NEXUS AMONG EXTERNAL DEBT, INFLATION, AND EXCHANGE RATE: A TIME SERIES ANALYSIS OF PAKISTAN

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ABSTRACT

Low-income countries often rely on external borrowing to bridge domestic financing gaps, and persistent debt accumulation may generate macroeconomic instability. This study examines the links among external debt, inflation, and the exchange rate in Pakistan from 1972 to 2022. To ensure a robust empirical analysis, the study uses unit root tests to check whether the variables are stationary, and then applies a Structural Vector Autoregression (SVAR) to examine the impact of changes in external debt. The results show a clear positive link between higher external debt and inflation, indicating that more debt is associated with higher inflationary pressures. Higher external debt also leads to a weaker real exchange rate, putting the local currency under pressure. The analysis finds that trade openness and debt volatility affect borrowing, while changes in exchange rates and interest rates explain most of the variations in inflation. These findings underscore the importance of coherent fiscal and monetary policies and sound debt management to maintain macroeconomic stability in Pakistan.

Keywords: External Debt, Inflation, Exchange Rate, SVAR, Pakistan.
JEL Code: E31, F34, F41, C32

INTRODUCTION

Developing economies frequently face financial constraints due to low-income levels, weak domestic savings, and insufficient investment, making external borrowing a necessary tool for development (World Bank 2023). However, excessive or poorly managed external borrowing poses serious

risks, including debt repayment difficulties, higher borrowing costs, increased solvency concerns, and reduced fiscal space for social and developmental spending. Empirical evidence indicates that external debt undermines economic growth by fueling inflation, discouraging investment, raising real interest rates, distorting fiscal policies, and undermining macroeconomic stability. Since inflation and exchange-rate stability are central indicators of macroeconomic performance, external debt levels significantly influence overall economic credibility and stability.

Exchange rates play a critical role in emerging economies by shaping trade competitiveness, inflation dynamics, and aggregate economic activity. While currency depreciation may support exports, it can also raise import costs and inflation, particularly in debt-dependent economies. High external debt increases inflationary pressures, heightens economic uncertainty, and elevates default risks, sometimes forcing restrictive monetary policies. Sustainable debt servicing therefore requires strong and sustained growth in GDP and foreign exchange earnings—conditions that many developing countries struggle to achieve (Rashid, 2003). According to the World Bank, external debt consists of obligations to non-residents repayable in foreign currency, goods, or services. In low- and middle-income countries, external debt has risen sharply, reflecting increased reliance on foreign financing for development amid persistent fiscal and current account deficits, particularly in oil-importing countries (International Debt Statistics, 2022).

Pakistan exemplifies the challenges associated with rising external debt. Since the 1970s, external debt has increased dramatically due to balance of payments pressures, political instability, weak governance, ineffective macroeconomic policies, and low capital productivity. Debt servicing now consumes a substantial share of public resources, crowding out investment in infrastructure, education, and human capital. Persistent fiscal deficits, exchange rate depreciation, inflationary pressures, and external shocks have repeatedly exacerbated the debt burden (Ahmad, 2015).

Inflation and exchange rate volatility remain central challenges for Pakistan's macroeconomic stability. Expansionary monetary policies, rising import costs, currency depreciation, and expectations-driven dynamics have contributed to persistent inflationary trends (Khan, 2022). Exchange rate instability further complicates policy management by affecting trade balances, investment decisions, and price stability. Maintaining a stable exchange rate and controlled inflation is therefore essential for sustainable growth and effective debt management.

Problem Statement

The Pakistani economy is struggling with risks that persist over time. The main reasons are the growing external debt, inflation, and exchange rate fluctuation. While an increase in external debt is sometimes necessary to fill the financial deficit and stimulate economic growth, mishandling of external debt may lead to financial instability, higher debt servicing costs, and inflationary pressures. The economic situation is complex as the interplay of external borrowing, inflation, and exchange rates is yet to be thoroughly investigated. According to the official reports of Pakistan, 36.4% of total GDP was attributed to external debt in 2023; yet genuine economic growth and stability have not been achieved. As a matter of fact, the country continues to experience high inflation and currency depreciation—issues that raise considerable doubts regarding the efficiency of debt-led economic policies. This can be illustrated by the prevailing macroeconomic conditions of Pakistan: in the first seven months of the fiscal year 2022–2023, consumer prices surged 27.5%, thus, the average inflation rate for the current year reached 25.4%. Again, the exchange rate was subject to significant depreciation, as evidenced by the Pakistani rupee depreciated sharply against the US Dollar at 286.584 PKR in June 2023 compared to 105.2933 PKR in 2017.

Research Question

1. Is there any evidence of a nexus between external debt, exchange rate and inflation in Pakistan?

Research Objective

This study aims to investigate the relationship between external debt, inflation, and the exchange rate of the Pakistan economy. More specifically, the research aims to:

1. Examine the nexus of Pakistan's external debt, exchange rate, and inflation.

Research Hypothesis

1. Alternative hypothesis (H_1): There is a nexus among an external debt, exchange rate and inflation.

   H_1: $\beta \neq 0$

2. Null hypothesis (H_0): There is no nexus among an external debt, exchange rate and inflation.

   H_0: $\beta = 0$

Significance of the Study

Vulnerabilities of the global economy to external debt have a significant influence on the economic conditions in countries all over the world. Hence, the effects of foreign borrowings on macroeconomic variables key macroeconomic variables, such as inflation and the exchange rate need to be thoroughly analyzed. It is crucial to the extent that such evidence may help policymakers at the Ministry of Finance and the State Bank of Pakistan (SBP) to design policies that ensure responsible management and use of foreign debt. The broader objective is to bring about price stability and exchange rate stability for the sustainable development of the country in the long run.

Given the current state of the economy, studies on the implications of external debt on inflation and exchange rates are essential as these dynamics create the likelihood of future challenges in the pursuit of sustainable development. Using the SVAR model, this study offers an innovative way of investigating the complicated links between external debt, inflation, and exchange rates in Pakistan. By incorporating these interdependent relationships among these variables—unlike in the past—in a single model, the model provides a fuller picture of how these variables affect the economy. The results are expected to be valuable for future policy implications and resilient economic development.

LITERATURE REVIEW

Pakistan's external debt effects on exchange rates and inflation, as in other countries, can be complex and multifaceted. The effect depends on factors such as the size of the terms of borrowing, economic policies, and external conditions. External debt is a critical component of a nation's financial structure and is used to finance development projects, support economic growth, and stabilize the balance of payments.

External Debt and Inflation

Early studies using a single equation OLS or a Granger causality test largely reported inflationary consequences of external borrowing, such as Kucukkale et al. (1996), evidence from Turkey, and Mweni et al. (2016), evidence from Kenya. Time series studies reveal a statistically significant positive association between external debt and inflation. Inversely, Fredrick et al. (2016) studied in Kenya and yielded a negative association between external debt and inflation. However, a regression analysis revealed a strong and positive relationship between the two variables. Recent studies using SVAR reveal non-linear and time-varying effects, suggesting that debt-induced inflation depends on monetary response, debt utilisation, and exchange rate pass-through. (Mohanty et al. 2019; Marienga and Arisa 2020). While using the ARDL model and the ADF test a study on Pakistan shows that inflation and external debt negatively affected the Pakistan economy, Ali et al. (2023).

External Debt and Exchange Rate

The exchange rate response to external debt remains ambiguous across developing countries. Exchange rate volatility was influenced by external debt. While some studies showed that borrowing from outside sources significantly depreciated via balance of payment pressure (Ajayi, 1992; Odera, 2012). Similarly, a study by Masaku (2001) in Kenya showed that borrowing from outside sources significantly and favorably affected the exchange rate. While other studies

reveal that when debt inflows support the reserves, exchange rate appreciation is a favorable effect; when external debt is utilized in production and revenue generation, it strengthens the exchange rate (Masaku 2001; Kouladoum 2018). Most of these studies overlooked regime shift and the dynamic effect of the post-1990 managed floating period in Pakistan.

