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Fiscal Deficit, Government Expenditure and Economic Growth in India: A Comparative Analysis using ARDL and NARDL Approach

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Abstract

The relationship between fiscal deficit and economic growth is a critical issue in macroeconomic policy, particularly in developing economies like India, where fiscal interventions play a significant role in economic stabilization. While fiscal deficits may support growth through demand stimulation, their long-term effects depend on the composition of expenditure.

This study examines the impact of fiscal deficit on economic growth in India by incorporating developmental and non-developmental expenditure within a unified framework. The analysis is based on annual data from 1980–81 to 2021–22. To capture both linear and nonlinear dynamics, the study employs the Autoregressive Distributed Lag (ARDL) and Nonlinear ARDL (NARDL) models.

The results from the ARDL model confirm a long-run relationship among the variables; however, the impact of fiscal deficit on economic growth is statistically insignificant under the linear specification. In contrast, the NARDL model reveals significant asymmetric effects, indicating that the impact of fiscal deficit varies depending on its direction. Fiscal expansion negatively affects growth, while fiscal consolidation exerts a stronger contractionary impact.

Furthermore, both developmental and non-developmental expenditures positively influence economic growth in the long run, highlighting the importance of expenditure composition. Overall, the findings suggest that the fiscal deficit–growth relationship in India is nonlinear, emphasizing the need for cautious and balanced fiscal policy.

Keywords: Fiscal Deficit; Economic Growth; NARDL; Asymmetry; Cointegration; India

JEL Classification: C22, E62, H50, H62, O47

1 Introduction

Fiscal policy is a critical determinant of macroeconomic performance, particularly in developing economies where government intervention plays a central role in economic development. Among its key components, the fiscal deficit has received considerable attention due to its potential impact on economic growth, macroeconomic stability, and public debt sustainability. Theoretical and empirical literature suggests that the effects of fiscal deficit are not uniform and may vary depending on economic conditions, policy orientation, and institutional frameworks (Fischer, 1993; Easterly and Rebelo, 1993).

From a Keynesian perspective, fiscal deficits can stimulate aggregate demand and promote economic growth, particularly during periods of economic slowdown (Keynes, 1936; Blinder and Solow, 1973; Auerbach and Gorodnichenko, 2012). However, the Neoclassical view argues that persistent fiscal deficits may hinder long-run growth by crowding out private investment and increasing the burden of public debt (Barro, 1991; Giavazzi and Pagano, 1990). Empirical studies such as Fölster and Henrekson (2001) and Gupta et al. (2005) further emphasize that excessive fiscal expansion can adversely affect economic performance, especially when resources are not allocated efficiently.

The Indian economy presents a compelling case for examining the fiscal deficit–growth relationship. Over the past four decades, India has experienced several phases of fiscal expansion and consolidation, shaped by major economic events such as the 1991 balance of payments crisis, the introduction of fiscal discipline under the FRBM Act, the global financial crisis of 2008–09, and the COVID-19 pandemic in 2020–21. These episodes highlight the dual role of fiscal deficit as both a growth-enhancing instrument and a potential source of macroeconomic instability (Rangarajan and Srivastava, 2005; Chakraborty and Chakraborty, 2006, 2013; Chakraborty, 2016).

Despite the extensive body of literature, empirical findings on the fiscal deficit–growth nexus remain inconclusive. While some studies report a negative relationship between fiscal deficits and economic growth (Rahman, 2012; Zareen and Qayyum, 2015; Yusuf and Mohd, 2021), others emphasize the importance of expenditure composition, suggesting that the impact of fiscal policy depends on how resources are allocated between productive and non-productive uses (Ghali, 1997; Gupta et al., 2005; Adam and Bevan, 2005). This indicates that the relationship is complex and may not be adequately captured through linear models.

A key limitation of the existing literature is the assumption of symmetry, where increases and decreases in fiscal deficit are expected to have identical effects on economic growth. However, recent empirical evidence suggests that fiscal policy may exhibit asymmetric effects, particularly in developing economies where structural rigidities and policy transmission mechanisms differ across periods (Taylor et al., 2012; Yusuf and Mohd, 2021). This highlights the need for adopting nonlinear approaches that can capture such dynamics more effectively.

