*	0.353*	1.000

The residuals correlation table shows that external debt residuals have a statistically significant negative correlation with foreign exchange reserves (-0.743), real GDP growth (-0.539), and REER (-0.219), and a positive correlation with government expenditure (0.424) and CAB (0.363). Moreover, FER has a statistically significant positive correlation with RGDP (0.382) and a negative correlation with CAB (-0.238). Government expenditure has moderate negative correlation with investment (-0.243), real GDP growth (-0.677) and the real effective exchange rate (-0.499). The residuals of current account balance are correlated with the residuals of real effective exchange rate (0.252). Investment's residuals are moderately positively correlated with the residuals of real effective exchange rate (0.341). finally, the residuals of RGDP are positively correlated with REER's residuals (0.353). Other residuals correlations are not significant. Out of twenty-one cross equation residuals correlation, thirteen are statistically significant.

5.8 Transmission Channels of Shock Effect.

The study explores the transmission channels of a shock to key macroeconomic variables such as external debt (ED), foreign exchange reserves (FER), Government Expenditure (GE), Current Account Balance (CAB), Investment (INV), Real GDP (RGDP), and Real Effective Exchange Rate (REER). A shock to one variable can have both direct and indirect effects on the others, driven through different channels.

Shock to External Debt

***Table 5. 8*:** Shock to External Debt

Equation	Direct Effect	Indirect Effect
ED	1	1.219118
FER	1.019	0.5782936
GE	-0.102	-0.026067
CAB	-0.678	-0.836848
INV	-0.103	-0.156505
RGDP	0.767	0.050042
REER	1.36E-08	2.38112E-09

A 1 SD shock to External Debt (ED) has varying direct and indirect effects on key macroeconomic variables. A 1 SD shock to external debt directly effect Foreign Exchange Reserves and rise it by 1.019. However, Government Expenditure, Current Account Balance and Investment face a negative direct effect, with a decrease by -0.102, -0.678 and -0.103 unit respectively. Meanwhile, Real GDP rises significantly with a direct effect of 0.767, while the direct effect on REER is minimal (1.36E-08).

The indirect effects of a 1 SD shock to ED reflects to the broader economic interactions. The FER, RGDP and REER experience a significant rise of 0.579, 0.050 and 2.38E-09, respectively. The indirect effect of ED transmits to foreign exchange reserves through CAB and REER. Additionally, RGDP faced the indirect effect of ED transmits through GE. Moreover, GE. CAB and RGDP carry the indirect effect of ED to REER. On the contrary, Government Expenditure, Current Account Balance and Investment encounter a reduction due to 1 SD shock to ED, by -0.026, -0.84, and -0.156 unit respectively. GE faced the indirect effect of ED transmits through RGDP. Additionally, the indirect effect of ED transmits to current account balance through REER. Moreover, Investment encounters a indirect effect of through the GE, CAB and RGDP.

Shock to Foreign Exchange Reserves

***Table 5. 9*:** Shock to Foreign Exchange Reserves

Equation	**Direct Effect**	**Indirect Effect**
ED	0.606	0.606
FER	1	0.617514
GE	0	-0.061812
CAB	0	-0.410868
INV	0	-0.062418
RGDP	0	0.464802
REER	0	8.2416E-09

Direct Effects of a 1 SD Shock to Foreign Exchange Reserves rises External Debt by 0.606 units. However, the direct effects on Government Expenditure (GE), Current Account Balance (CAB), Investment (GFCF), Real GDP (RGDP), and the Real Effective Exchange Rate (REER) are all zero, suggesting no direct change in these variables as a result of a shock to FER.