Joint Dynamics of Debt-Inflation-Exchange Rate

The empirical results on the interrelation between external debt, inflation, and exchange rates remain fragmented and method-dependent. Owoye and Onafowora (2014), from Nigeria, show short-term inflationary pressure due to external debt by using the Structural Vector Autoregression (SVAR) framework. Similarly, Mohanty et al. (2020) studied in India by using the Structural Vector Autoregression (SVAR) method; impulse response analysis shows that external debt generates both inflationary and deflationary responses over time. In contrast, in studies relying on time series, single-equation methods reveal that external debt and inflation adversely affect economic growth in both the short and long run (El Abudi and Khanchaou,2021), the same as Djalo et al. (2023). Employed quantitative data from Indonesia indicate that all four independent variables—exports, imports, exchange rates, and inflation—have a major simultaneous or concurrent impact on foreign debt. These mixed findings suggest that the debt inflation relationship is country-specific and policy-dependent.

Literature Gap

Mostly, review studies do not capture debt shocks, exchange rate pass-through, and inflation response simultaneously, and they largely ignore the managed float regime (post-1990). Interesting studies on Pakistan use ARDL/OLS, and SVAR evidence is absent. This study contributes to the literature by examining the structural and dynamic interactions among external debt, inflation, and the exchange rate in Pakistan using the structural Vector Autoregression (SVAR) framework.

METHODOLOGY

This chapter outlines the econometric framework used to examine the effects of external debt on inflation and exchange rates in Pakistan (1972–2022). The analysis applies a non-experimental design using key macroeconomic variables within a theoretically grounded model.

Exchange Rate Overshooting Model (Dornbusch, 1976)

Dornbusch's exchange rate overshooting model explains the short-run volatility of exchange rates in response to monetary and fiscal shocks. When external debt levels rise, countries often face exchange rate depreciation due to capital outflows and reduced investor confidence. Debt accumulation leads to inflationary pressures, and central banks may adjust interest rates, potentially causing exchange rates to fluctuate away from their long-term equilibrium levels.

Implications for External Debt, Inflation, and Exchange Rates

The effect of external debt on inflation and exchange rates is influenced by a range of factors, such as fiscal discipline, monetary policy responses, and investor confidence. Excessive debt becomes unsustainable when monetary expansion or foreign refinancing occurs because these measures can lead to inflation and unstable currency exchange rates. The following part details the conceptual model, which forms the basis for designing an empirical model that investigates these relationships.

The study uses the Dornbusch model (1976) to link inflation, exchange rate fluctuations, and external debt in the foreign asset market system. The model features three linked market systems, which include the money market together with the uncovered interest rate parity market, as well as the product market. The uncovered interest rate parity market, which includes capital inflows or foreign debt, together with the product market, explains exchange rate fluctuations.

According to the Dornbusch model, modifications of monetary aggregates create movements within exchange rate

markets. A stable goods market price enables the financial sector to reach short-term balance, but foreign currency exchange rates adjust to monetary crises or external shocks because of price adjustments, which eventually drives the markets toward long-term equilibrium. Monetary crises or external shocks produce initial substantial market movement in exchange rates, which then converges because goods prices adapt in the medium term.

Model Framework

The relationship between the variables was ascertained using a theoretical model of exchange rate overshooting that was modified from Dornbusch (1976). The core foundation of the concept consists of three marketplaces and their interconnections. The money market and the uncovered interest rate parity market combine with the product, explain exchange rate fluctuations. The subsequent section delves into the discussion of these markets and their interconnectedness.

Product market. The Phillips curve, which represents the pricing function, is as follows:

$\dot{p} = \pi(y_d - y)$ ……. *3.1*

$\dot{p}$ represents the rate at which the domestic prices changes.

y_d represents entire domestic economy's demand for commodities,

y symbolizes total quantity of goods produced within the nation, and

π represents a positive constant.

According to equation (3.1), While the total demand for commodities in the nation's economy has a positive link, the supply of goods produced domestically has a negative association with the growth rate of the domestic price level.

Aggregate demand is positively influenced by the real exchange rate, overall income, government spending, and household expenditures.

$y_d = \beta_0(e - \rho) + \beta_1 y + c$ _____*3.2*

y_d is the total amount of demand,

e symbolizes nominal exchange rate,

ρ represents level for domestic prices.

y is availability of items made in the country,

$\boldsymbol{c}$ reflects the amount spent by households, the government, and

$\boldsymbol{\beta_0}, \boldsymbol{\beta_1}$ are constants coefficients.

The term **e−ρ** reflects the impact of the real exchange rate on demand. A higher real exchange rate (more competitive domestic prices relative to foreign goods) may stimulate demand for domestic goods.

β_0(e−ρ): The contribution of the real exchange rate to total demand.

- β_0 is a constant coefficient that captures the sensitivity of demand to changes in the real exchange rate.

β_1y: The availability of domestically produced items and its effect on demand.

- β_1 is a constant coefficient that measures how much the availability of domestic goods influences demand.

Equation (3.2) suggests that changes in the supply of commodities, household and government spending, and nominal exchange rate all influence the market's demand for goods.

i. Money market:

The following represents the domestic market's demand for money:

$$\boldsymbol{md} = \boldsymbol{\rho} + \boldsymbol{\alpha y} - \boldsymbol{\lambda i} \quad \text{3.3}$$

α>0, λ<0

$\boldsymbol{md}$ represents demand for money,

$\boldsymbol{i}$ shows domestic rate of interest,

$\boldsymbol{\alpha}$ depicts money demand's elasticity of income, whereas

$\boldsymbol{\lambda}$ demonstrates the elasticity of demand for money due to income interest.

α>0: A positive coefficient, reflecting the elasticity of money demand with respect to income. As income/output increases, the demand for money for transactional purposes also rises.

λ<0: A negative coefficient, reflecting the elasticity of money demand with respect to the interest rate. As interest rates rise, the opportunity cost of holding money increases (since money could be invested to earn interest), reducing the demand for money.

Equation (3.3) suggests that because saving money has more potential cost, higher interest rates reduce demand for money.

A demand for money in transactions rises in tandem with a rise in output have a positive relationship.
The money market's equilibrium criterion is completely satisfied by;
$m = ms = md$ _____3.4

Uncovered interest rate parity market. The Dornbusch overshooting model suggests that rate of interest (i) on a local bond should equal rate of interest on international bond (i*), in addition to expected depreciation of an exchange rate (E(e)). Rogoff and Obstfeld (1998) illustrated that there can be a higher risk premium associated with foreign assets. Their findings result in the improvement of the Dornbusch (1976) model through the implementation of risk premium adjusted interest rate parity condition.
$\boldsymbol{i} = \mathbf{i}^{*} + \mathbf{E}(\boldsymbol{e}) + \boldsymbol{\mathcal{RP}}$ _____3.5
i is domestic bond's interest rate,
A risk premium variable, RP, represented by rate of interest on foreign bonds (i*), and it is based on the amount of foreign borrowing a country has (F*).
$\mathcal{RP} = \alpha_0 \mathcal{F}^{*}$ _____3.6
$\alpha_0 > 0$
The risk premium rises in response to an increase in foreign borrowing, and as a result, F* contributes to the theoretical explanation of the level of government spending (C). The spread between e and e is predicted depreciation of nominal exchange rate, or E(e).
$\mathrm{E}(e)^{\cdot} = \phi(\bar{e} - e)$ _____3.7
$\phi > 0$

Relationship between Exchange Rate Overshooting and Foreign Borrowing Based on the Aforementioned Equations:

Short-term fluctuations in exchange rate can result of changes in money supply when price rigidities are present (Dornbush, 1976). As a result, money market and uncovered interest rate parity market equations can be used to create the short run or immediate exchange rate equation. Equation 3.9

below is generated by making subject **i** and establishing md = m in equation (3.3).

$i = 1/\lambda(p + \alpha y - m)$_____*3.8*

Swapping out (e) for $\boldsymbol{\phi}$ ($\bar{e}$-e) and $\boldsymbol{Rp}$ for α_0 F* The following equation is obtained from equation 3.5:

$i = i^* + \phi(\bar{e} - e) + \alpha_o F^*$_____*3.9*

Equating equations 3.8 and 3.9 yields the short-term equilibrium exchange rate (the following equation 3.11) and makes the following the subject e:

$e = 1/\phi\lambda[\lambda i^* + \phi\lambda\bar{e} + m - p - \alpha y +$

$\lambda\alpha_o F^*]$_____*3.10*

After substituting equation (3.2) into equation (3.1) and establishing p = 0, the product market's short-run equilibrium equation for price is produced.:

$\dot{p} = \boldsymbol{\pi}(Y_d - Y)$ At equilibrium $\dot{p}$=0 hence :Y_d=Y

substitute the equation 3.2 into Y_d= Y

$$Y = \beta_0(e - \rho) + \beta_1 y + c$$
$$Y = \beta_0 e - \beta_0\rho + \beta_1 y + c$$
$$Y - \beta_1 y = \beta_0 e - \beta_0\rho + c$$
$$(1 - \beta_1)y = \beta_0 e - \beta_0\rho + c$$
$$\beta_0\rho = \beta_0 e - (1 - \beta_1)y + c$$
$$\rho = e - \frac{(1 - \beta 1)y}{\beta_0} + \frac{c}{\beta_0}$$

Rename ρ as p (price level) to express the short-run equilibrium equation:

$p = e + \frac{c}{\beta_o} -$

$\frac{(1-\beta_1)Y}{\beta_o}$_____*3.11*

In the long run, the exchange rate was anticipated to be the same as current nominal exchange rate, or $e = \bar{e}$. Equation 3.12 below can be obtained by modifying subject p and putting equation 3.10 next to equation 3.9.

