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# Fiscal Deficits and Economic Growth in Pakistan

***Muhammad Adil[1], Naseem Faraz[1, *]***

**Affiliations**
1. Finance Division,
Government of Pakistan

* Corresponding Author Email:
faraznaseem18@gmail.com

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## Abstract
This study examines the relationship between fiscal deficits and economic growth in Pakistan using annual data from 1976 to 2025. The empirical analysis uses log-linear time-series regression specifications and dynamic specifications with lagged fiscal-deficit and current-account terms, and Newey-West heteroskedasticity and autocorrelation-consistent standard errors to perform inferences in the dynamic specifications. Major macroeconomic disruptions are captured by the inclusion of event-based indicators, which are chosen a priori based on economic and historical considerations. Fiscal deficits are also expressed relative to alternative benchmark levels to provide a policy-oriented interpretation of fiscal imbalances. The baseline results show a negative association between fiscal deficits and economic growth. Investment is positively associated with economic growth, while the dynamic estimates provide some evidence of a negative relationship between current account imbalances and growth. The overall results indicate that fiscal conditions in Pakistan are closely linked with investment and external financing conditions, as well as with important macroeconomic shocks.

***Keywords:*** Fiscal Deficit, Real Output, Fiscal Sustainability, Current Account, Structural Changes

***JEL Classification:*** E62, H62, O47, O53, C22

## 1. Introduction

An important issue in the policy debate in emerging and developing economies continues to be the macroeconomic effects of fiscal deficits. The stabilizing effect of fiscal expansion in the short run is more prominent in the Keynesian models whereas the fiscal-sustainability models highlight the dangers of large and persistent deficits. If fiscal imbalances are persistent over time, they can lead to debt accumulation, increased sovereign risk premiums, crowding out of private investment and increased external vulnerability (Barro, 1979; Blanchard, 1990; Andlib et al., 2012; Woo & Kumar, 2015). Empirical research also has linked macroeconomic imbalances with poor long-run economic growth in countries with relatively weak institutions or financing constraints (Fischer, 1993; Chudik et al., 2017).

Pakistan is a relevant context through which the issues can be studied. It has had repeated fiscal deficits, times of external financing stress, IMF programmes of stabilization and has suffered significant macroeconomic fluctuations. This situation has created a pressing policy dilemma of whether the fiscal deficits have been more of an aid to short term stabilization or it has been a manifestation of the chronic financing and sustainability problems. There are multiple ways in which fiscal policy could be linked to economic activity: via public investment, taxes, debt accumulation, private investment and through macroeconomic stability (Easterly & Rebelo, 1993; Khan et al., 2016; Adam & Bevan, 2004).

The descriptive evidence pertaining to Pakistan reveals that the fiscal deficits have been on the rise over most of the sample period. The growth of real GDP has also been quite different during different fiscal and external adjustment and major economic disruption periods. The impact of fiscal conditions on economic activity is hard to disentangle from more general domestic and international developments, as seen in episodes after the global financial crisis, around the late 2010s stabilization period, and during the COVID-19 shock. Fiscal deficits and GDP growth are displayed in Figure 2 historically. These patterns

are generally similar to macroeconomic models focusing on the linkages between fiscal policies, external-financing requirements and economic activity in emerging markets (Obstfeld & Rogoff, 1996; Woo & Kumar, 2015). For the relatively long sample period, the empirical analysis also includes some of the most prominent macroeconomic shocks that could have influenced the fiscal-output relationship estimated. Indicators are included for 1998, 2008, 2019, and 2020. These years are chosen beforehand on economic and historical considerations, instead of using a formal statistical algorithm to determine unknown break years. These reflect the external and macroeconomic shocks arising from the sanctions environment after 1998, the global financial crisis of 2008, the macroeconomic adjustment cycle that began in 2019 and the COVID-19 shock in 2020. Because they are discrete variables that could affect the estimated relationships between fiscal deficits, investment, external conditions, inflation, and real output, they are included here to control for them.

In this light, the paper investigates the trend of fiscal deficit and real output of Pakistan during 1976- 2025. The empirical analysis is performed with log-linear time-series models, dynamic specifications and major structural changes indicators. Newey-West heteroskedasticity- and autocorrelation-consistent standard errors are used in the dynamic models. The fiscal deficit is presented in relation to other benchmark values as well, to facilitate a policy-oriented interpretation of fiscal imbalances. This change is not considered to be a formal test of threshold effects. Further descriptive and regression based exercises are explored that look at the investment and external-balance effects.

The baseline estimates show that there is a negative relationship between log real GDP and the fiscal deficit. In the dynamic specifications, however, the fiscal coefficients are not statistically significant and hence it is sensitive to model specification and time-series dependence. In most models including controls for structural change, investment is positively related to real output. In addition, the dynamic estimates suggest a negative link between current-account imbalances and output, which is likely to be channeled via lags in external conditions.

The paper adds to the existing literature by studying Pakistan's fiscal-output relationship for the rather long historical period. It includes structural-change controls, external-balance variables, and a fiscal position presented using a benchmark for both baseline and dynamic specifications. One special addition of the research is to investigate the sensitivity of the estimated fiscal-output relationship to dynamic specification and the treatment of big macroeconomic disruptions over a long historical sample. Therefore, the analysis relies on the robustness of the predicted connections across parameters and not on interpreting a particular fiscal coefficient as a stable or causative influence. The framework offers evidence of the variations in the estimated relationships across the specifications and emphasizes the role played by investment, external factors, and a significant macroeconomic shock in assessing the fiscal performance of Pakistan.

## 2. Literature Review

The empirical literature has focused on the relationship between fiscal deficits and economic growth. In general, macroeconomic stability is seen to be important for long-run growth in growth-oriented cross-country studies, such as those of Fischer (1993) who lists high inflation, large fiscal deficits, and misaligned exchange rates as indicators of macroeconomic instability. Similarly, Easterly and Rebelo (1993) demonstrate that fiscal policy has a growth impact on developing countries, including the impact of public investment and the fiscal balance. More generally, the literature on growth, such as that of Barro (1991) and Mankiw et al. (1992), focuses on the macroeconomic fundamentals and policy environment in attempts to account for cross-country variation in growth.

The mechanisms by which fiscal policy impacts economic outcomes are explored in other strands of literature, for example by Kneller et al. (1999) who conclude that the impact on growth varies with the nature of the tax and spending. While productive public spending can help to facilitate growth, distortionary taxes and crowding out private investment can have adverse consequences. The same could be concluded by Gemmell et al. (2014) who demonstrate that the impact of fiscal consolidation on growth is not only sensitive to the policy instruments employed, but also to the overall macroeconomic context.

Some nonlinearities in the fiscal deficit-growth link have also been found in the literature, such as the threshold effects that are found in developing countries by Adam and Bevan (2004). They find that relatively small deficits have limited negative effects, but deficits above a sustainable size have a higher chance to negatively impact economic performance. This view sees the impact of a fiscal deficit as being both the magnitude and how large or persistent it is compared to sustainable fiscal conditions.

Recent work focuses more on public debt and country specific characteristics, with Woo and Kumar (2015) showing that an increase in the ratio of public debt to GDP is related to a decrease in per capita growth, especially in emerging economies that lack financial markets. Likewise, Chudik et al. (2017) find that the negative effects of high public debt persist for output growth. These impacts can be more extreme in less developed institutions, when there are financing limits, or when macroeconomic policies are not credible.

