Debt Dynamics and Economic Growth

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Abstract

This paper assesses the impact of unanticipated shocks to public debt on Pakistan's economic growth. Following the methodology of Soyres, Kawai, and Wang (2022), a series of forecast errors is constructed to serve as exogenous shocks in analyzing their effects on real GDP. Using data from 1994 to 2023, the analysis reveals that a 1.0 percent unanticipated increase in the debt-to-GDP ratio leads to a 0.14 percent decline in real GDP in the subsequent year. This negative impact highlights the need to identify a debt threshold beyond which economic growth is adversely affected. Applying threshold regression techniques, a critical debt threshold of 57 percent is estimated for Pakistan. The findings underscore the importance of gradual fiscal adjustments to place the debt-to-GDP ratio on a declining and sustainable path.

1. Introduction

Pakistan's public debt to GDP ratio has been hovering around 76 percent over the past five years. With addition of almost 2 percent of GDP each year, the current debt level is significantly higher than the trough seen in FY07 (**Figure1a**). With such a higher level debt accumulation, the public-debt to GDP ratio surpassed the ceilings prescribed in the FRDL Act, which has been in place since 2005. The evolution of public debt is associated with higher fiscal deficit, which on average remained above 6 percent of GDP during FY08-FY23, almost double the level seen during FY94-FY07.

The higher fiscal deficit partly reflects the frequent slippage from the planned consolidation, especially observed during the rising debt trajectory. (**Figure 1b**). This has created concerns about medium term fiscal and debt sustainability that possibly have implication for the growth. The scenario poses questions, like, what happens to growth when fiscal position continues to deviate from the target and whether there exists a debt threshold beyond which the economic growth turns negative.

Figure 1a: Pakistan's Public Debt-to-GDP

Figure 1b: Fiscal Deficit (as % of GDP), Actual viz-a-viz Budget
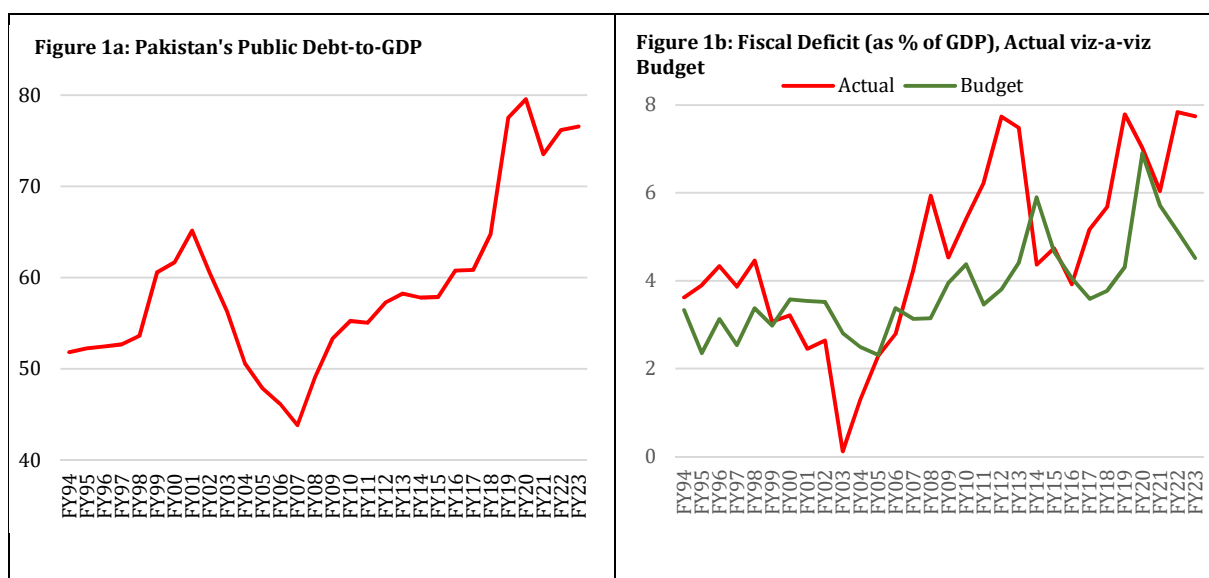
Theoretically, two arguments exist about impact of public debt on economic growth. First, the higher public borrowing induces public investment having positive impact on country's economic growth. On the other hand, when debt levels are too high, the fiscal space for development spending squeezes having negative implications for growth. As shown in the **Figure 2**, the debt servicing has grown significantly over past few years, while development expenditures remained stagnant at around 2 percent of GDP. Similarly, the higher debt servicing burden increases the probability of future taxation,

as often observed in the form of short term measures like, tax rate increase and recourse to mini budget during the year. Moreover, the large public debt can impact the growth through "crowding out" effect. For instance, it has been observed that around two-third of the fiscal deficit was financed by the banking system over past five years. The heavy reliance of the government on the banking system along with commercial bank's appetite for risk free government securities crowd-out the private investment and negatively impact the economic growth.