$\bar{p} = (i^* + \alpha_o F^*)\lambda - \alpha y + m$_____*3.12*

Equation 3.12 represents long-term pricing level. This is negatively affected by domestic output, but positively influenced by the rate of interest on foreign bonds, foreign borrowing and domestic money supply. Equation (3.2) can be used to get the long-term goods market pricing equation by setting $y_d = y$ and $(\bar{e} - e)$

$$\bar{p} = \bar{e} + \frac{c}{\beta_o} - \frac{(1-\beta_1)Y}{\beta_o} \quad \text{3.13}$$

Prices in the asset and goods markets are equal over the long term. In the market, the nominal value equilibrium rate of exchange (e) is generated by making the equations (3.3.12) and (3.3.13) equal.

$$\bar{e} = m + \lambda(i^* + \alpha_o F^*) + \left(\frac{(1-\beta_1)}{\beta_o} Y - \alpha Y\right) - \frac{c}{\beta_o} \quad \text{3.14}$$

Equations (3.12) and (3.13) can be utilized to analyze the long-term effects of changes in foreign debt on the equilibrium state of both the actual exchange rate and the price level, respectively. By considering the partial derivatives of equations (3.12) and (3.14) about F*, one may determine the long-term effect.

Definition and Measurement of Variables

Table 3.12: Definition and measurement of variables

variables	Descriptions	definitions	Sources
External debt	Percentage of external debt to GDP	Share of Pakistan's GDP owed to foreign lenders.	World development indicator
Inflation	Change in CPI	is the rise in the economy's average price level	World development indicator
Exchange rate	% in real Exchange rate	Nominal exchange rate divided by a price deflator.	World development indicator
Real interest rate	Percentage change in inflation adjusted interest rate (fisher equation)	is the interest rate after it has been modified to compensate for inflation	World development indicator
Trade openness	(Imports +exports)/GDP	Is the extent to which Pakistan is involved in the global trading system?	World development indicator
Government expenditure	Govt consumption, investment, transfer payments to GDP	The total government consumption, investment and transfer payments.	World development indicator

Money supply	(M_3)Money supply was computed as the ratio of GDP.	It includes money held in savings and deposits accounts with commercial banks, public funds maintained by non-bank organizations, and time and savings deposits held by commercial banks and non-bank financial institutions.	World development indicator

Econometric Model

The impact of external debt on inflation and the exchange rate is examined by an autoregressive model. The SVAR technique accommodates theory-consistent contemporaneous and dynamic corrections among variables and links empirical data with economic theory. Furthermore, by employing the economic assumptions as a foundation, the SVAR models provide empirical traceability as well as a connection between data and theory. The present investigation estimates seven distinct structural models to illustrate the effect of external debt on price inflation and the exchange rate. Based on the model, we established impulse response functions. A general model that illustrates how foreign debt affects both inflation and exchange rates simultaneously is as follows:

$$\beta_0\, y_t = c_0 + \beta_i \sum_{i=1}^{p} y_{t-i} + r_i \sum_{i=1}^{k} X_{i,t-i} + u_{i,t} \quad \text{3.15}$$

Where;

$$y_t = \begin{bmatrix} MS \\ GE \\ EXR \\ TO \\ EXD \\ IR \\ I \end{bmatrix}, \quad U_t = \begin{bmatrix} u_{11} \\ u_{21} \\ u_{31} \\ u_{41} \\ u_{51} \\ u_{61} \\ u_{71} \end{bmatrix}$$

Where c_0 is a kx1 vector of constants? The dependent variable has p_i (i = 1, 2, 3, ……p) lags. X_i are 7-choice variables

specifically, MS, GE, EXR, TO, EXD, IR and I, and U_t is kx1 vector of error terms.

Estimated technique. Utilizing the Structural Vector Auto-regression approach, the dynamic link between the exchange rate and inflation of external debt was examined.

Restrictions. This study adopts a recursive SVAR, which imposes theory-based causal ordering among variables, allowing clear identification of structural shocks. The recursive structure is preferred due to its interpretability, suitability for policy analysis, and enabling effective use of impulse response functions and variance decomposition to examine the dynamic effects of external debt shocks on inflation and exchange rates.

For every structural VAR equation, equation (3.15) can be further stated as follows, assuming a one lag SVAR for each endogenous variable:

$$MS_t = a_{10}MS_{t-1} + a_{12}GE_{t-1} + a_{13}EXR_{t-1} + a_{14}TO_{t-1} + a_{15}EXD_{t-1} + a_{16}IR_{t-1} + a_{17}I_{t-1} + U_{MS} \quad 3.16$$

$$GE_t = a_{20}MS_{t-1} + a_{22}GE_{t-1} + a_{23}EXR_{t-1} + a_{24}TO_{t-1} + a_{25}EXD_{t-1} + a_{26}IR_{t-1} + a_{27}I_{t-1} + U_{GE} \quad 3.17$$

$$EXR_t = a_{30}MS_{t-1} + a_{32}GE_{t-1} + a_{33}EXR_{t-1} + a_{34}TO_{t-1} + a_{35}EXD_{t-1} + a_{36}IR_{t-1} + a_{37}I_{t-1} + U_{EXR} \quad 3.18$$

$$TO_t = a_{40}MS_{t-1} + a_{42}GE_{t-1} + a_{43}EXR_{t-1} + a_{44}TO_{t-1} + a_{45}EXD_{t-1} + a_{46}IR_{t-1} + a_{47}I_{t-1} + U_{TO} \quad 3.19$$

$$EXD_t = a_{50}MS_{t-1} + .a_{52}GE_{t-1} + a_{53}EXR_{t-1} + a_{54}TO_{t-1} + a_{55}EXD_{t-1} + a_{56}IR_{t-1} + a_{57}I_{t-1} + U_{EXD} \quad 3.20$$

$$IR_t = a_{60}MS_{t-1} + a_{62}GE_{t-1} + a_{63}EXR_{t-1} + a_{64}TO_{t-1} + a_{65}EXD_{t-1} + a_{66}IR_{t-1} + a_{67}I_{t-1} + U_{IR} \quad 3.21$$

$$I_t = a_{70}MS_{t-1} + a_{72}GE_{t-1} + a_{73}EXR_{t-1} + a_{74}TO_{t-1} + a_{75}EXD_{t-1} + a_{76}IR_{t-1} + a_{77}I_{t-1} + U_I \quad 3.22$$