Another aspect that needs to be addressed is fiscal institutions, discussed by Abbasov (2025). This study also highlights the importance of fiscal governance, government budgeting, revenue collection, and expenditure management, which affect fiscal sustainability and economic performance. Better fiscal institutions can increase the credibility of government policy. The quality of fiscal management can then impact on the nature of financing the deficit and its overall impact on the economy.

Recent empirical evidence also points to a time horizon and country-specific macroeconomic dimension sensitivity of the fiscal imbalances-fiscal sustainability-economic growth relationship. Sore et al. (2024) find that fiscal deficits have a positive short-run association with growth in a system-GMM framework for 42 Sub-Saharan African economies and a negative long-run association. Premacio et al. (2023) study fiscal sustainability in 22 developing Asian economies in a framework that accounts for the possibility of structural changes and nonlinearity (Markov-switching Augmented Dickey-Fuller approach), and their findings indicate that fiscal paths need not be linear. Recent evidence in Pakistan is on point too! In a similar study, Masheed et al. (2024) find an inverse relationship between fiscal deficits and economic growth in Pakistan in ARDL for both short- and long-term periods in Pakistan and Afghanistan. Combined, these studies provide further support for the importance of considering fiscal outcomes in dynamic country-specific contexts, which should take into account broader macroeconomic conditions and potential shifts in economic regimes.

Contrary to this, the fiscal deficit growth nexus is not similar across all cases. From a Vietnam perspective, Tung (2018) finds that fiscal deficits do not always have a positive relationship with short-run economic growth, but do have a positive relationship with long-term economic growth. This discovery is an example of the need for fiscal adjustment versus the short-term fiscal impact. In Pakistan, Fatima et al. (2011) conclude that fiscal deficits have a negative effect on economic performance, as measured by investment, and macroeconomic instability. Further, the impact of fiscal deficits is found to be sensitive to domestic economic situations and types of financing of fiscal imbalances based on the evidence reported by Hussain and Haque (2017) from Bangladesh. The overall picture of these studies suggests a close relationship between fiscal results and investment, external financing conditions, and domestic macroeconomic stability.

Yet, there are some empirical gaps in this literature that are still to be filled. First, a large number of country-level studies have only short time series available which fail to reflect long-run aspects of fiscal developments and large economic policy shifts. Second, most of the empirical studies make the assumption that there is a linear relationship between fiscal deficits and economic growth, failing to take into account fiscal outcomes against other fiscal targets for sustainability. Third, structural breaks and shift in macroeconomic regimes are frequently ignored in empirical specifications even though they are widespread in emerging economies and could impact estimated relations.

This study is an addition to the literature as it gives evidence for Pakistan on a relatively long period of time. It applies a fiscal-gap specification based on a benchmark, which will define the fiscal imbalance in relation to alternative sustainability benchmarks. Dynamic specifications and external-balance diagnostics are also used to assess whether the fiscal deficit is related to economic performance via domestic macroeconomic conditions, investment or external financing constraints. The analysis is thus

set against the backdrop of the global experience and literature on fiscal policy and macroeconomic performance in emerging economies.

## 3. Methodology

This section provides details of empirical approach adopted to study the relationship between fiscal deficit and real output in Pakistan.

### 3.1 Fiscal Deficit and Real Output Specification

We begin the analysis with a log-linear time-series model which aims to review the relationship between the fiscal deficit and real output in Pakistan. The dependent variable is real GDP, while the independent variables are in levels in the model. This form eliminates the problem of scale differences and the coefficients can be interpreted as changes in log real GDP with respect to a change of one unit of an explanatory variable. It is also consistent with the functional form commonly used in empirical studies of output and growth (Barro, 1991; Mankiw et al., 1992).

The baseline specification is:

$$\ln(\text{GDP}_t) = \beta_0 + \beta_1 FD_t + \beta_2 INV_t + \beta_3 INF_t + \gamma' D_t + \varepsilon_t. \quad (1)$$

Here, ln(*GDP*$_t$) is the natural logarithm of real GDP. The variable *FD*$_t$ is the fiscal deficit as a percentage of GDP, *INV*$_t$ is gross investment as a percentage of GDP, and *INF*$_t$ is the inflation rate. These variables are entered in percentage-point units, so a one-unit change represents a one-percentage-point change. The vector $D_t$ contains indicators for 1998, 2008, 2019, and 2020.

The fiscal-deficit variable represents the fiscal position, with larger values indicating a larger deficit relative to GDP. Investment is included to account for the relationship between capital formation and real output. Inflation captures one aspect of macroeconomic instability, since changes in the price level may be associated with uncertainty, relative-price distortions, and economic performance (Fischer, 1993).

The year indicators account for observations associated with major economic disruptions: the sanctions following the 1998 nuclear tests, the global financial crisis in 2008, the macroeconomic adjustment beginning in 2019, and the COVID-19 shock in 2020. The chosen years are defined a priori, based on economic and historical events identified by the authors, and not because they are determined by a formal statistical method of estimating the dates of the unknown structural changes in the underlying time series.

These indicators are included as controls for discrete changes in economic conditions (Perron, 1989; Hamilton, 1994). Their coefficients should not be interpreted as causal estimates of the effects of the corresponding events.

Because the dependent variable is expressed in logarithms and the explanatory variables enter in percentage-point units, the slope coefficients are semi-elasticities. More precisely, each coefficient represents the change in log real GDP associated with a one-percentage-point change in the relevant explanatory variable, holding the remaining variables constant. Given the relatively large coefficient estimates, the results are discussed mainly in terms of their signs, statistical significance, and sensitivity across specifications rather than converted into percentage changes.

Equation (1) provides the benchmark against which the augmented and dynamic specifications are compared. The estimated coefficients represent conditional associations within the sample and should not be interpreted as causal effects.

### 3.2 External Imbalance Linkage

Fiscal deficits may be linked to economic activity through domestic as well as external conditions. In an open economy, changes in the fiscal position often occur alongside changes in the current account. This does not necessarily mean that one causes the other, since both may respond to the same economic

shocks. The current-account variable is therefore added to the baseline model to determine whether external conditions alter the estimated relationship between the fiscal deficit and real output.

The augmented model is written as:

$$\ln(GDPt) = \alpha_0 + \alpha_1 FD_t + \alpha_2 CAt + \alpha_3 INV_t + \alpha_4 INF_t + \delta' D_t + \varepsilon_t, \quad (2)$$

where $CA_t$ represents the current-account position as a percentage of GDP. Its coefficient, $\alpha_2$, shows how the current-account position is associated with log real GDP after the other variables in the model are held constant. The interpretation of its sign depends on how the current-account series is recorded in the dataset.

For comparison, the restricted model excludes the current-account variable:

$$\ln(GDPt) = \beta_0 + \beta_1 FD_t + \beta_2 INV_t + \beta_3 INF_t + \gamma' D_t + u_t. \quad (3)$$

The fiscal-deficit coefficients from Eqs. (2) and (3) are then compared. If the coefficient changes noticeably after the current account is included, external conditions may be relevant to the estimated fiscal-output relationship. If it remains broadly unchanged, the current-account variable adds little to the baseline fiscal estimate. To capture the extenral sector vulnerabilities, it includes the current-account position whether it changes the estimated association between the fiscal deficit and real output.

## 3.3 Investment Linkage

Another linkage between the fiscal position and economic outcomes is through investment. While fiscal expansion can spur investment through raising demand, other indicators of ongoing fiscal deficits can also be linked to regulations that make it more difficult for investors to finance the project, increased uncertainty, or the crowding out of private investment (Blanchard, 1990; Woo & Kumar, 2015).