Figure 2: Government's Interest Payment viz a-viz Development Spendings
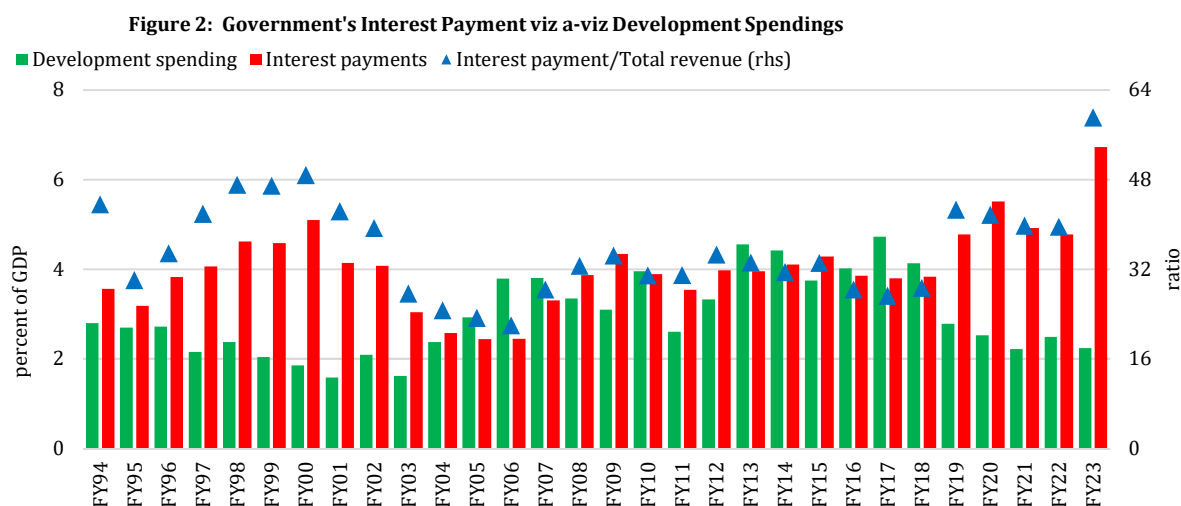
In this backdrop, the study is an attempt to empirically devise the relationship between public debt and real GDP for Pakistan. Thus, the objective of this study is twofold: First, it assesses the resilience of economy by analyzing the short to medium term output responses, when the fiscal balance deviates from the budget target. Second, the study explores the existence of public debt threshold, beyond which the economic growth hampers. The finding shows that public debt shock lowers the real GDP by 0.14 percent, while there exists debt threshold at 57 percent of GDP. Finally, the study prescribes the set of medium term fiscal reform essential for the fiscal and debt sustainability and to ensure that debt remains within the threshold limit.

The rest of the paper is organized as follows. The next section reviews the existing literature, section III lays out the analytical framework, section IV explains the construction of key variables and estimations and Section V concludes the paper.

2. Review of the Literature

There exists ample literature that theoretically and empirically investigates the relationship between public debt and the real GDP. For instance, Reinhart and Rogoff (2010) claimed that high public debt

level negatively impacts the economic growth, roughly above 90 percent of GDP. Shabbir (2013) explored the long run relationship between external debt and growth in developing countries and concluded that external debt reduces fiscal space and dampen the economic growth. Pescatori (2014) established that there is no debt threshold beyond which growth compromises, rather, debt trajectory is important. Countries with high debt levels but declining trend grow equally, as countries with lower debt levels. Lim (2019) found negative relationship between debt and economic growth- one standard deviation change in debt to GDP leads to 0.2 percentage point contraction in GDP.

In case of Pakistan, Akram (2011) showed that both domestic and external debt has negative relationship with per capita GDP confirming the existence of "debt overhang effect". Mustafa (2012) revealed that external debt exerts negative impact on Pakistan's economic growth. Shahzad (2014) showed that external debt has significantly negative impact on growth. Zohaib (2020) confirmed the negative relationship of external debt with growth, while relationship is positive for domestic debt.