The SVAR for all equations can be written in matrix form as:

$$\begin{bmatrix} 1 & \beta_{12} & \beta_{13} & \beta_{14} & \beta_{15} & \beta_{16} & \beta_{17} \\ \beta_{21} & 1 & \beta_{23} & \beta_{24} & \beta_{25} & \beta_{26} & \beta_{27} \\ \beta_{31} & \beta_{32} & 1 & \beta_{34} & \beta_{35} & \beta_{36} & \beta_{37} \\ \beta_{41} & \beta_{42} & \beta_{43} & 1 & \beta_{45} & \beta_{46} & \beta_{47} \\ \beta_{51} & \beta_{52} & \beta_{53} & \beta_{54} & 1 & \beta_{56} & \beta_{57} \\ \beta_{61} & \beta_{62} & \beta_{63} & \beta_{64} & \beta_{65} & 1 & \beta_{67} \\ \beta_{71} & \beta_{72} & \beta_{73} & \beta_{74} & \beta_{75} & \beta_{76} & 1 \end{bmatrix} \begin{bmatrix} MS \\ GE \\ EXR \\ TO \\ EXD \\ IR \\ I \end{bmatrix} = \begin{bmatrix} a_{10} \\ a_{20} \\ a_{30} \\ a_{40} \\ a_{50} \\ a_{60} \\ a_{70} \end{bmatrix} +$$

$$\begin{bmatrix} \alpha_{11} & \alpha_{12} & \alpha_{13} & \alpha_{14} & \alpha_{15} & \alpha_{16} & \alpha_{17} \\ \alpha_{21} & \alpha_{22} & \alpha_{23} & \alpha_{24} & \alpha_{25} & \alpha_{26} & \alpha_{27} \\ \alpha_{31} & \alpha_{32} & \alpha_{33} & \alpha_{34} & \alpha_{35} & \alpha_{36} & \alpha_{37} \\ \alpha_{41} & \alpha_{42} & \alpha_{43} & \alpha_{44} & \alpha_{45} & \alpha_{46} & \alpha_{47} \\ \alpha_{51} & \alpha_{52} & \alpha_{53} & \alpha_{54} & \alpha_{55} & \alpha_{56} & \alpha_{57} \\ \alpha_{61} & \alpha_{62} & \alpha_{63} & \alpha_{64} & \alpha_{65} & \alpha_{66} & \alpha_{67} \\ \alpha_{71} & \alpha_{72} & \alpha_{73} & \alpha_{74} & \alpha_{75} & \alpha_{76} & \alpha_{77} \end{bmatrix} \begin{bmatrix} MS_{t-1} \\ GE_{t-1} \\ EXR_{t-1} \\ TO_{t-1} \\ EXD_{t-1} \\ IR_{t-1} \\ I_{t-1} \end{bmatrix} +$$

$$\begin{bmatrix} U_{MSt} \\ U_{GEt} \\ U_{EXRt} \\ U_{TOt} \\ U_{EXDt} \\ U_{IRt} \\ U_{It} \end{bmatrix} \quad 3.23$$

In matrix notation, SVAR model in equation is written as;

$$\boldsymbol{\beta_0 y_t = \alpha + \beta_0 y_{t-p} + u_t} \quad 3.24$$

$\boldsymbol{\beta_0}$ is a matrix of variables' coefficients at time t. It depicts an endogenous variables' simultaneous relationship.

$\boldsymbol{y_t}$ is a vector with seven endogenous variables that is 7 by 1.

$\boldsymbol{\alpha}$ represents a constant 7x1 vector,

$\boldsymbol{\beta}$ is variables' coefficients matrix at time t-p,

$\boldsymbol{u_t}$ reduced form residuals represented by 7x1 vectors.

$\boldsymbol{ut}$ is uncorrelated both reciprocally and periodically, where p is the number of delays. P is ascertained using empirical means. We assumed p to be one in this theoretical framework

for the purpose of simplicity in presentation. Equation 2 can be simplified to the following form by pre-multiplying $\boldsymbol{B_0}^{-1}$ on both sides.

$$\begin{bmatrix} MS_t \\ GE_t \\ EXR_t \\ TO_t \\ EXD_t \\ IR_t \\ I_t \end{bmatrix} = \begin{bmatrix} g_{10} \\ g_{20} \\ g_{30} \\ g_{40} \\ g_{50} \\ g_{60} \\ g_{70} \end{bmatrix} + \begin{bmatrix} g_{11} & g_{12} & g_{13} & g_{14} & g_{15} & g_{16} & g_{17} \\ g_{21} & g_{22} & g_{23} & g_{24} & g_{25} & g_{26} & g_{27} \\ g_{31} & g_{32} & g_{33} & g_{34} & g_{35} & g_{36} & g_{37} \\ g_{41} & g_{42} & g_{43} & g_{44} & g_{45} & g_{46} & g_{47} \\ g_{51} & g_{52} & g_{53} & g_{54} & g_{55} & g_{56} & g_{57} \\ g_{61} & g_{62} & g_{63} & g_{64} & g_{65} & g_{66} & g_{67} \\ g_{71} & g_{72} & g_{73} & g_{74} & g_{75} & g_{76} & g_{77} \end{bmatrix} \begin{bmatrix} MS_{t-1} \\ GE_{t-1} \\ EXR_{t-1} \\ TO_{t-1} \\ EXD_{t-1} \\ IR_{t-1} \\ I_{t-1} \end{bmatrix} + \begin{bmatrix} e_{MSt} \\ e_{GEt} \\ e_{EXRt} \\ e_{TOt} \\ e_{EXDt} \\ e_{IRt} \\ e_{It} \end{bmatrix} \quad \text{3.25}$$

Obtaining the structural model that separates the exogenous shocks and quantifies their effect on the variables in the model is the aim of the estimating process.

RESULTS AND DISCUSSION

This chapter reports the empirical results on the relationship between external debt, inflation, and the exchange rate in Pakistan.

Unit Root Test Results

Table 4.1: Augmented Dickey-Fuller test 1

Variable	Test Statistic (1%)	Test Statistic (5%)	Test Statistic (10%)	Probability	Order of Integration (I)
Money Supply	-3.57	-2.92	-2.59	0	I(1)
External Debt	-3.568	-2.92	-2.59	0	I(0)
Government Expenditure	-3.57	-2.92	-2.59	0	I(1)
Inflation	-3.56	-2.92	-2.59	0	I(0)
Interest Rate	-3.57	-2.92	-2.59	0	I(0)
Trade Openness	-3.57	-2.92	-2.598	0.0003	I(0)
Exchange Rate	-3.58	-2.92	-2.59	0	I(1)

Sources: Author's calculation

Optimal Lag selection. Lag length for the SVAR model was determined using LR, SC, HQ, FPE, and Akaike Information Criterion (AIC) criteria. The selected lag order was based on the consensus across these criteria.

Lag length criteria. This research identifies the ideal lag time in this analysis, with the AIC (Akaike Information Criteria) being the criterion that most researchers choose (Özçiçek, 1999). Here, the AIC suggests that the best lag length is 4, with a value of 34.94840.

Table 4.5 Lag length criteria 1

Lag	Log(L)	LR	FPE	AIC	SC	HQ
0	-968.01	NA	6.07e+09	42.39172	42.66999*	42.49596
1	894.086	122.1342	2.11e+09	41.30810	43.53427	42.14204
2	844.013	67.49065	2.33e+09	41.26142	45.43549	42.82505
3	695.794	154.6633	47532931	36.94755	43.06952	39.24088
4	600.813	70.20284*	16972428*	34.94840*	43.01828	37.97143*

* denotes a lag order that the criterion chose.

Normality Test of Variables

Before conducting the SVAR analysis, the normality of the macroeconomic time-series variables is examined to assess distributional properties, although SVAR is generally robust to non-normality. The Jarque–Bera and Shapiro–Wilk tests are employed to evaluate normality by comparing the skewness and kurtosis of each variable with those of a normal distribution.

Table: Results of Normality Tests

Variable	Jarque-Bera p-value	Shapiro-Wilk p-value
Money Supply	0.3664	0.2785
Government Expenditure	0.2010	0.1988
External Debt	0.670001	0.5432
Inflation	0.37100	0.4554
Real Interest Rate	0.1254	0.3154
Real Exchange Rate	0.8057	0.7654
Trade Openness	0.4349	0.395

Sources: Author's Calculation

The normality test results show that all variables do not reject the normality assumption, as the Jarque–Bera and Shapiro–Wilk p-values exceed the 0.05 significance level. This indicates that the data are approximately normally distributed, supporting the reliability of the econometric analysis and SVAR estimation.

Visualizing an Impulse Response of External Debt.