In this context, the present study makes two important contributions. First, it distinguishes between developmental and non-developmental expenditure, thereby providing a more refined understanding of the role of fiscal policy in economic growth. Second, it employs both the Autoregressive Distributed Lag (ARDL) and Nonlinear ARDL (NARDL) models to examine the symmetric and asymmetric effects of fiscal deficit. While the ARDL model captures linear relationships, the NARDL framework allows for decomposition of fiscal deficit into positive and negative changes, enabling the identification of nonlinear and asymmetric effects.

The study utilizes annual time series data for India covering the period 1980–81 to 2021–22, encompassing major structural shifts and policy regimes. By comparing the results of linear and nonlinear models, the study aims to provide a more comprehensive understanding of the fiscal deficit–growth relationship in India.

2 Trend and Pattern of Economic Growth and Fiscal Deficit

The graphical representation of changes in economic growth (ΔGDP) and fiscal deficit (ΔFD) as presented in Figure 1 provides important insights into the evolving macroeconomic dynamics of the Indian economy over the study period. The trends reveal distinct phases characterized by fluctuations driven by policy shifts, structural reforms, and external shocks.

During the early 1980s, both ΔGDP and ΔFD exhibited moderate fluctuations, indicating a relatively stable macroeconomic environment. However, towards the late 1980s, an increase in fiscal deficit was accompanied by volatility in economic growth, reflecting emerging fiscal imbalances.

The early 1990s mark a period of significant instability, particularly around 1991–92, where a sharp decline in economic growth coincides with a substantial reduction in fiscal deficit. This period corresponds to the balance of payments crisis and subsequent structural reforms, indicating a strong adjustment phase in the economy.

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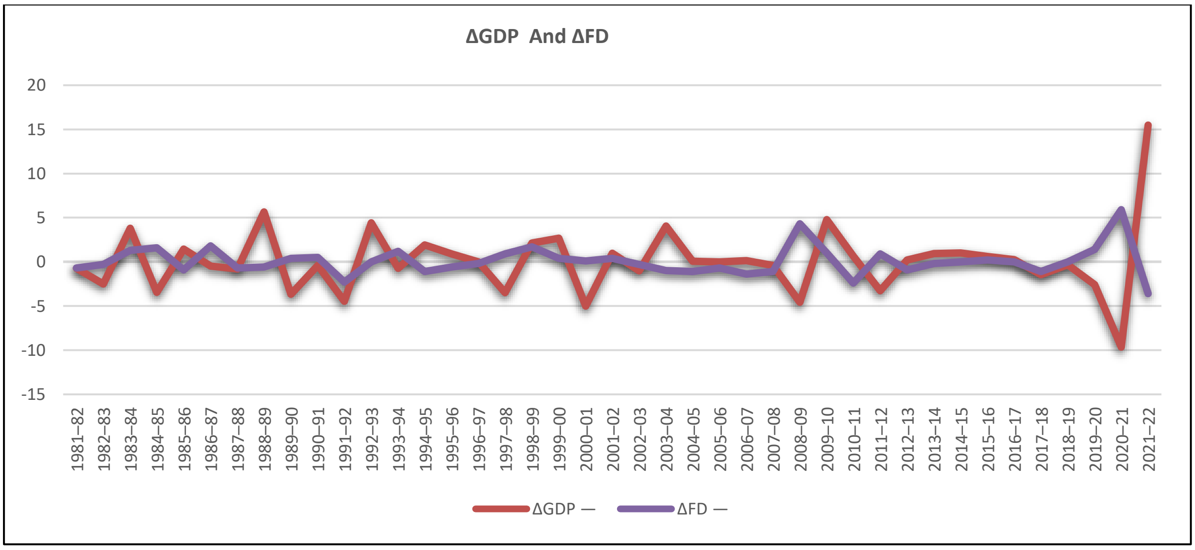
Figure 1: Trend and Pattern of Changes in Economic Growth and Fiscal Deficit in India



Source: *Authors' compilation using data from RBI, Handbook of Statistics on the Indian Economy (2022).*

In the mid to late 1990s, both variables displayed cyclical movements. Economic growth recovers, while fiscal deficit continues to fluctuate, suggesting a phase of gradual stabilization with intermittent fiscal pressures.