The investment specification is:

$$INV_t = \delta_0 + \delta_1 FD_t + \delta_2 \ln(GDP_t) + \delta_3 CA_t + \delta_4 INF_t + \lambda' D_t + \nu_t, \quad (4)$$

where $INV_t$ is gross investment as a percentage of GDP. The fiscal deficit is the main explanatory variable of interest. Log real GDP is included to account for the relationship between economic activity and investment demand. The current-account variable captures external-balance conditions, while inflation represents price instability and macroeconomic uncertainty. The interpretation of the current-account coefficient depends on how that variable is recorded in the dataset.

The vector $D_t$ contains indicators for major macroeconomic disruptions that may be associated with changes in investment beyond those explained by the other included variables. A negative and statistically significant fiscal-deficit coefficient would be consistent with the crowding-out argument, whereas a positive coefficient would be consistent with fiscal expansion occurring alongside stronger investment.

The estimates represent conditional associations rather than causal effects. In particular, investment and real output may influence each other, and both may respond to economic conditions that are not fully captured by the model. The investment equation is therefore used to examine whether the fiscal deficit is associated with investment after controlling for the included macroeconomic variables; it does not establish that investment is a causal channel through which fiscal deficits affect output.

## 3.4 Dynamic Fiscal Deficit Output Relationship

The linkages between fiscal conditions, external balances and real output can evolve over a period of years, not a single year. Often, implementation delays are a part of fiscal measures and financing conditions and/or private sector responses may change over time. There may be a fiscal deficit as well as a current account deficit that can continue from one period to the next. The analysis includes lags to investigate the relationship between the earlier fiscal and external conditions and the current real

output. The first dynamic specification includes the contemporaneous and lagged current-account positions:

$$\ln(GDP_t) = \beta_0 + \beta_1 FD_t + \beta_2 CA_t + \beta_3 CA_{t-1} + \beta_4 INV_t + \beta_5 INF_t + \gamma' D_t + \varepsilon_t. \quad (5)$$

Including $CA_t$ and $CA_{t-1}$ allows the current-account position to be associated with output both in the current period and with a one-year lag. The interpretation of these coefficients depends on the sign convention used for the current-account series.

The second specification adds a lagged fiscal-deficit term:

$$ln(GDPt) = \beta 0 + \beta 1 FDt + \beta 2 FDt - 1 + \beta 3 CAt + \beta 4 CAt - 1 + \beta 5 INVt + \beta 6 INFt + \gamma' Dt + \varepsilon t. \quad (6)$$

The inclusion of $FD_{t-1}$ allows the estimated relationship to distinguish between the contemporaneous fiscal position and the fiscal position in the preceding year. A statistically significant lagged coefficient would indicate that the previous year's deficit contains information associated with current real output after the other included variables are held constant. It would not, by itself, establish a delayed causal effect.

A third specification excludes the structural-change controls:

$$\ln(GDP_t) = \beta_0 + \beta_1 FD_t + \beta_2 FD_{t-1} + \beta_3 CA_t + \beta_4 CA_{t-1} + \beta_5 INV_t + \beta_6 INF_t + \varepsilon_t. \quad (7)$$

Comparing Eqs. (6) and (7) shows whether the estimated coefficients are sensitive to the inclusion of indicators for major macroeconomic disruptions. The comparison is for specification sensitivity purposes only and not a formal test of unknown structural breaks. Any changes in signs, magnitudes, or statistical significance of the coefficients across the two specifications would suggest that the estimated relationships are sensitive to the major macroeconomic disruptions. The vector $\mathbf{D}_t$ contains the structural indicators retained in the reported dynamic specifications.

Annual macroeconomic data may produce residuals that are serially correlated or have non-constant variance. The reported inference therefore uses Newey-West heteroskedasticity-and autocorrelation-consistent standard errors with a lag length of two (Newey & West, 1987). This adjustment changes the estimated standard errors but does not remove possible endogeneity, omitted-variable bias, or non-stationarity. The dynamic estimates should consequently be interpreted as conditional time-series associations rather than causal effects.

### 3.5 Deviation from Fiscal Sustainability Benchmarks

The baseline specification provides an estimation of the average conditional relationship between the fiscal deficit and real output. It can be helpful, in interpreting the policy, to report the actual fiscal position in reference to certain prudential benchmarks. This method only tests whether the fiscal deficit for a specific year is above or below a selected benchmark but it doesn't test whether the slope of the fiscal-output relationship turns towards or away from the benchmark at that year.

The fiscal-deficit gap is defined as:

$$FDGapt = FDt - \theta, \quad (8)$$

where $\theta$ denotes the selected benchmark. The analysis considers benchmark values of $\theta \in \{3.0, 3.5, 4.0, 4.5\}$ percent of GDP. These values represent a range of fiscal reference points discussed in the literature on deficits and macroeconomic performance in developing economies (Adam & Bevan, 2004). A positive value of $FDGap_t$ indicates that the observed fiscal deficit is above the selected benchmark, while a negative value indicates that it is below the benchmark.

Expressing the fiscal deficit in this form provides a policy-oriented measure of its distance from the selected reference level. However, subtracting a constant from the fiscal-deficit variable is a linear reparameterization of the original regression. Under ordinary least squares, this transformation changes the intercept but leaves the slope coefficient, its standard error, and the model's goodness of fit statistics unchanged because variance and covariance are invariant to constant shifts (Greene, 2018; Wooldridge,

2010). The benchmark specifications should therefore not be interpreted as separate threshold tests or as evidence that the marginal association becomes stronger above a particular deficit level.

The baseline, which include, investment, dynamic, and benchmark-based specifications provide several perspectives on the relationship between fiscal conditions and real output in Pakistan. The baseline and dynamic models show how the estimated coefficients vary across specifications, while the investment and current account models examine related domestic and external associations. The benchmark formulation complements these models by presenting the fiscal position relative to selected reference levels without imposing a nonlinear relationship.

## 3.6 Estimation Strategy

The empirical analysis is based on the data of Pakistan for the last 49 years (from 1976 to 2025). The data can be used for up to 50 observations, but fewer observations are used for models that include a 1-year lag. All the regressions are specified using natural log real GDP. All the fiscal deficit, investment, current account and inflation variables are kept in percentage point units, such as 5 percent as 5, not 0.05. When interpreting the estimated coefficients this scaling is considered.

Estimation of the models is done in R. The dynamic specifications employ the dynlm package which allows for specification of variables with time invariant index as well as time lagged variables in direct regression (Zeileis, 2004). The baseline models are estimated first and then the specification with lagged current-account and fiscal-deficit terms are added. Where indicated, indicators for selected macroeconomic disruptions were added, and a model without these indicators was estimated to assess the sensitivity of the coefficients to the inclusion of these indicators.

Because annual macroeconomic data may produce serially correlated and heteroskedas-tic residuals, inference in the dynamic models is based on Newey-West heteroskedasticity-and autocorrelation-consistent standard errors with a lag length of two (Newey & West, 1987). This adjustment is applied to the estimated covariance matrix and therefore affects the standard errors and significance levels rather than the coefficient estimates themselves.

The analysis is intended to describe conditional relationships within the sample. The use of lagged regressors and HAC standard errors does not resolve possible reverse causality, omitted-variable bias, or measurement error. In addition, the models are not estimated as a cointegration system. The results should therefore be interpreted as specification dependent associations rather than as estimates of causal or long-run equilibrium effects. Moreover, the application of the event-based indicator of structural change does not replace formal tests on structural breaks of unknown dates and the findings should be understood as specification-dependent conditional associations, while other structural change models may be explored in future.