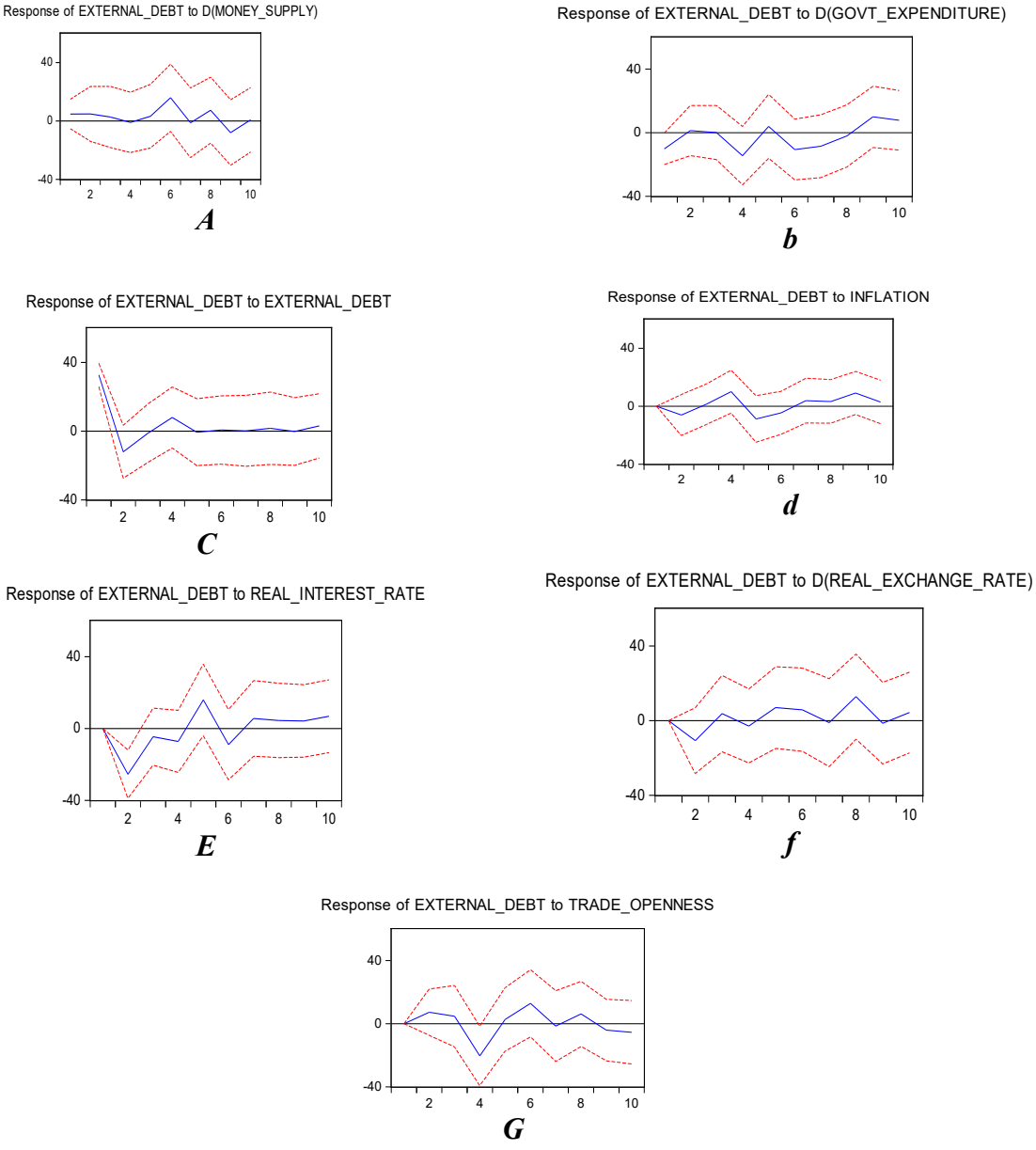

Figure 4.5.2: Responses of external debt 1

Graph A shows that in the first period, the shock of external debt on the money supply is minimal. A positive

external debt shock causes only a slight and inconsistent change in money supply across periods, suggesting a weak indirect relationship.

The b graph shows that one unit change in external debt leads to a decrease in government expenditure. The impulse response shows a decline in government expenditure after a debt shock, most notably in early periods. This implies a contractionary fiscal stance, likely aimed at managing higher debt servicing costs. However, in later periods (e.g., Period 9), expenditure increases again despite high debt, suggesting counter-cyclical or politically driven spending.

The graph shows that a one standard deviation shock to external debt leads to a sharp and immediate increase in external debt levels during the first four quarters. This indicates that external debt is highly persistent, implying that current borrowing decisions are strongly influenced by past debt accumulation. The effect remains positive and decays slowly, indicating long-term fiscal dependency on external sources. This behavior reflects the path-dependent nature of debt in developing countries like Pakistan, where budgetary constraints and low domestic savings necessitate recurring foreign borrowing. Similar dynamics are observed in Reinhart and Rogoff (2010), who noted that debt accumulation often leads to "debt overhang" in developing economies.

In graph d, period 2 shows a significant decrease in inflation alongside a decrease in external debt, as repaying external debt can involve reducing government spending. This can lead to lower aggregate demand in the economy, potentially putting downward pressure on prices Sheen (2013) Period 2: Real interest rates are highly negative, and there's a significant decrease in external debt. In Period 6: Real interest rates are highly negative again, but the change in external debt is minimal. In Period 9: Real interest rates remain negative even though foreign debt has slightly increased. Rising external debt can crowd out private investment by competing for loanable funds (Sheen, 2013)

The real exchange rate fluctuates in response to changes in the external debt in graph f, as demonstrated in Period 2: A notable decline in external debt is accompanied by a decline (with no positive values) in the real rate of exchange.

In Period 6: Minimal change in external debt with a depreciation. In Period 9: Slight increase in external debt with a depreciation.

From period 3-4th and 7th there is decline in trade openness with exchange rate. High external debt can influence trade openness through policy measure such as tariffs, subsidies or trade agreements.

The graph a indicates that there is a slight increase in money supply during Periods 1 and 4, coinciding with a rise in inflation. Period 5: Demand-pull inflation may be the cause of a little increase in money supply and a decrease in inflation. Overall, the relationship between money supply and inflation.

Graph b illustrates that there's no clear and consistent pattern of inflation changes following government spending changes. In some periods, an increase in expenditure coincides with higher inflation, aligning with higher inflation, while in other periods, it coincides with a decrease.

Initially, there is a consistent effect, with improvement observed from the 3rd period onwards, peaking in the 4th period, and then declining thereafter. Starting from the 5th period, another recovery phase ensues, with continuous improvement observed until the 7th period. However, there is a slight decline by the 8th point, after which the effect stabilizes and levels off in the long run. This pattern indicates that initially, the external debt to gross domestic product ratio affects inflation in both positive and negative ways (Malik, 2012) also find the same results while checking the economic growth in the context of Pakistan. Subsequently, it begins to rise and eventually stabilizes, indicating a more consistent impact over time. (Mustafa Uğur KARAKAPLAN, 2009) Indicates that if financial markets are well-developed, external debt will have a less inflationary effect.

Impulse Responses of Inflation.