The early 2000s show relatively stable movements in both ΔGDP and ΔFD, indicating improved macroeconomic management. However, this stability is disrupted during the global financial crisis (2008–09), where a sharp decline in economic growth is accompanied by a significant increase in fiscal deficit, reflecting expansionary fiscal policy adopted to counter the downturn.

The post-crisis period (2010–2015) demonstrates recovery in economic growth along with gradual fiscal consolidation. However, fluctuations persist, indicating that the adjustment process is not uniform.

From 2016 onwards, both variables exhibit relatively moderate movements, suggesting a period of controlled fiscal policy and stable economic performance. However, this trend is sharply disrupted during the COVID-19 pandemic (2020–21), where economic growth experiences a steep contraction, while fiscal deficit increases significantly. This inverse movement reflects aggressive fiscal expansion to mitigate the economic impact of the pandemic.

In 2021–22, the economy shows a strong recovery in growth, accompanied by a reduction in fiscal deficit, indicating a return towards macroeconomic normalization.

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Overall, the graphical trends clearly demonstrate that the relationship between economic growth and fiscal deficit is highly volatile and context-dependent. The presence of sharp divergences during crisis periods and uneven adjustments across time suggests that the relationship is inherently nonlinear. These observations provide strong preliminary support for the use of nonlinear econometric techniques, such as the NARDL model, to capture the asymmetric effects of fiscal deficit on economic growth in India.

3 Literature Review

3.1 Theoretical Framework

The relationship between fiscal deficit and economic growth has been explained through different theoretical perspectives. The Keynesian view, originating from Keynes (1936), argues that fiscal deficits can stimulate aggregate demand, raise employment, and accelerate output, particularly during periods of recession or underutilized capacity. This view suggests that deficit-financed public expenditure may support short-run growth through the multiplier process. In contrast, the Neoclassical perspective, based on the Solow-Swan framework, maintains that persistent fiscal deficits may hinder long-run growth by crowding out private investment, raising interest rates, and increasing the burden of public debt. From this standpoint, deficits weaken capital accumulation and reduce productive efficiency over time.

Another important strand is the Ricardian Equivalence Hypothesis proposed by Barro (1974), which argues that deficit financing may not affect real economic activity if rational agents anticipate future taxation and increase savings accordingly. However, this proposition has received limited empirical support, especially in developing economies. The Endogenous Growth approach offers a more nuanced view by emphasizing the composition of fiscal policy. It argues that if deficits are used to finance productive expenditure such as infrastructure, education, and development programs, they may generate long-run growth benefits despite higher borrowing.

In this context, the distinction between developmental and non-developmental expenditure becomes particularly important. Developmental expenditure is generally expected to support productive capacity and long-run growth, whereas non-developmental expenditure may have weaker or mixed effects depending on its composition and efficiency. Thus, the deficit-growth relationship is not only a question of the size of the deficit, but also of how borrowed resources are allocated within the economy.

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3.2 Review of Empirical Studies

The empirical literature on fiscal deficit and economic growth provides mixed evidence. Early studies such as Fischer and Easterly (1990) and Fischer (1993) emphasized that macroeconomic instability arising from fiscal imbalances can adversely affect growth. Similarly, Easterly and Rebelo (1993) showed that the composition of public expenditure matters significantly for growth outcomes, especially in developing countries. Fölster and Henrekson (2001) also found that larger government size and excessive fiscal expansion may reduce economic performance over time.

A number of studies have specifically highlighted the importance of expenditure composition. Ghali (1997) found a positive contribution of public expenditure to growth in Saudi Arabia, while Gupta et al. (2005) argued that the quality and allocation of expenditure are more important than the aggregate size of the fiscal deficit. Adam and Bevan (2005) further suggested that the deficit-growth relationship may be nonlinear, implying that moderate deficits may not be harmful, but beyond a certain threshold they may significantly reduce growth.

In the Indian context, Rangarajan and Srivastava (2005) warned that persistent fiscal deficits could weaken investment and macroeconomic stability. Chakraborty and Chakraborty (2006, 2013) and Chakraborty (2016) examined India’s fiscal stance and observed that fiscal policy often exhibited procyclical tendencies, with important implications for growth and stabilization. These studies suggest that the effect of fiscal deficit in India cannot be understood without considering the broader policy environment and the nature of government expenditure.