The sample period average growth rate of GDP is 4.6 per cent with moderate volatility (standard deviation = 2.10 per cent). There is some negative skewness (-0.292), which means that there were slightly more frequent mild declines than large periods of growth. If the kurtosis coefficient has a value around 3 (2.948), the distribution is approximately normal, but it has moderate tail risk.

The fiscal deficit is on average 5 per cent of GDP, thus reflecting ongoing structural fiscal imbalances. It is relatively low (1.45) and near-zero (0.160), suggesting a structural component to fiscal pressures not a strong episodic shock effect.

The investment level is around 17 per cent of GDP, and there is not much difference between countries. Negative skewness of slight proportions and a kurtosis that is not above the three (2.324) suggest a relatively stable investment climate and that there are no evident boom-bust cycles in capital formation.

The current account balance exhibits moderate spread and a mild positive skewness implying regular, but not extreme, external imbalances. If the kurtosis is < 3, then the tails of the distribution are thinner than those of the normal distribution.

Inflation is the most erratic macroeconomic variable. Its distribution is highly positively skewed (1.778) with a high kurtosis (7.390) and a large right-tail risk (8.9% average) which are not typical of a normal distribution, suggesting that the distribution is leptokurtic. It is a characteristic of 'episodic inflation' and macroeconomic instability.

## 4. Descriptive Statistics

**Table 1: Descriptive Statistics of Key Macroeconomic Variables: Pakistan**

| Variable | Mean | Median | Min | Max | SD | Skewness | Kurtosis |
|---|---|---|---|---|---|---|---|
| GDP Growth (%) | 4.604 | 4.515 | -0.94 | 8.71 | 2.099 | -0.292 | 2.948 |
| Fiscal Deficit (% of GDP) | 5.038 | 5.050 | 1.70 | 7.90 | 1.447 | 0.160 | 2.726 |
| Investment (% of GDP) | 16.991 | 17.200 | 13.20 | 20.60 | 1.720 | -0.153 | 2.324 |
| Current Account (% of GDP) | 3.228 | 3.485 | 0.10 | 7.18 | 1.939 | 0.260 | 2.135 |
| Inflation (%) | 8.933 | 7.900 | 2.90 | 29.20 | 5.169 | 1.778 | 7.390 |

Notes: SD denotes standard deviation. Skewness measures distributional asymmetry, while kurtosis captures tail thickness relative to the normal distribution.

The main statistical characteristics of the basic macroeconomic variables are presented in table 1.

Descriptive evidence shows that overall there is moderate volatility in the output growth and fiscal variables, but the price instability is the most important source of macro-economic volatility in the sample period in Pakistan.

### 4.1 Correlation Structure

**Correlation Matrix: Pakistan Macroeconomic Variables**

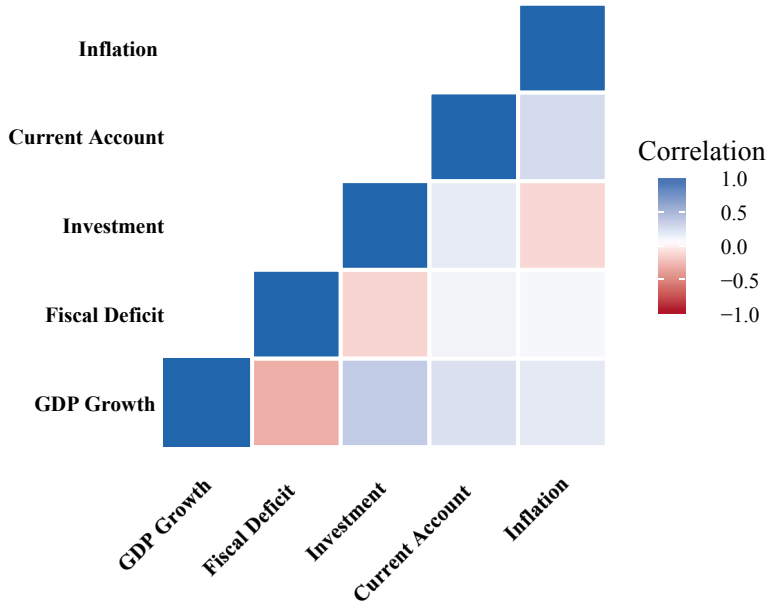



**Figure 1: Correlation Heatmap**

The correlation matrix shows a moderate negative correlation between fiscal deficit and economic growth which supports sustainability-based hypotheses. The relationship between investment and growth is positive, consistent with the fact that it is an important factor for output growth.

The pairwise correlations of inflation with the other variables are weak, and the same is true for the current account.Many of the pairwise correlations between the current account and other variables are relatively small, as are the pairwise correlations between inflation. This weak correlation decreases the worry of a significant multicollinearity in the following regression analysis.

## 5. Macroeconomic Fiscal Dynamics

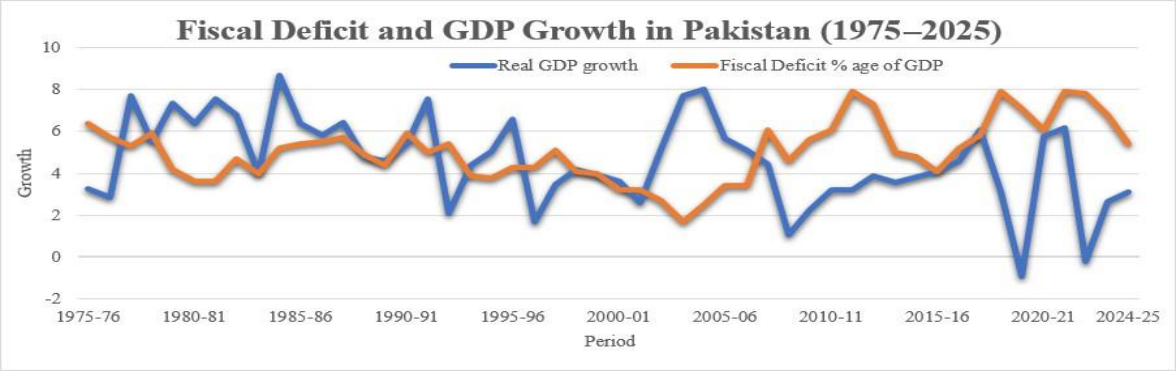



**Figure 2: Real GDP growth and the fiscal deficit as a percentage of GDP in Pakistan, 1976-2025**

In Figure 2, we have plotted the trend of real GDP growth and fiscal deficit since 1976 till 2025. Many of the sample economies have persistently high budget deficits and, in some instances, have been greater than 4 percent of GDP, and in one case, even 7 percent. Economic growth is not regular, but is characterized by growth periods that are sometimes followed by diminishment and contraction. In certain instances, higher deficit observations are correlated with a lower growth rate, particularly during macroeconomic adjustments and/or external shocks. However, it does not necessarily imply that it is a direct causal link between the two, but rather that the two move together. The fiscal deficit might become larger when economic activity is short of its target or economic shocks might affect either the economic slowdown or the fiscal deficit.

Panel A shows the historical trend of the fiscal-deficit size and GDP growth as well as some fiscal reference levels. Panel B shows how the magnitude of the fiscal deficit is related to the growth of GDP. In Panel C, the fiscal balance is graphed against the current-account balance, with the fiscal balance being on the Y-axis and the current-account balance being on the X-axis.Panel C shows the signed fiscal balance plotted against the signed current-account balance, with more negative values corresponding to larger deficits.