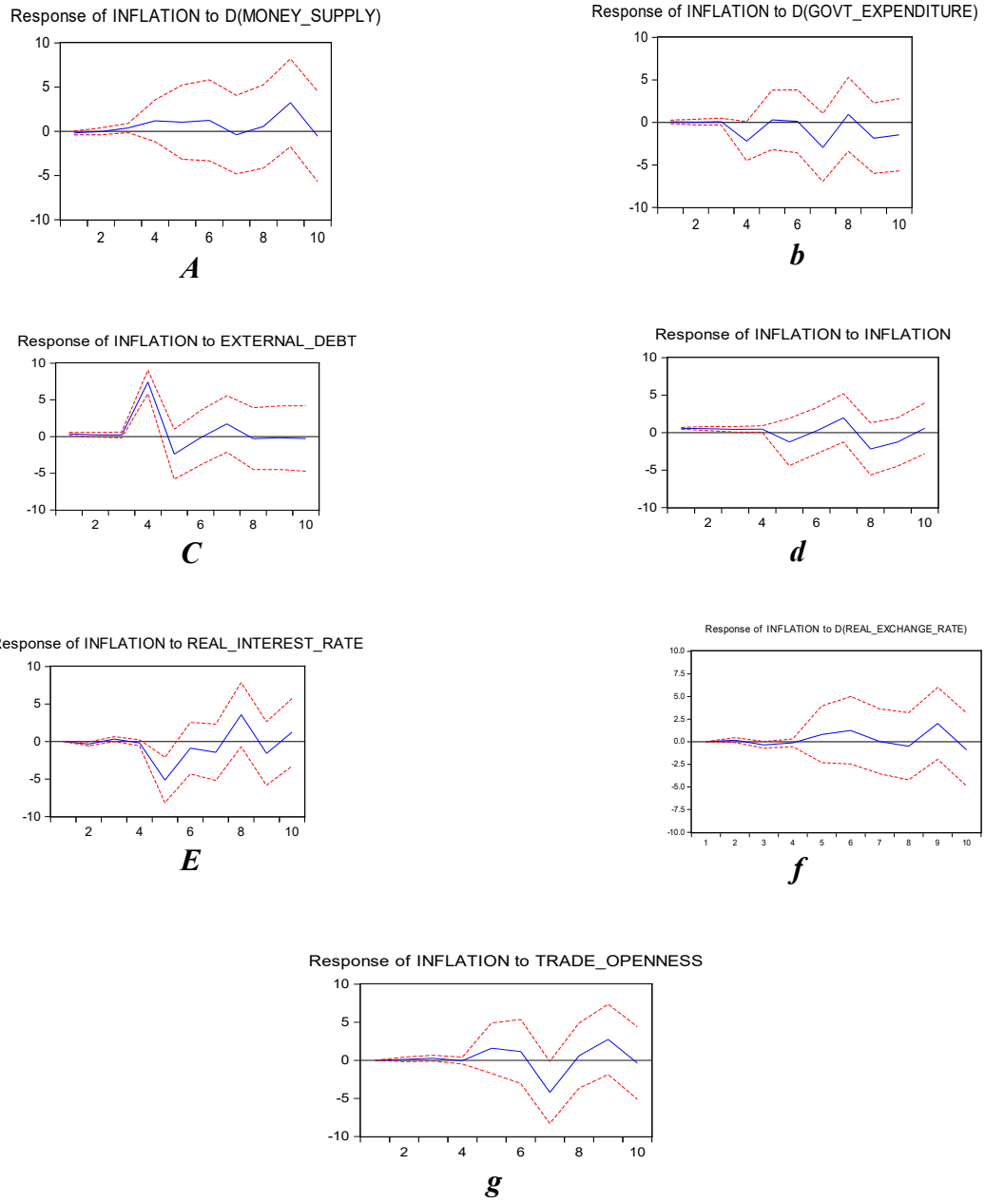

Figure 4.5.3: responses of inflation 1

Inflation wouldn't cause itself. It is an outcome of various economic factors. Examining the response of inflation to inflation would essentially be looking at the variable's own persistence over time. The graph d shows that inflation is consistent up to the 4^{th} period and then shows a minimum fluctuation over time. This is due to Inflation persistence, which explains this behavior. (Moore, 1995)

The graph e shows that the Periods with higher real interest rates don't necessarily correspond to lower inflation, real interest rate is high but inflation is negative. This seems counterintuitive but could be explained by the interest rate hike might be too recent for its deflationary effects to be realized. Periods with lower real interest rates Period 7: don't necessarily correspond to higher inflation.

The graph f illustrates the response of inflation to a variation in real exchange rate of a single unit. In period 6, there is an unexpected rise in the real exchange rate despite an increase in inflation. High inflation usually reduces the purchasing power of an exchange, making it less valuable in comparison to other currencies and resulting in a drop in the actual exchange rate. Conversely, however, low inflation, or low inflation relative to trading partners, can support a nation's exchange and raise the real exchange rate. (Geert Bekaert, 2007)

The last graph g shows the change in trade openness with response to inflation. Period 7, trade openness diminishes with a decline in inflation. In Period 4 high trade openness, but also high inflation (Totonchi, 2011.). In Period 6, Trade openness increases, but inflation falls. This could be consistent with the disinflationary effects of increased competition (Loungani, 2005).

Impulse Responses of Real Exchange Rate.

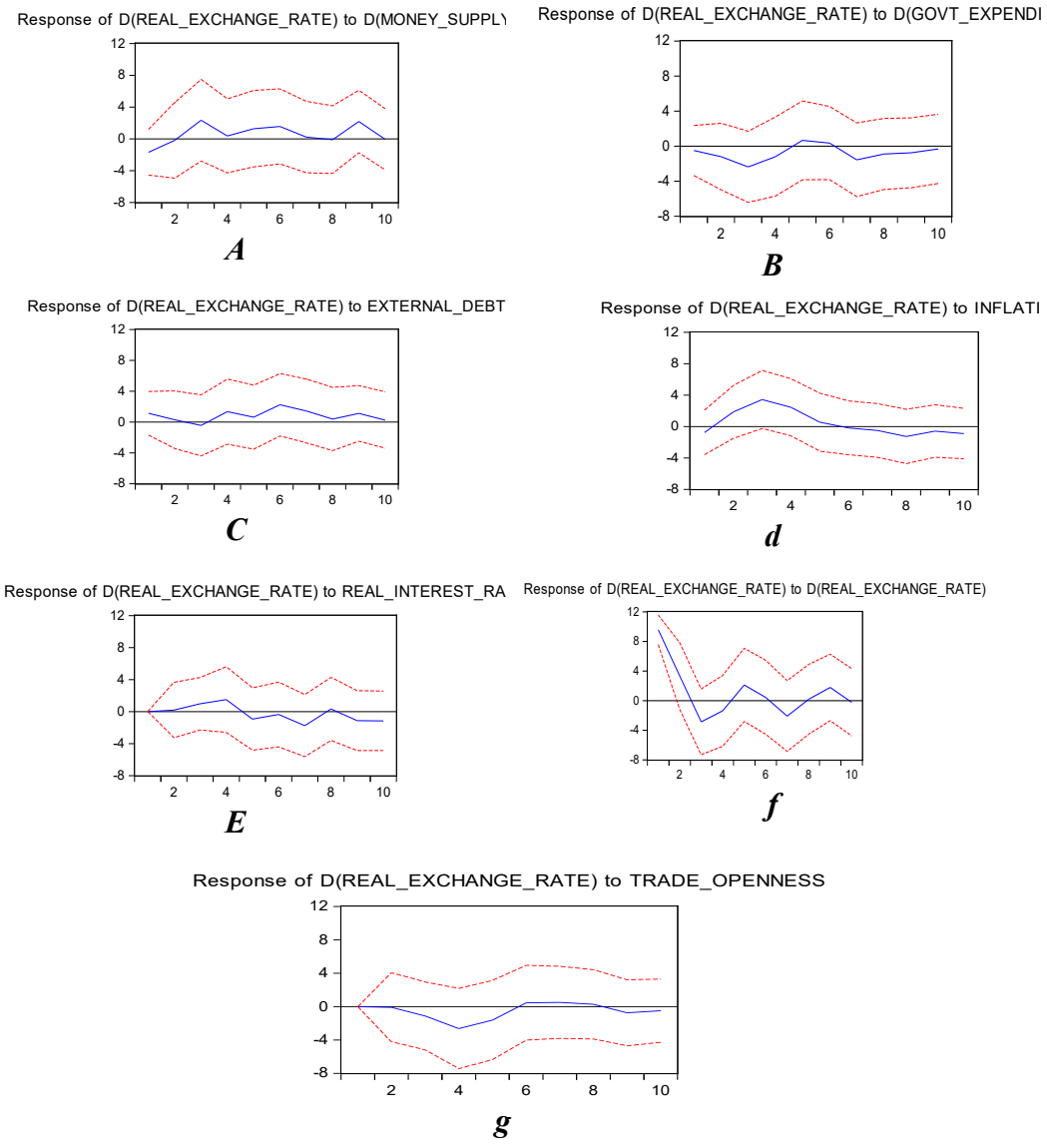

Figure 4.5.4: responses of exchange rate 1

The graph a showcases relationship among exchange rate shocks and the money supply. Typically, a rise in the money supply leads to a depreciation of the real exchange rate. However, Period 1 presents a unique case with a negative money supply and a high (appreciating) real exchange rate. In

Period 2, money supply is negative again, and real exchange rate falls (depreciation). In Period 3, money supply is negative (but a smaller decrease compared to period 1 & 2), and real exchange rate barely changes. In Period 4 & 5, money supply becomes positive (increases), but real exchange rate stays relatively flat or even appreciates slightly. In Period 6, 7, & 8, money supply remains positive (increases), and real exchange rate starts appreciating. in Period 9 & 10, money supply remains positive, and real exchange rate shows mixed results.

The graph b shows the one-unit deviation shock in real exchange rate will respond to government expenditure. In period 1, Real exchange rate and government expenditure is declining up to 4^{th} period

In addition to short-term depreciation from selling local exchange for debt service, however, productive investments from borrowed funds could ultimately lead to appreciation. Period 1, external debt is positive, but real exchange rate is high (appreciation). Period 2: external debt increases further, and real exchange rate falls (depreciation). In Periods 3-10, external debt keeps increasing, but real exchange rate shows mixed results (both appreciation and depreciation). Graph d shows how a one-unit shock to the real exchange rate affects inflation. Periods 1 and 2 experience deflation (negative inflation). However, in later periods, a real exchange rate shock leads to a significant rise in inflation.