3. The Analytical Framework

Following Soyres, Kawai and Wang (2022), we see how an unanticipated shock to public debt impacts the real GDP for Pakistan.[1] The debt shock is the difference between change in actual debt to GDP($\Delta lndebt_t^{actual}$) and change in forecasted debt to actual GDP ratio ($\Delta lndebt_t^{forecast}$).

$$debt_t^{shock} = \left(ln\frac{Debt_t^{actual}}{NGDP_t^{actual}} - ln\frac{Debt_{t-1}^{actual}}{NGDP_{t-1}^{actual}} \right) - \left(ln\frac{Debt_t^{forecast}}{NGDP_t^{forecast}} - ln\frac{Debt_{t-1}^{actual}}{NGDP_{t-1}^{actual}} \right) \qquad (1)$$

$$= \Delta lndebt_t^{actual} - \Delta lndebt_t^{forecast}$$

Once shocks to public debt is identified, the short and medium term out responses are evaluated by estimating the following VAR model:

$$y_{t+k} - y_{t-1} = c + \beta debt_t^{shock} + \theta Z_t + \varepsilon_t \qquad (2)$$

Here y_t is the economic growth, while Z_t is the set of control variables affecting the output and θ's are their respective coefficients. Consistent with literature, we choose investment, trade deficit and the inflation as control variables affecting the Pakistan's economic growth. Separate dummy variables are used to capture the negative impact of Covid-19 and the floods during FY23. The expression $y_{t+k} - y_{t-1}$

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[1] Unanticipated shock is calculated as the difference between actual debt stock and the forecast. This is the mirror of fiscal deficit deviation from the budget estimate and intuitively reflects a shock. For example, when term of trade shock hits the economy, the energy prices increases and the government extend subsidies to partially absorb this increase, resulting higher deviation from the target.

is the k period ahead change in the output level. In order to assess the short to medium term impact of debt shock on country's output, k ranges from zero to 5 years.

In the second stage of the study, we used Khan and Senhadji (2001) framework to determine public debt-to-GDP threshold for Pakistan by estimating the following equation through multistep ordinary least square:

$$y_t = \alpha + \beta_1 d_t (Pd_t - Pd^*) + \beta_2 (1 - d_t)(Pd_t - Pd^*) + \theta Z_t + \varepsilon_t \qquad (3)$$

Here Pd_t is the public debt to GDP ratio at time t, while Pd^* is the arbitrary optimal debt value used in the iteration process to determine the public debt threshold. The term d_t is the interaction dummy variable assuming values as follows:

$$d_t = \begin{cases} 1, if\ Pd > d^* \\ 0, elsewhere \end{cases}$$

In equation (3), the coefficient β_1 captures the impact on real GDP , when debt to GDP ratio is greater than optimal debt level ($Pd_t > Pd^*$), while β_2 represent the impact when debt level is below the assumed threshold ($Pd_t > Pd^*$).

4. The Data and Estimation

The first step is to construct the series of forecast error that acts as an exogenous shock to assess its impact on output for the period FY94-FY23. The forecast errors are precisely the difference between change in actual debt to GDP and change in forecasted debt to GDP ratio. In order to isolate the impact of GDP from the debt shock series, both actual and forecasted debt are in terms of actual nominal GDP, thereby making it purely public debt shock. The actual debt to GDP data is taken from the latest World Economic Outlook (WEO) database, while forecasts are from same year WEO published in October. The key objective to use the October forecast is to avoid the problem of endogeneity. Since the this forecast captures all the policy related measures announced in annual budget and thereafter changes in macroeconomic framework, the debt shock is assumed purely exogenous.

The construction of debt shock series become tricky due to number of reasons. First, the change in GDP base year to 2015-16 restricted to take the forecast of debt to GDP ratio directly from WEO vintages. To cater this problem, the forecast of absolute debt stock and ratios are calculated manually using re-based

GDP series (2015-16).[2] Second, the available WEO vintages only contains the Pakistan's debt stock forecast from 2010 onward. For the period FY00-FY10, IMF Article IV reports, preferably published during the Jul-Dec period, are used to extract the debt forecasts. Prior to FY00, the IMF publications on Pakistan were scarce, so percentage deviation of fiscal deficit (in percent of GDP) from the budget estimate is used as proxy in debt shock construction.