In Figure 3 three descriptive perspectives of fiscal and macroeconomic situation in Pakistan have been provided. The panels address the durability of fiscal deficits, their link to the growth rate of GDP and the link with the current account. Lines and shaded areas in the graph are for descriptive purposes only and are not to be interpreted as statistical thresholds.

**Panel A: Fiscal deficits and growth over time**

The fiscal-deficit size is compared with the growth of real GDP in Panel A. The horizontal line at 4.5 per cent of GDP is a prudential threshold, while the shaded area above 7 per cent of GDP highlights observations with significant deficits. The fiscal deficit is forecast under the reference line in some periods of the sample, such as early 1990s and since 2008 and 2018. This is a pattern that suggests that large deficits are not a one-off event.

Growth is also subject to fluctuations at times of high deficits. The resulting fiscal deficits in the observations of the periods 2008-2009 and 2019-2020 are relatively large and they are coupled with low economic activity. These episodes are consistent with the hypothesis of the co-occurrence of fiscal stress and weak output. However, they cannot imply that growth loss was due to large deficits as both growth and the deficit could have been influenced by macroeconomic adjustment and external shocks.

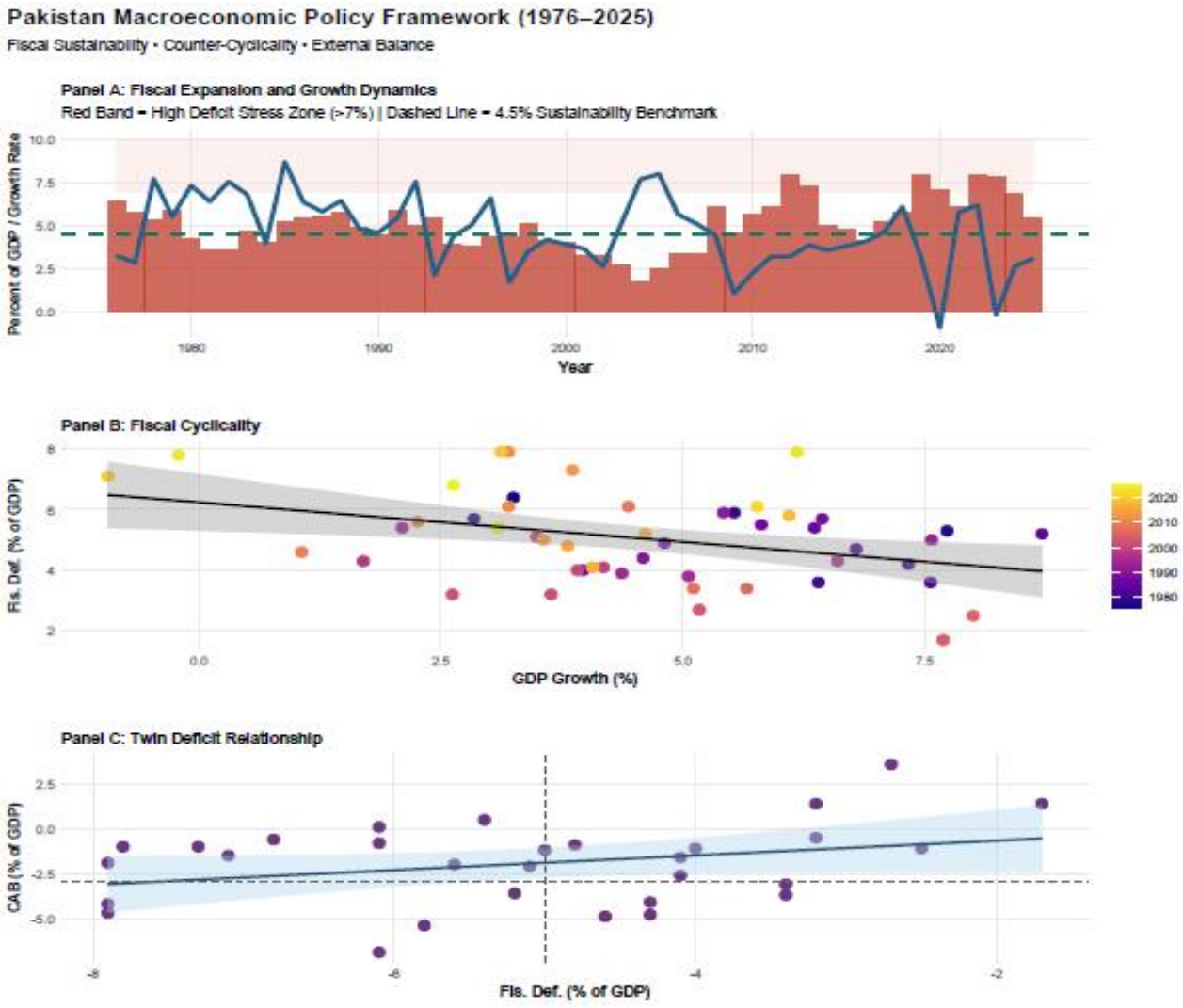



**Figure 3: Macroeconomic indicators for Pakistan, 1976-2025**

**Panel B: Fiscal deficit and GDP growth**

Panel B shows the magnitude of the fiscal deficit as a function of the growth rate of GDP, and shows a fitted linear trend. The negative slope means that years with less growth are likely to have larger deficits. This is a counter-cyclical co-movement pattern since fiscal deficits may increase during a slowdown in economic activities. It could also be due to the reverse causality, automatic adjustments of government revenues/expenditures or common macroeconomic shocks.

The scatter of the data points from the line indicates that there is no simple, consistent pattern through the data. The panel is then to be looked at as evidence of a description of fiscal policy, not as an indicator of pro- or anti-cyclicality.

**Panel C: Fiscal and current-account balances**

Panel C shows the relationship between the signed fiscal balance and the signed current account balance. In this panel, fiscal and current account deficits are negative values and bigger deficit is shown by a smaller value. The positive slope suggests that (in the sample) fiscal balances and current-account balances are negatively related. This is in line with the type of co-movement that the twin-deficit

hypothesis predicts, but the figure itself is not necessarily sufficient to test the twin-deficit hypothesis and/or to identify an external transmission mechanism.

The relationship might be examined in the context of national-income identity:

$$CA = S - I. \tag{9}$$

where *CA* is the current-account balance, *S* is national saving, and *I* is investment. Other things being equal, a decline in public saving may reduce national saving and weaken the current-account balance. In practice, private saving, investment, exchange rates, capital flows, and economic growth may also change, so the observed relationship cannot be attributed solely to the fiscal balance.

**Integrated Interpretation**

As a whole, the panels indicate that fiscal deficits, economic growth and external imbalances typically happen in a more or less overlapping fashion in

Pakistan. The evidence in the graphical format is in line with the potential interaction between the fiscal conditions and domestic activity and external financing constraints. However, these data show only descriptional associations. The regression analysis must be used to investigate these relationships when investment, inflation, lagged adjustment and major macroeconomic upheavals are considered.

## 6. Empirical Results

### 6.1 Baseline Results

**Table 2: Baseline Log-Linear Model**

| Variable | Coefficient | Std. Error |
|---|---|---|
| Fiscal Deficit | -0.244** | (0.110) |
| Investment | 0.203** | (0.099) |
| Inflation | -0.005 | (0.022) |
| D1998 | 2.974*** | (0.319) |
| D2008 | 1.929*** | (0.410) |
| D2019 | 0.992** | (0.408) |
| D2020 | -0.146 | (0.713) |
| $R^2$ | 0.916 | |

*** $p < 0.01$, ** $p < 0.05$

The baseline estimates reveal a negative association with statistically significant results between the fiscal deficit and real output. Under the constant conditions of investment and inflation, and the structural indicators, the estimated fiscal-deficit coefficient is −0.244. The variable being measured (real GDP) is measured in log form and the fiscal deficit is measured in level form which means the coefficient is a semi-elasticity rather than an elasticity. The interpretation of its percentage value will vary according to the unit in which the fiscal-deficit variable is entered. It is not therefore a percentage change in output that is encountered here, but the coefficient.