Indirect Effects of a 1 SD Shock to Foreign Exchange Reserves on other macroeconomic variables is transmitted thorough external debt channel. Government Expenditure experiences a small adverse indirect effect by a decline of -0.062 units. Moreover, the Current Account Balance shows a notable negative indirect effect (-0.411), indicating a worsening of the balance as reserves increase. Similarly, Investment shows a minor negative indirect effect (-0.062), reflecting a slight decline. Interestingly, Real GDP has a positive indirect effect (0.465), suggesting that increased FER indirectly increases economic growth. Lastly, the Real Effective Exchange Rate has a negligible indirect effect, indicating minimal influence from a shock to FER on the exchange rate.

Shock to Government Expenditure

***Table 5. 10*:** Shock to Government Expenditure

Equation	Direct Effect	Indirect Effect
ED	-0.864	-0.203274
FER	0	-0.817606
GE	1	0.783999
CAB	0	0.468992
GFCF	1.269	2.053863
RGDP	7.029	6.366312
REER	1E-08	-3.8301E-08

The direct effect of a 1 SD shock to GE on ED is -0.864. In simpler terms, when government spending increases, external debt tends to decrease directly and significantly. Investmet, RGDP and REER are positive effected by the 1 SD shock to government expenditure, and rise by 1.269, 7.029, and 1E-08 units, respectively.

The indirect effect of a 1 SD shock to GE on ED is -0.203 unit. the indirect effect of shock to government expenditure is transmitted through the RGDP channel. Foreign exchange reserves experience the indirect effect through the external debt and REER by -0.818 units. Moreover, CAB experience an improvement (0.468992) through the channel of external debt and REER, where ED reduces and REER appreciates, so the net impact of these two is positive on current account balance. Investment also increases indirectly due to the reduction in external debt and a rise in RGDP. The indirect effect of 1 SD shock to GE on RGDP is smaller compared to its direct impact due to the reduction in external debt. Finally, REER faces an indirect depreciation due to the decline in ED and increase in RGDP.

Shock to Current Account Balance

***Table 5. 11*:** Shock to Current Account Balance

Equation	**Direct Effect**	**Indirect Effect**
ED	-0.651	-0.180744
FER	0.776	0.17016496
GE	0	0.066402
CAB	1	0.3343892
INV	0	0.067053
RGDP	0	-0.499317
REER	9.16E-09	3.064E-10

The direct effect of a 1 SD shock to CAB on ED is -0.651. This means that an increase in the current account balance by one standard deviation leads to a direct reduction in external debt by 0.651 units. A higher CAB generally reflects improved trade balance, meaning more exports than imports, which reduces the need for external borrowing, and lead to a significant increase in FER by 0.776 units. Additionally, this betterment in CAB leads to the appreciation in REER.

The indirect effect of a 1 SD shock to CAB on ED is -0.180744. The indirect effect of CAB on ED is transmitted through the channel of FER. Moreover, FER increases indirectly through the channel of decrease in ED and appreciation in REER. Likewise, the indirect increase in government expenditure, investment and a reduction in RGDP are attributed to a decline in external debt. The indirect minimal appreciation in REER is through the channel of ED.

Shock to Economic Growth

***Table 5. 12*:** Shock to Economic Growth

Equation	Direct Effect	Indirect Effect
ED	0.094	0.008464
FER	0	0.0631248
GE	0.099	0.089412
CAB	0	-0.002996
INV	0.099	0.214949
RGDP	1	0.767969
REER	-5.2E-09	-2.9316E-09

The direct effect of a 1 SD shock to RGDP on ED is 0.094. This indicates that an increase in RGDP by one standard deviation directly increases external debt by 0.094 units. A 1 SD shock to economic growth significantly increase government expenditure and domestics investment by 0.099 units, each. However, REER directly encounter a depreciation a shock to RGDP.

The indirect effect of a 1 SD shock to RGDP on ED is 0.0084, minimal compared to the direct impact. the indirect effect of RGDP on external debt is transmitted through the channel of government expenditure. In the same way, FER and GE experiences an indirect increase due to the ED. Moreover, the indirect increase in investment is transmitted through the channel of

ED and GE. On the other hand, CAB faces a minimal reduction due to the increase in ED, while the indirect depreciation in REER is attributed to ED and GE.