Recent empirical works also point toward the possibility of asymmetric and context-specific effects. Rahman (2012), using an ARDL framework, reported a long-run negative relationship between fiscal deficit and growth in Malaysia. Taylor et al. (2012) showed that while fiscal policy may stabilize output in the short run, it can also create future debt risks. Similarly, Zareen and Qayyum (2015) and Yusuf and Mohd (2021) found that excessive borrowing and public debt can adversely affect growth through crowding-out effects and rising debt servicing obligations.

Overall, the literature suggests that the impact of fiscal deficit on growth is neither uniform nor purely linear. It depends on the size of the deficit, the composition of expenditure, and the broader macroeconomic context. However, limited attention has been paid to distinguishing developmental and non-developmental expenditure within the same growth framework, and even fewer studies have examined whether the effects of fiscal deficit are asymmetric. This provides the basis for employing both ARDL and NARDL approaches in the present study.

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4 Research Gap and Objectives

4.1 Research Gap

The relationship between fiscal deficit and economic growth has been widely examined in the existing literature, particularly within the framework of linear econometric models such as the Autoregressive Distributed Lag (ARDL) approach. These studies generally assume that fiscal deficit and government expenditure exert a symmetric and uniform impact on economic growth, irrespective of the nature or direction of fiscal changes. However, such an assumption may not adequately capture the complexities of fiscal dynamics, especially in a developing economy like India, where policy responses and macroeconomic adjustments are often uneven.

In addition, although government expenditure has been incorporated in several empirical studies, relatively limited attention has been paid to differentiating between developmental and non-developmental expenditure within the same analytical framework. This distinction is important, as these components may have differing implications for economic growth.

Further, the possibility of asymmetric effects of fiscal deficit on economic growth remains insufficiently explored in the Indian context. The existing literature provides limited evidence on whether increases and decreases in fiscal deficit influence growth differently. The use of a Non-linear ARDL (NARDL) framework allows for a more nuanced understanding by capturing such asymmetries.

Therefore, there is a need to re-examine the fiscal deficit–growth relationship by incorporating both expenditure components and by comparing linear and non-linear modelling approaches. The present study attempts to address this gap.

4.2 Research Objectives

The present study is guided by the following objectives:

1. To examine the symmetric (linear) impact of fiscal deficit, developmental expenditure, and non-developmental expenditure on economic growth in India using the ARDL framework.
2. To investigate the asymmetric (non-linear) effects of fiscal deficit on economic growth using the NARDL model and compare the results with the linear ARDL findings.

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4.3 Hypotheses of the Study

Based on the above objectives, the following hypotheses are formulated:

1. **H_{01}**: Fiscal deficit, developmental expenditure, and non-developmental expenditure have no significant impact on economic growth in India.
   H_{11}: Fiscal deficit, developmental expenditure, and non-developmental expenditure have a significant impact on economic growth in India.
2. **H_{02}**: There is no asymmetric (non-linear) impact of fiscal deficit on economic growth in India.
   H_{12}: There exists an asymmetric (non-linear) impact of fiscal deficit on economic growth in India.

5 Data and Methodology

5.1 Data Sources and Description of Variables

The present study utilizes annual time series data for India covering the period from 1980–81 to 2021–22. The data have been sourced from the Reserve Bank of India (RBI) Handbook of Statistics on the Indian Economy, which provides consistent and reliable information on macroeconomic indicators. Economic growth is proxied by Gross Domestic Product (GDP), while fiscal deficit (FD) is included as the primary fiscal policy variable reflecting the imbalance between government revenue and expenditure. In order to capture the differential impact of public spending, government expenditure is disaggregated into developmental expenditure (DevExp) and non-developmental expenditure (NonDevExp). This classification allows for a more nuanced understanding of how different components of public expenditure influence economic growth.

All variables are transformed into their natural logarithmic form to ensure uniformity of scale, reduce potential heteroscedasticity, and enable elasticity-based interpretation of the estimated coefficients. The description of variables used in the study is presented in Table 1.