The coefficient of investment is positive and statistically significant, with a value of 0.203; this shows that there is a positive conditional association between investment and real output. The fiscal-deficit coefficient has the same problems as interpreting its percentage meaning with respect to the scale

employed for the investment variable. The coefficient of inflation is small and not statistically significant, and there is no obvious evidence of a linear association with inflation in the baseline specification.

All structural indicators are positive and statistically significant for years 1998, 2008, and 2019 while the coefficient for 2020 is not statistically significant. These estimates suggest that the level of real output is different for the observations identified in the model, when the other variables in the model are held fixed. Due to the positive sign and the relatively high level of all the coefficients, these are not to be taken as the economic impact of the respective crises per se. Instead, they might isolate more general shifts in the growth rate and overall growth of real GDP or other macroeconomic changes that are not included.

The model has an $R^2$ of 0.916, so the variables in the model explain a significant portion of the variation in the sample of log real GDP. A model is correctly specified though in regressions where macroeconomic series are trending, a high $R^2$ is not uncommon.

Overall, the baseline coefficients are conditionals and do not necessarily imply causation. They explain the relationship between log real GDP and the regressors that were included in the regression model, and explain why the other regressors were kept constant. The estimates should thus be viewed as indications of co-movement in the sample and not as evidence of a link between fiscal deficit/investment and real output.

## 6.2 External Imbalance Linkage

Table 3 shows a comparison of two nested specifications of log real GDP. This is the Model (1) (current account included) and the Model (2) (current account excluded). This comparison is conducted to assess the importance of the impact of introducing the external-balance conditions on the estimated relationship between the fiscal deficit and real output.

In Model (1), the fiscal-deficit coefficient is negative and statistically significant at 10 percent level. The estimated coefficient of -0.211 suggests that there is a negative conditional association between the fiscal deficit and log real GDP. The extent to which it can be interpreted as a percentage varies according to the scale the fiscal variable was entered on and is therefore not reported here. This current account coefficient is also negative, but not statistically significant. Hence, there is not strong enough evidence of the independent linear relationship between the current account and real output when the other variables included are held constant within this specification.

Model (2): without the current account. The fiscal-deficit coefficient is still negative and significant at 5 percent of the level. Its magnitude changes only slightly, from −0.211 in Model (1) to −0.244 in Model (2). This relative stability makes it unlikely that the fiscal-output association estimated in these models is driven by the current account variable. However, such a comparison is not sufficient to determine if fiscal deficits have an external-balance effect on output.

The coefficients of investment are statistically significant and positive for both the specifications, and the coefficient of inflation is unalteratively. The structural indicators for 1998, 2008 and 2019 are positive and statistically significant while the indicator for the year 2020 is not significant. These coefficients reflect differences in the level of real output conditional on the observed events, but cannot be used as a direct measure of the economic impact of such events.

The general result of the nested-model comparison is a negative relationship between the fiscal deficit and the level of real output. Does not offer statistical proof of an independent contemporaneous association with the current account in the contemporaneous specification. Evidence concerning external conditions emerges more clearly in the dynamic models, particularly when contemporaneous and lagged current-account terms are included.

**Table 3: Determinants of Log Real GDP: Time Series Estimates (dynlm)**

| | **Model (1)** Full Specification | **Model (2)** Restricted Specification |
|---|---|---|
| Intercept | 8.588*** | 10.451*** |
| | (2.295) | (1.891) |
| Fiscal Deficit | -0.211. | -0.244** |
| | (0.111) | (0.110) |
| Current Account | -0.120 | — |
| | (0.086) | |
| Investment | 0.324** | 0.203** |
| | (0.130) | (0.099) |
| Inflation | -0.006 | -0.005 |
| | (0.022) | (0.022) |
| D1998 | 2.882*** | 2.974*** |
| | (0.322) | (0.319) |
| D2008 | 2.097*** | 1.929*** |
| | (0.422) | (0.410) |
| D2019 | 1.056** | 0.992** |
| | (0.406) | (0.408) |
| D2020 | -0.245 | -0.146 |
| | (0.708) | (0.713) |
| R-squared | 0.920 | 0.916 |
| Adjusted R-squared | 0.903 | 0.900 |
| F-statistic | 52.03*** | 57.71*** |
| Residual Std. Error | 0.647 | 0.655 |

Notes: Standard errors are reported in parentheses. *** $p < 0.01$, ** $p < 0.05$, . $p < 0.10$.

The results of the benchmark-based fiscal-gap specifications are presented in Table 4. The fiscal gap is defined as the observed fiscal deficit minus a selected benchmark ranging from 3.0 to 4.5 percent of GDP. A positive value indicates that the observed deficit is above the selected benchmark, while a negative value indicates that it is below the benchmark.

The fiscal-gap coefficient is approximately −0.647 and is statistically significant at the 1 percent level in each specification. The negative coefficient indicates that larger fiscal gaps are associated with lower real output, conditional on the variables included in the model. Its precise percentage interpretation depends on the scale in which the fiscal variable entered the regression. The coefficient is therefore reported here without converting it into a percentage change in output.

The identical slope coefficients across the alternative benchmarks follow directly from the linear reparameterization of the fiscal-deficit variable. Subtracting a constant benchmark changes the intercept but leaves the slope coefficient, its standard error, and the model's goodness-of-fit statistics unchanged. Consequently, the stability of the coefficient across the four columns is a mathematical property of the specification and should not be interpreted as evidence of robustness across independent models or as proof of a threshold effect.

Investment and inflation are not statistically significant in these specifications. The coefficient on the 2008 structural indicator is positive and statistically significant, showing that the estimated level of real output differs for that observation after conditioning on the other included variables. Given the size

and sign of this coefficient, it should not be interpreted directly as the economic cost of the global financial crisis without further analysis.

## 6.3 Deviation from Fiscal Sustainability Benchmarks

**Table 4: Fiscal Gap Specification under Alternative Benchmarks (3.0-4.5)**
**Benchmark Threshold**

| Variable | Gap = 3.0 | Gap = 3.5 | Gap = 4.0 | Gap = 4.5 |
|---|---|---|---|---|
| Fiscal Deficit Gap | -0.647*** | -0.647*** | -0.647*** | -0.647*** |
| | (0.173) | (0.173) | (0.173) | (0.173) |
| Investment | -0.177 | -0.177 | -0.177 | -0.177 |
| | (0.156) | (0.156) | (0.156) | (0.156) |
| Inflation | -0.000 | -0.000 | -0.000 | -0.000 |
| | (0.039) | (0.039) | (0.039) | (0.039) |
| D2008 | 3.904*** | 3.904*** | 3.904*** | 3.904*** |
| | (0.627) | (0.627) | (0.627) | (0.627) |
| D2020 | 0.617 | 0.617 | 0.617 | 0.617 |
| | (1.250) | (1.250) | (1.250) | (1.250) |
| $R^2$ | 0.698 | 0.698 | 0.698 | 0.698 |
| F-statistic | 17.57 | 17.57 | 17.57 | 17.57 |

Overall, the benchmark formulation provides a policy-oriented way of expressing the fiscal position relative to selected reference levels. It shows a negative conditional association between the fiscal gap and real output, but it does not establish that the slope changes when the deficit exceeds a particular benchmark. Testing such a claim would require a nonlinear model, such as a threshold regression or an interaction between the deficit and an indicator for observations above the selected benchmark.