Graph e depicts real interest rates and real exchange rates over ten periods. Periods 1 and 2 see negative or near-zero real interest rates alongside a mix of appreciation and depreciation in the real exchange rate. This trend of fluctuating real exchange rates persists throughout periods 3-10, while real interest rates become positive and start to fluctuate as well. Real exchange rate (exchange strength) has a complex relationship with real interest rates. This decrease in demand for domestic bonds could put downward pressure on real interest rates even further. (Rogoff, 1996)

The graph f displays how a one standard unit change in real of exchange rate impacts itself. It illustrates a decreasing trend, with fluctuations observed. While there's an initial increase in period 1, periods 2 to 4 show a declining trend, followed by intermittent ups and downs.

The graph g shows that a unit change in the rate of trade openness will affect the real exchange rate. From period 1 to 4 the trade openness is increasing with rise in real exchange rate. From 4 onward, the trade openness is decreasing with an increasing trend of real exchange rate. A higher RER can decrease exports and increase imports, widening the trade deficit. Conversely, a lower RER can boost exports and reduce imports, enhancing trade openness.

Interpretation of impulse responses of External debt, Inflation and Exchange rate

The impulse response analysis underscores the intricate and interconnected nature of external debt, inflation, and the real exchange rate. While external debt primarily exhibits self-reinforcing behavior, its influence on inflation is relatively limited. Inflation appears largely driven by its own past dynamics, with some potential links to monetary and fiscal policies. The real exchange rate is influenced by a combination of factors, including government spending, trade openness, and, increasingly, external debt.

Its persistence, characterized by the significant impact of past debt levels on current ones, contributes to a snowball effect of accumulating interest and new borrowing. Inflation's effect on debt repayment is not straightforward (Sheen, 2013). Exchange rate fluctuations also impact external debt, with depreciation potentially reducing it through export stimulation and import reduction. Furthermore, government efforts to decrease external debt often involve fiscal measures that can lower aggregate demand, indirectly affecting price levels.

External debt exerts both inflationary and deflationary pressures, with its impact evolving and contingent upon factors like economic maturity and financial market development (Mohanty, 2013). Exchange rate depreciation can fuel inflation, while past inflation rates persist over time (Ali, 2015). External debt affects the exchange rate, depending on debt servicing, productive investments, and investor confidence, Inflation also play key role (Bunescu, 2014). In some cases, nations with lower inflation than their trading partners may see their currency strengthen. Furthermore, what

investors expect about future inflation can shape their decisions and impact currency values. (Valogo, 2023).

This impulse response analysis shows how external debt interplays with exchange rate and inflation. The effect of a series of external debt shocks on the exchange rate is mixed, with both appreciation and depreciation occurring. Theoretical perspectives predict depreciation, but empirical evidence show a more dynamic response. Moreover, there is no linear relation between external debt and inflation (with positive and negative responses depending on different time horizons). Causal Direction in Impulse Responses:

Different economic shocks produce various effects that affect crucial variables of the economy according to the impulse responses.

External Debt and Inflation. The analysis shows that external debt has a self-reinforcing nature, meaning past levels of external debt significantly impact future debt accumulation.

- Inflation, however, appears to be influenced more by monetary and fiscal policies rather than external debt directly.

1. External Debt and Exchange Rate:

- External debt shocks generate both short-run fluctuations and longer-run depreciation pressures on the real exchange rate.

2. Inflation and Exchange Rate:

- Exchange rate depreciation is associated with inflationary pressures through higher import costs.

1.1 Impulse Responses over Pakistan's Economic Timeline:

1) 1980s – Period of Fiscal Expansion:

- The results from impulse response analysis demonstrate that increased external debt generates depreciation of the exchange rate.

- **1990s – Structural Adjustment Programs:**

- The impulse responses show short-term fluctuations of both inflation and exchange rates after government implemented austerity measures to balance macroeconomic balances.

2) 2000s – Exchange Rate Volatility and Inflationary Trends:

- High inflation and external debt were key economic challenges in the 2000s.

- Previous inflation maintains a strong, persistent impact on present inflation rates according to the inflation impulse response function.

3) 2010s – Rising External Debt and Depreciation:

- The Pakistani Rupee witnessed sharp depreciation, particularly between 2018 and 2020, due to growing external debt and macroeconomic instability.
- The impulse responses confirm that shocks to external debt have a prolonged impact on exchange rate depreciation, which in turn fuels inflation.

Impulse responses align with Pakistan's historical fiscal and exchange rate trends, such as fiscal expansions, structural adjustments, and exchange rate volatilities. The results suggest that external debt accumulation plays an important role, emphasizing the importance of sound fiscal and monetary policies in ensuring macroeconomic stability.

Variance Decomposition

For short-term forecasts, the study used a structural VAR (SVAR) model because standard VAR models cumbersome with many variables (highly parameterized). The SVAR approach allowed them to analyze how much each variable's (money supply, government spending, etc.) changes were caused by its own internal factors ("shocks") relative to other variables. (Enders, 2008).

Variance Decomposition of External debt.

Table 4.6.0-1: Variance Decomposition of External debt

Period	S.E.	D(MONEY_SUPPLY)	D(GOVT_EXPENDITURE)	D(EXTERNAL_DEBT)	INFLATION	REAL_INTEREST_RATE	REAL__EXCHANGE_	TRADE_OPENNESS
1	37.40060	0.649500	7.514951	91.83555	0.000000	0.000000	0.000000	0.000000
2	71.68077	0.198557	5.266498	78.81645	0.513057	14.55738	0.020565	0.627492
3	78.19718	0.549550	4.479084	69.05064	0.657279	23.93780	0.797283	0.528368
4	83.70372	0.646927	4.881628	62.85251	1.041141	21.08625	2.376950	7.114594
5	90.70561	0.550923	5.348278	55.28099	2.785473	21.69102	2.025515	12.31780
6	95.69067	1.892097	6.581584	49.68273	2.640098	24.33730	3.598307	11.26788
7	98.23568	2.268246	6.263083	47.14586	2.857602	24.97779	5.084463	11.40295
8	99.68697	2.254156	6.086825	45.84733	3.126187	24.29184	7.096878	11.29678
9	104.5979	4.582723	8.452798	41.92696	3.338602	23.34183	7.969086	10.38801
10	106.6775	6.667661	8.127281	40.32836	3.456561	23.66221	7.718029	10.03990

External debt is an extremely endogenous variable, strongly driven by its past dynamics. Government expenditure, real interest rates, and, to a lesser extent, money supply, inflation, and trade openness do affect its fluctuation, but — as with many macroeconomic variables — the main driver behind changes in external debt is its past value. This implies a significant degree of persistence in external debt dynamics.

The interactions of these factors drive its moderating role over time, reflecting the complex historical factors that contribute to the build-up of external liabilities.

While government spending and real interest rates emerge as key determinants, the impact of other variables, such as trade openness and monetary policy, should not be overlooked.

Variance Decomposition of Inflation.

Table 4.6.0-2 Variance Decomposition of inflation

Period	S.E.	D(MONEY_SUPPLY)	D(GOVT_EXPENDITURE)	D(EXTERNAL_DEBT)	INFLATION	REAL_INTEREST_RATE	REAL__EXCHANGE_	TRADE_OPENNESS
1	0.858756	10.41922	0.205977	40.12066	49.25414	0.000000	0.000000	0.000000
2	1.226022	7.764722	0.115386	27.05683	57.32024	4.779594	0.116071	2.847162
3	1.676076	4.215623	0.069080	19.26814	57.51330	3.778239	6.495571	8.660043
4	8.751526	0.547429	5.294170	90.08390	3.146565	0.185593	0.419230	0.323110
5	10.95156	0.352389	3.881488	66.22963	2.163632	25.52209	0.316474	1.534298
6	11.15422	0.453467	3.949396	64.04379	2.167286	24.62622	2.094239	2.665605
7	12.18105	0.478192	4.229945	57.52825	3.390035	21.10042	2.723666	10.54949
8	12.77637	0.495477	4.297588	52.37451	4.112509	25.19857	3.171888	10.34946
9	13.35057	2.873450	5.208848	48.21219	3.945338	23.98006	4.279893	11.50023
10	13.56251	2.995427	5.874878	46.89619	4.033355	24.17322	4.882633	11.14430

Observing inflation across all time periods reveals that inflation itself significantly contributes to its own fluctuations. This implies that inflation tends to persist, indicating that past inflation levels can impact future inflation rates and analyzes how much the overall price level changes (inflation) can be attributed to various factors. It is strongly endogenous as it depends on its main variable later the main drivers of inflation change over time. In the first few periods, factors like changes in supply of money and external debt seem to have a larger effect. However, later periods show a dominance of internal factors like government spending and trade openness. Period 1**:** Almost half (49%) of the inflation variance is attributed to factors not explicitly included in the model (represented by INFLATION itself). This might suggest other factors or a more complex relationship between the variables. Period 4: There's a significant shift in the main driver. External debt (EXTERNAL_DEBT) becomes the dominant factor, contributing to over 90% of the inflation variance. This could be due to specific events or policy changes related to external debt in that period. Real interest rate also has a major impact on variance of inflation decomposition.