Shock to Real Effective Exchange Rate

***Table 5. 13*:** Shock to Real Effective Exchange Rate

Equation	Direct Effect	Indirect Effect
ED	0	11409966
FER	6281000	-2782680
GE	0	0
CAB	-1.2E+07	-11680000
INV	0	0
RGDP	0	0
REER	1	-0.1069888

The direct effect of a 1 SD shock in REER on ED, investment and RGDP is 0. The direct of REER appreciation on FER is positive and increases by 6281000 units. Contrary to this, current account balance experiences a significant decline due 1 SD shock to REER.

The indirect Effect of a 1 standard deviation (SD) shock in the Real Effective Exchange Rate (REER) on External Debt (ED), we observe an increase of 11,409,966 units through the channel of FER and CAB. While FER reduces significantly due to the indirect effect of a decline CAB. Moreover, the indirect effect of REER appreciation on is CAB is negative, and the indirect effect flows through the channel of FER.

CHAPTER 6

CONCLUSION

Thus, in this study, a comprehensive analysis is made of the relationships between the external debt and other major macroeconomic indicators in Pakistan for the period of 1976-2022. We conducted the unit root test for the time series data using the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. The unit root test results for the 19 variables are mixed. Some variables are stationary at the level, while others become stationary only after first difference. This indicates a combination of I(0) and I(1) processes among the variables. The non-stationary variables are made stationary by taking the first difference to conduct the analysis.

In this study, the system of equations is being developed for exploring the causes and consequences of external debt. Thus, using the Three Stage Least Squares (3SLS) method, which allows to eliminate the problem of simultaneity bias because the system of equations includes mutually dependent variables. On the cause of external debt, the results shows that government expenditure and current account balance reduce external debt which indicate the situation that government has decreases it's on dependence more on external borrowings and the improved situation in trade balance equation. Contrary to this, Real GDP (RGDP) and Foreign Exchange Reserves (FER) positively impact ED. Import driven economic growth in Pakistan which results in increase in external debt, similar as, enhancement in the foreign exchange reserves which is mostly through borrowing results in rise in external debt. Thus, concerning the impacts of external debt, the study shows that external debt has a negative impact on governance expenditure, balance of current account and investment which means that high level/amount of external debt can reduce domestic investment, the current account balance through exports and fiscal expenditures. At the same time, the study shows that other factors such as economic growth, foreign exchange reserves, and real effective exchange rates are positively affected by external debt.

The correlations between the residuals of various equations confirm the appropriateness of the 3SLS model over the Two Stage Least Squares (2SLS) model, both 2SLS and 3SLS are consistent but the 3SLS delivers more efficient estimates. The study further explores the transmission channel of a shock to any of the macroeconomic variable (ED, FER, GE, CAB, INV, RGDP and REER) transmitted to other variables. The thorough research provides

significant insights into the diverse impacts of external debt on Pakistan's macroeconomic indicators and emphasizes the importance of examining both the causes and consequences of external debt when formulating policy.

This study contributes to the existing knowledge by presenting a comprehensive analysis of external debt dynamics and confirming the importance of using appropriate estimation technique, namely 3SLS, to determine the influence of interconnected macroeconomic variables.

6.1 Policy Recommendation

The following are the policy recommendation has been made on the basis of the finding of this study

1. The government should reduce its dependence on external borrowing in financing its expenditure and deficit. It should adopt austerity measures rather than substituting debt servicing expenditures (external debt) for other important expenditures (education, health, and development, etc.).

2. Policies should aim to diversify exports, boost remittances, and put emphasis on import substitution to improve current account balance, foreign exchange Reserves and reduce external debt.

3. Economic growth should be driven by domestic sources rather than depending on imported goods. Productivity enhanced by domestic resources can reduce the burden of external debt.

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