## 6.4 Dynamic Specifications and Robustness

**Table 5: Dynamic Determinants of Log Real GDP (HAC SE)**

| **Variable** | **Coefficient** | **Std. Error** |
|---|---|---|
| Intercept | 8.0046*** | (2.0244) |
| Fiscal Deficit | -0.2440 | (0.1632) |
| Current Account | -0.1189* | (0.0661) |
| Current Account$_{t-1}$ | -0.1212* | (0.0628) |
| Investment | 0.3858** | (0.1579) |
| Inflation | 0.0109 | (0.0162) |
| D1998 | 2.6471*** | (0.5718) |
| D2008 | 2.2568*** | (0.8146) |
| D2019 | 1.0803** | (0.4356) |

HAC standard errors (Newey-West, lag = 2)

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

**Table 6: Dynamic Determinants Including Lagged Fiscal Deficit (HAC SE)**

| Variable | Coefficient | Std. Error |
|---|---|---|
| Intercept | 8.6190*** | (1.6861) |
| Fiscal Deficit | -0.1981 | (0.1309) |
| Fiscal Deficit$_{t-1}$ | -0.1093 | (0.0753) |
| Current Account | -0.1427** | (0.0686) |
| Current Account$_{t-1}$ | -0.1136* | (0.0594) |
| Investment | 0.3713*** | (0.1337) |
| Inflation | 0.0127 | (0.0159) |
| D1998 | 2.5287*** | (0.6075) |
| D2008 | 2.3586*** | (0.8390) |
| D2019 | 1.1448** | (0.4291) |

HAC standard errors (Newey-West, lag = 2)
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

**Table 7: Dynamic Model without Structural Breaks (HAC SE)**

| Variable | Coefficient | Std. Error |
|---|---|---|
| Intercept | 28.0660*** | (4.5764) |
| Fiscal Deficit | 0.1453 | (0.2145) |
| Fiscal Deficit$_{t-1}$ | -0.3243 | (0.2297) |
| Current Account | -0.0764 | (0.1315) |
| Current Account$_{t-1}$ | -0.2522*** | (0.0874) |
| Investment | -0.6556*** | (0.2342) |
| Inflation | 0.0450 | (0.0698) |

HAC standard errors (Newey-West, lag = 2) *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 5 presents the baseline dynamic specification using Newey-West heteroskedasticity-and autocorrelation-consistent standard errors. The fiscal deficit coefficient remains negative but is not statistically significant. This suggests that the negative relationship found in the baseline model is sensitive to dynamic adjustment and HAC inference. The contemporaneous and lagged current-account coefficients are both negative and weakly significant, indicating that external imbalances may have a persistent association with real output. Investment remains positive and statistically significant, supporting its importance in explaining economic activity.

Table 6 extends the model by including a lagged fiscal deficit to account for fiscal persis-tence. Neither the contemporaneous nor the lagged fiscal-deficit coefficient is statistically significant. The current-account coefficients remain negative, with the contemporaneous term significant at the 5 percent level and the lagged term significant at the 10 percent level. Investment continues to have a positive and statistically significant coefficient. These results provide stronger evidence for the roles of investment and external conditions than for an independent fiscal-deficit effect in the dynamic specification.

Table 7 reports the dynamic model without structural-break controls. Removing these controls changes both the signs and magnitudes of several coefficients. In particular, the contemporaneous fiscal-deficit coefficient becomes positive, although it remains statistically insignificant, while the investment coefficient becomes negative and statistically significant. The lagged current-account coefficient remains negative and statistically significant. These changes indicate that the estimated relationships are sensitive to the treatment of major macroeconomic disruptions and regime changes.

Overall, the dynamic specifications do not provide a statistically robust fiscal-deficit coefficient after lagged adjustment and serial correlation are taken into account. The results for investment and the

current account are comparatively stronger, although they also vary across specifications. The substantial changes observed when the structural-break controls are removed show that these controls are important for obtaining more stable estimates of Pakistan's macroeconomic relationships.

## 6.5 Investment Effects

**Table 8: Baseline Investment Model**

| Variable | Coefficient |
|---|---|
| Intercept | 10.699*** (2.637) |
| Fiscal Deficit | -0.017 (0.137) |
| Log GDP | 0.450** (0.181) |
| Current Account | 0.425*** (0.075) |
| Inflation | 0.017 (0.025) |
| Dummy 1998 | -1.466** (0.634) |
| Dummy 2008 | -2.118*** (0.539) |
| Dummy 2019 | -1.354*** (0.444) |
| $R^2$ | 0.836 |
| Adjusted $R^2$ | 0.805 |
| Residual Std. Error | 0.759 |
| F-statistic | 26.95*** |

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

Table 8 shows the baseline regression results for the fiscal and macroeconomic variables explaining the dynamics of investment. The model is well explanatory, as the $R^2$ and adjusted $R^2$ are 0.836 and 0.805, respectively, showing that the macroeconomic vari-ables included in the model account for a significant portion of the investment-growth relationship.

The negative coefficient on fiscal deficits indicates that a greater fiscal imbalance is correlated with a decline in investment. The coefficient is small and not statistically significant, however, and suggests that short-term changes in the fiscal deficit do not have a direct measurable impact on investment after controls for macroeconomic factors. This could be partly attributed to offsetting influences through which fiscal expansion could simultaneously boost demand and increase macroeconomic uncertainty.

The coefficient for economic activity (log GDP) is positive and statistically significant. This means that there is a positive relationship between economic output and investments, as is normal in the case of accelerator processes in which firms increase investment when the conditions of its demand improve. There is a strong positive and very significant association between the current account balance and investment. Foreign exchange constraints seem to have been eased and macroeconomic stability improved, as reflected in the external balance improvements, thus facilitating domestic capital formation.

The coefficient of inflation is positive, albeit small and statistically insignificant, indicating that the sample period does not include systematic effects of moderate levels of inflation on investment behavior. Major macroeconomic shocks are contained in the structural dummy variables. The 1998 dummy is negative and significant, indicating that the investment slowdown after the nuclear tests and in the face of sanctions and macroeconomic instability in the 1990s. Likewise, the global financial crisis and domestic macroeconomic stress in 2008 are represented by a large negative dummy coefficient, which is also very significant. The 2019 dummy also signals a statistically significant decline in investment, in line with the stabilization policies and macroeconomic adjustment in that period.

Overall, the study indicates that investment in Pakistan is more closely related with the macroeconomic growth conditions and stability of external sectors rather than short-term fluctuations in fiscal deficits.

## 7. Discussion

The empirical findings offer a qualified explanation of the impact of fiscal deficits on real output in Pakistan. The baseline specification shows a negative and significant fiscal-deficit coefficient. This finding is in line with theoretical arguments that have connected the existence of continuing fiscal imbalances with financing pressures, increased risk premium, decreased investment, and macroeconomic instability. The baseline regression, however, does not imply that fiscal deficits are necessarily associated with a decrease in output; it is just an association in the context of the baseline regression.

The Newey-West standard errors' specifications are found to be more robust than the fixed-effects specifications in the sense that the fiscal-deficit coefficient is found to be statistically insignificant. This change reflects the changes in the baseline result due to the presence of lagged variables and the choice of how to handle serial correlation and heteroskedasticity. In the model including both the contemporaneous and the lagged fiscal-deficit coefficient neither coefficient is statistically significant. The evidence is thus mixed with respect to a strong independent fiscal-deficit effect in all specifications.