The plot of debt shock series is plotted in the **Figure 3**, which shows that the forecast error usually widens during the crises time, e.g. the global financial crises 2008, Covid-19 outbreak and Russia-Ukraine war and have an economic interpretation. For commodity importing country, like Pakistan, the term of trade shock deteriorates the balance of payment position, increases gross financing need and higher external debt. In case of scared FX resources, pressures on exchange rate can further aggravate the external debt stock, when revalued at higher exchange rate. On fiscal front, the shock could have spillover effect, when government extends subsidies, grants and cash disbursements to absorb a part of the shock.

Figure 3: Evolution of Public Debt Forecast Error, FY94-23
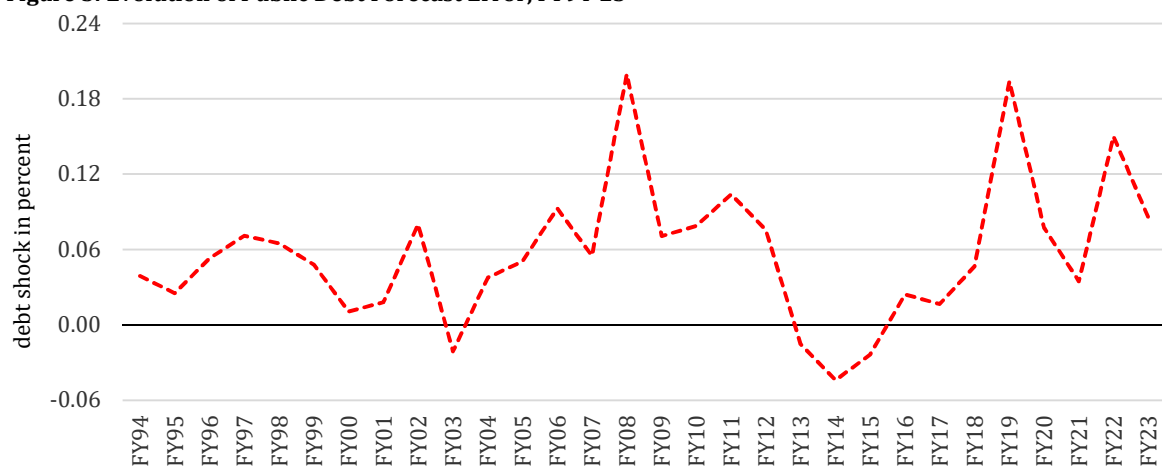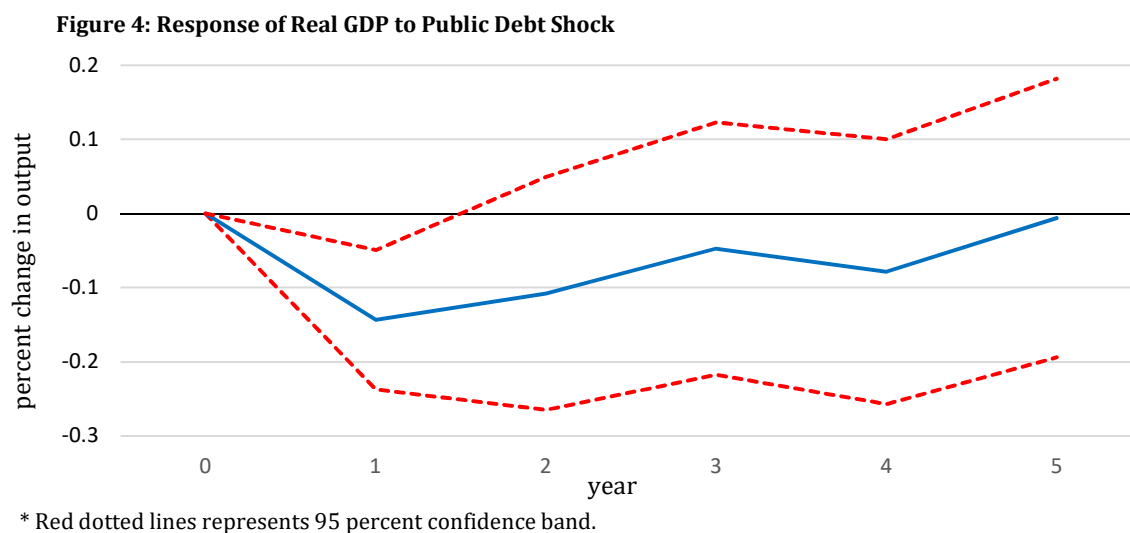

Based on the regression **equation 2**, the impulse responses are calculated to see the impact of shock on public debt on GDP. **Figure 4** shows that one percent unanticipated shock to public debt have a negative impact of around 0.14 percent on real GDP in the year after the shock.[3] For the later years, the impact

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remains negative but are statistically insignificant. The direction of the impact is similar to the finding by Soyres (2021), however, magnitude and duration varies. In case of Pakistan, the impact on output comes at first year that though consistent with the Soyres (2021) finding for the subset of politically risky countries.