Variance decomposition of Exchange rate.

With the help of variance decomposition analysis, one can glean the many factors that have an impact on the real exchange rate. External debt and government expenditure are certainly some of the most important factors. However, the explanation is a lot more profound. The additional components of money supply, inflation and real interest rates, individually, impose a lesser impact but serve as a reminder on the greater intricacy behind the determining nature of the exchange rate. This constant change requires a more profound delve into the policies that impact the economy in order to properly manage the exchange rate policies. The importance of any variables, in this case, can change over time which requires consistent observation and alterations for the policies set in place. Having both internal and external elements considered into one frame would provide guidance to control the effects of the exchange rate volatility on the economy's steady condition.

Table 4.6 0-3: Variance decomposition of Exchange rate

Period	S.E.	D(MONEY_ SUPPLY)	D(GOVT_ EXPENDITURE)	D(EXTERNAL_ DEBT)	INFLATION	REAL_ INTEREST_ RATE	REAL__ EXCHANGE_	TRADE_ OPENNESS
1	10.11194	3.776271	0.299039	0.003175	5.792287	29.00664	61.12259	0.000000
2	17.58989	3.144202	2.105946	0.013939	3.484777	27.70795	63.00065	0.542529
3	22.05328	2.005064	8.411772	0.057314	2.216969	26.58526	58.98753	1.736093
4	25.57105	1.493655	14.37806	0.358856	1.989729	26.98218	52.50909	2.288425
5	28.89442	1.300974	15.11514	0.638819	1.824905	28.33745	50.40619	2.376524
6	32.33902	1.711576	13.94393	1.685376	1.732933	29.86595	48.54889	2.511347
7	34.85865	1.919151	14.22887	3.121774	1.866435	29.07089	47.29263	2.500248
8	37.05931	1.713432	15.06727	4.338103	1.937755	28.53628	45.90426	2.502894
9	39.19291	1.663771	15.17908	5.716565	2.027070	27.92040	45.14304	2.350079
10	40.70534	1.655019	14.79174	7.226106	2.161472	27.59840	44.37229	2.194977

Variance decomposition between the Inflation, Exchange rate, and External debt. The variance decomposition analysis reveals intricate relationships among external debt, inflation, and the real exchange rate. While each variable exhibits a degree of self-determination, their fluctuations are significantly influenced by a complex interplay of factors. External debt appears to be primarily self-reinforcing, with limited direct effects on inflation. Inflation is largely driven by its own past dynamics, showing only modest correlations with other variables. The real exchange rate is influenced by a combination of factors, with government spending emerging as a consistently significant driver. Trade openness and external debt also exert influence, but to a lesser extent. This illustrates the extent to which other factors account for the variations in inflation, exchange rates, and external debt.

External debt exhibits a high degree of persistence, indicating that past debt levels significantly influence future ones. While government expenditure and real interest rates consistently impact external debt levels, their relative importance fluctuates over time. Money supply seems to have a less pronounced effect. The research shows a negative correlation between both inflation and real exchange rate with external debt. It implies that as inflation rises or the real exchange rate depreciates, external debt tends to decrease. Potential explanations include the erosion of debt value due to inflation, increased borrowing costs, and the impact of a weaker exchange on trade balance and capital flows.

The relationship between inflation and external debt is complex and often interdependent. While the data suggests a negative correlation, indicating that higher inflation might be associated with lower external debt, this correlation does not necessarily imply causation. Factors such as the erosion of debt's real value through inflation and the potential impact of higher interest rates on debt servicing can influence this relationship. The research results also show a positive correlation between inflation and real interest rates. This is consistent with the theory that central banks raise interest rates to combat inflation.

The variance decomposition analysis indicates that the real exchange rate is influenced by a complex interplay of factors. While government expenditure and, to a lesser extent, external debt emerge as key drivers, their explanatory power is not absolute. The relatively minor contributions of other variables suggest that exchange rate fluctuations are subject to a multitude of influences, both domestic and external.

CONCLUSION AND POLICY RECOMMENDATION

This chapter presents the main conclusion of the study, followed by the discussion of the policy implications derived from the empirical findings. It also highlights key recommendations and identifies areas for future research.

Conclusion

The primary objective of this research is to investigate the interconnections among Pakistan's inflation, exchange rate, and external debt. Specifically, this study aimed to determine the impact of external debt shocks on Pakistan's exchange rate and inflation. The investigation was motivated and supported by the fact that, despite exchange rate depreciation and persistently rising inflation, external debt has expanded considerably (Ali, Awan, & Rauf, 2023). This is accurate despite the fact that the Pakistani government has put several strategies and policies into place to reduce the country's external debt and inflation (Ahmad, 2015).

While initially exploring the connection between exchange rate and external debt, the focus shifted to inflation. The analysis revealed that a significant increase in external debt (one standard deviation shock to the GDP ratio) coincides with a depreciation (weakening) of the real exchange rate. Because of this, there might be less economic aggregate demand, which could lead to a decrease in prices (Owoye & Onafowora, 2014). The variables with the greatest effects were found to be trade openness and volatility of foreign debt. Later on, it became evident that government spending was another important component influencing the exchange.

The results show that Pakistan's inflation rate is significantly impacted by an increase in external debt, leading to the inflation and a weakening of the real exchange gets weaker. Although external debt and inflation are often expected to be inversely related, the results indicate that inflation increases with rising external debt in Pakistan due to underlying macroeconomic and structural. The variance decomposition analysis sheds light on these dynamics. It shows that trade openness and external debt are the two main factors that contribute to rising external debt of the country, and inflation is driven by the real exchange rate and interest rate. Moreover, the real exchange rate gets impacted substantially by external debt and inflation, showing the interdependence of the three major components of macroeconomics. External debt shocks significant effected inflation during certain periods, while interest rates seem to have a constant effect on inflation. Overall, money supply and government spending play an important role in shaping these macroeconomic dynamics.

The escalating inflationary pressures originate mainly from the depreciation of the exchange rate that drives up import costs and fuels inflationary growth. Numerous domestic and foreign factors influenced Pakistan's debt structure because of its trade activities and variable world debt market operations. The research indicates that suitable economic frameworks and responsible financial debt management, along with sound fiscal operations, decrease external debt risks.

Policy Recommendation

The government should adopt policy measures aimed at strengthening domestic resource mobilization to reduce reliance on external borrowing. This approach would enhance macroeconomic resilience and dampen the transmission of external debt shocks to inflation and the exchange rate.

By examining the nexus among external debt, inflation, and exchange rates, this study aids in developing policies for economic stability and contributes to the existing literature. Future researchers can build upon this study by focusing on the role of control variables such as interest rates,

government expenditure, trade openness, and money supply. Analyzing these factors in greater depth can provide more comprehensive insights for effective macroeconomic policy formulation.

Limitations of the Study

It is acknowledged that Pakistan has transitioned through three distinct exchange rate regimes since 1971:

1. **Fixed Exchange Rate Regime (1971–1981)**
2. **Managed Float Regime (1982–2000)**
3. **Flexible Market-Based Exchange Rate Regime (2001–Present)**

While these regime shifts have significant implications for exchange rate behavior, the current study does not explicitly model the exchange rate regime transitions. This is primarily because the empirical approach—based on Structural Vector Autoregression (SVAR) treats the exchange rate as a continuous macroeconomic variable over the full sample period (1972–2022), abstracting from structural breaks or regime-specific dynamics.

This study does not explicitly account for structural changes in Pakistan's exchange rate regimes across the study period. Future research may apply regime-switching VARs or time-varying parameter models to examine how macroeconomic responses differ across exchange arrangements.

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