Investment has a positive and statistically significant coefficient in the baseline and dynamic model with structural-change-controlled. This outcome is in line with the function of capital formation as a support for the productive capacity. When the investment coefficient is removed from the structural-change controls, though, it turns negative. The estimated relationship with output is thus sensitive to how the major macroeconomic shocks are treated, and can't be said to be stable for all specifications.

The result of the current account is mixed either. It is not statistically significant in the nested baseline model but is negative and becomes so at conventional or marginal levels in some dynamic models. Such estimates are some evidence that external conditions are related to real output, especially with a lag. They do not, however, assert in any way that fiscal deficits impact output in a twin-deficit fashion. The mechanism could be directly tested in a model where the current account is determined by the fiscal balance and other relevant factors.

The fiscal-gap analysis is presented as a policy-oriented presentation of fiscal imbalances, relative to selected reference levels, the benchmark-based fiscal-gap analysis. The same fiscal-gap ratio between the benchmarks (3.0 to 4.5 per cent of GDP) is due to the fact that the fiscal-deficit variable has different constants applied, leading to the same ratio. This reparametrization involves changing the intercept, but not the slope coefficient. The benchmark results hence do not show a nonlinearity or indicate a threshold of deficit for which the fiscal-output relationship is stronger.

The descriptive evidence in the graph of Figure 3 reveals that some of the observations with high deficits are associated with lower growth or outside stress. These patterns are similar to the regression evidence, and should be viewed as association patterns only. They could be reverse causality in action, that is, when a fiscal deficit is growing, while output is contracting, and when external balances are deteriorating, along with the effects of common shocks on fiscal conditions, external balances and output at the same time.

The findings can be summed up as Pakistan's fiscal deficits, investment, external conditions and structural changes are closely linked with the performance of the macroe-conomic indicators. Whilst the negative fiscal-output association in the baseline model is not statistically sound across the different dynamic specifications, the investment and current-account results also differ across model specification. Therefore, the results are not necessarily representative of a consistent strong independent fiscal-deficit effect, as the estimated fiscal-output relationship is not only dependent on model specification but also on dynamic adjustment and the treatment of major structural changes. The results thus warrant a qualified conclusion: fiscal sustainability is a policy issue, but further econometric work is needed to establish more causal or threshold conclusions.

## 8. Conclusion

In this study, the fiscal deficit-rreal GDP linkages in the context of Pakistan have been explored for the selected time period 1976-2025. All models used in the empirical analysis were log-linear time-

series models, dynamic specifications, models with event-based structural-change controls and Newey-West inferential models with heteroskedasticity and autocorrelation adjustments.

The baseline model shows a negative and significant relationship between the fiscal deficit and real output. The fiscal-deficit coefficients lose statistical significance if the lags and HAC inference are also included in the model, however. The dynamic results thus show that the estimated relationship between fiscal variables and the output is sensitive to specification. The coefficient of investment is positive and statistically significant in most of the specifications tested which include structural-break controls, but the sign of the coefficient is not stable when the structural-break controls are excluded. The dynamic models also offer some indications of a negative relationship between current-account imbalances and real output, mainly via external conditions (lags).

It is useful to consider the fiscal deficit relative to some other benchmarks in order to give an interpretation of fiscal imbalances which is relevant to policy. Because subtracting a constant (benchmark) does not affect the slope coefficient of a linear regression, these estimates should be viewed as not indicative of a statistical threshold effect. Rather, they demonstrate that the negative link between fiscal deficits and output can be made relative to a variety of prudential reference levels. If a threshold is exceeded, one might expect the relationship will change and a formal test of nonlinearity would be needed to establish this.

The overall results indicate that fiscal conditions in Pakistan are closely linked with investment and external financing conditions, as well as with the important macroeco-nomic shocks. The sensitivity of the estimates to the structural-break controls further demonstrates the significance of using the appropriate controls when looking at "long" historical samples that take into account the economic conditions and policy regimes.

Policy-wise, the findings confirm credible fiscal management and prioritisation of expenditures in Pakistan and the need to protect productive investment and manage external financing pressures. Medium-term fiscal frameworks may help to alleviate financing pressures and enhance policy credibility, whereas better revenue mobilisation and expenditure efficiency can help to lower persistent fiscal imbalances without unduly squelching growth-enhancing investment. The current account outcomes also highlight the need to address external vulnerabilities while undertaking fiscal adjustment, and to build external buffers. Domestic saving, productive investment and an external position that is more resilient, can thus be integrated with fiscal discipline. Nevertheless, these implications must be taken with a pinch of salt; estimates are conditional associations and do not imply causal effects.

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**Data Availability Statement**

The data used in this study are publicly available from the relevant official sources.

**Conflict of Interests Disclosure Statement**

The authors declare that they have no conflict of interest.

**Ethical Approval**

Ethical approval was not required as the study is based on publicly available secondary data.

**Author Contributions**

Dr. Naseem Faraz contributed to the conceptualization, planning, and overall supervision of the study. Dr. M. Adil contributed to the data analysis, interpretation of results, and manuscript preparation.

# Appendix

## A. Algebraic Invariance of Benchmark Reparameterization

Consider the baseline regression:

$$\ln\left(GDP_t\right) = \beta_0 + \beta_1 FD_t + X_t^{'}\gamma + \varepsilon_t. \tag{A1}$$

where ln($GDP_t$) denotes the logarithm of real GDP at time $t$, $FD_t$ represents the fiscal deficit as a percentage of GDP, and $\mathbf{X}_t$ is a vector of control variables capturing macroeconomic conditions. In the empirical specification of this study, $\mathbf{X}_t$ includes variables such as the current account balance, inflation, and structural dummy variables that account for major macroeconomic shocks. The term $\varepsilon_t$ represents the stochastic error term.

Define the fiscal deficit gap relative to a benchmark level $\theta$:

$$FD_t^{Gap} = FD_t - \theta. \tag{A2}$$

Substituting $FD_t = FD^{Gap} + \theta$ into the baseline equation yields:

$$\ln\left(GDP_t\right) = \beta_0 + \beta_1\left(FD_t^{Gap} + \theta\right) + X_t^{'}\gamma + \varepsilon_t. \tag{A3}$$

Rearranging terms gives:

$$\ln\left(GDP_t\right) = \left(\beta_0 + \beta_1\theta\right) + \beta_1 FD_t^{Gap} + X_t^{'}\gamma + \varepsilon_t. \tag{A4}$$

Thus, the intercept shifts to:

$$\beta_0^* = \beta_0 + \beta_1\theta. \tag{A5}$$

while the slope coefficient $\beta_1$ remains unchanged.

This invariance follows from the ordinary least squares (OLS) estimator:

$$\widehat{\beta}_1 = \frac{\mathrm{Cov}\left(FD_t, \ln\left(GDP_t\right)\right)}{\mathrm{Var}\left(FD_t\right)}. \tag{A6}$$

together with the translation properties of variance and covariance:

$$\mathrm{Var}\left(FD_t - \theta\right) = \mathrm{Var}\left(FD_t\right), \qquad \mathrm{Cov}\left(FD_t - \theta, Y_t\right) = \mathrm{Cov}\left(FD_t, Y_t\right). \tag{A7}$$

Therefore, shifting the fiscal deficit variable by a constant benchmark affects only the intercept term and leaves the slope coefficients, goodness-of-fit measures such as $R^2$, and overall model statistics unchanged.

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