Figure 4: Response of Real GDP to Public Debt Shock

* Red dotted lines represents 95 percent confidence band.

Using **equation 3**, the threshold search begins from debt level of 50 percent of GDP till 70 percent of GDP. The interactive dummies take different values during the iteration process and impact calculated for both high ($\beta1$) and low debt regimes($\beta2$). As expected, the sign of coefficient $\beta1$ is negative throughout, while $\beta2$ remains positive initially but turns negative after debt level of 52 percent of GDP. Here, the sum of both coefficients represent the combined impact of public debt on the economic growth. Consistent with the literature, threshold is established, where residual rum of square(RSS) and root mean square error (RMSE) is minimized. In case of Pakistan, both RSS and RMSE are minimum at 57 percent of GDP during the iteration process (**Figure 5**).

To see whether our results are robust to various specifications, we dropped the variable lags to minimum in VAR model, calculated impulse responses using Bayesian VAR and local projection approach. All methods essentially produce identical results.

Figure 5: Shock Residual Sum of Squares (SSR) and Root Mean Square Error (RMSE) for the Iterative Regressions
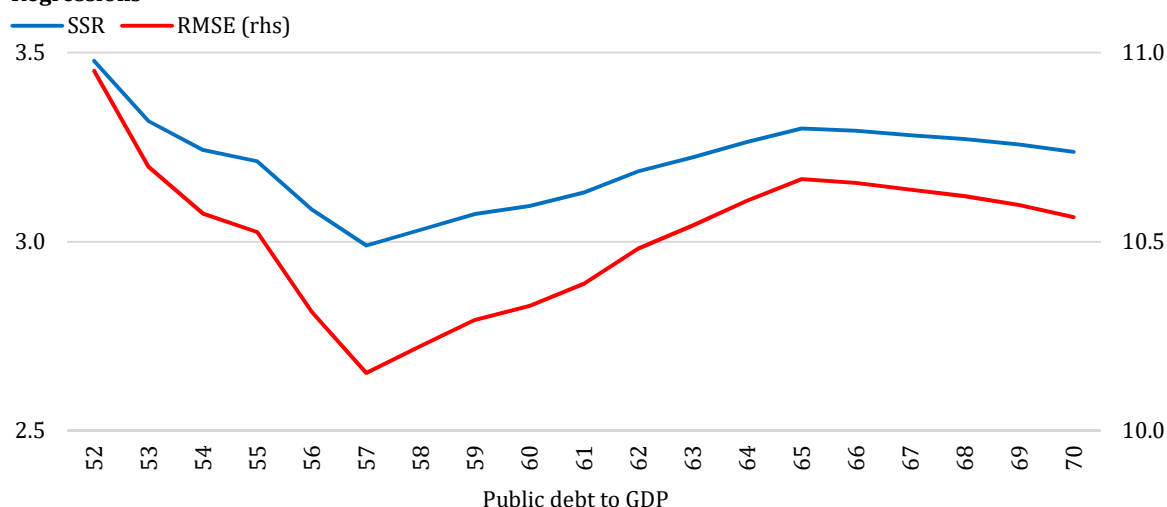
5. Conclusion

This study evaluated the resilience of economy against the debt shock and empirically established the existence of debt threshold. Based on historical data and controlling important growth determinants, the study concluded that 1 percent shock to public debt lower the GDP by 0.14 percent, while debt threshold turns out at 57 percent of GDP.

The existence of debt threshold emphasizes the need of medium term reform necessary for fiscal and debt sustainability. Instead of relying on short term measures, like taxing the existing tax payers or increasing tax rates, reforms should focus should be on the chronic fiscal issues like; expanding tax net, limiting power sector losses, reducing unbudgeted grants to loss-making PSEs and the untargeted subsidies. These reform can put country on sustainable debt path by gradually generating the primary surpluses. This does not imply that any temporary deviation from threshold like economic slowdown is bad for the economic growth. However, prolonged diversion would be worrisome and requires fiscal policy adjustments over the long term.

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