Table 1: Description of the variables

Variables	Acron.	Definition	Source
Dependent Variable			
Economic Growth	LnGDP	Log of Gross Domestic Product	Reserve Bank of India
Independent Variables			
Fiscal Deficit	LnFD	Log of Fiscal Deficit (Central and State Government)	Reserve Bank of India
Developmental Expenditure	LnDevExp	Log of Developmental Expenditure	Reserve Bank of India
Non-Developmental Expenditure	LnNonDevExp	Log of Non-developmental Expenditure	Reserve Bank of India

Source: *Author's own Compilation*

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5.2 Model specification

The study examines the impact of fiscal deficit and government expenditure on economic growth in India. Government expenditure is disaggregated into developmental and non-developmental components to capture their differential effects.

The functional form of the model is specified as:

$$\boldsymbol{LnGDP = f(LnFD, LnDevExp, LnNonDevExp)}$$

This specification is used to analyse both linear (ARDL) and non-linear (NARDL) relationships between fiscal deficit and economic growth.

5.3 Methodological **Framework**

5.3.1 Linear ARDL Model Framework

The study employs the Autoregressive Distributed Lag (ARDL) approach to cointegration, as developed by Pesaran et al. (2001), to examine the linear and symmetric relationship between fiscal deficit, government expenditure, and economic growth in India. The ARDL framework is advantageous as it overcomes the limitations of traditional cointegration techniques and can be applied irrespective of whether the variables are integrated of order I(0) or I(1).

The cointegration relationship is examined through the estimation of an unrestricted error correction model (ECM), specified as follows:

$$\boldsymbol{\Delta lnGDP_t = \alpha_0 + \sum_{i=1}^{n} \delta_i \Delta lnGDP_{t-i} + \sum_{i=0}^{m}[\beta_1 \Delta lnFD_{t-i} + \beta_2 \Delta lnDevExp_{t-i} + \beta_3 \Delta lnNonDevExp_{t-i}] + \gamma_1 lnGDP_{t-1} + \gamma_2 lnFD_{t-1} + \gamma_3 lnDevExp_{t-1} + \gamma_4 lnNonDevExp_{t-1} + \mu_t} \quad \textbf{(1)}$$

where Δ denotes the first difference operator and t represents the time period. The coefficients δ_i and β_1 to β_3 capture short-run dynamics, while γ_1 to γ_4 represent long-run relationships among the variables. The term μ_t denotes the white noise error term.

The short-run dynamics are further estimated through the error correction representation given by:

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$$\Delta lnGDP_t = \alpha_0 + \sum_{i=1}^{n} \theta_i \Delta lnGDP_{t-i} + \sum_{i=0}^{m} [\phi_1 \Delta lnFD_{t-i} + \phi_2 \Delta lnDevExp_{t-i} + \phi_3 \Delta lnNonDevExp_{t-i}] + \psi ECT_{t-1} + \mu_t$$
(2)

The symbols $\sum_{i=1}^{n} \theta_i$ and $\sum_{i=0}^{m} \phi_i$ denote the coefficients of short-term elasticities. The variable ECT_{t-1} signifies the error correction term, represented by ψ, measures the pace of correction over a period of time.

5.3.2 Non-Linear ARDL Model (NARDL) Framework

To capture potential asymmetries in the fiscal deficit–growth relationship, the study employs the Nonlinear Autoregressive Distributed Lag (NARDL) model proposed by Shin et al. (2014). This approach decomposes the fiscal deficit variable into its positive and negative partial sums, allowing for the estimation of asymmetric effects on economic growth.

The long-run nonlinear specification is given as:

$$\ln GDP_t = \alpha_0 + \beta_1^+ \ln FD_t^+ + \beta_2^- \ln FD_t^- + \beta_3 \ln DevExp_t + \beta_4 \ln NonDevExp_t + \mu_t \quad (3)$$

Equation (3) break down the exogenous variable into two separate partial sums, one positive and one negative.

$$lnFD_t^+ = \sum_{j=1}^{t} \Delta\, lnFD_t^+ = \sum_{j=1}^{t} \max(\Delta lnFD_j, 0)$$
(4)

$$lnFD_t^- = \sum_{j=1}^{t} \Delta\, lnFD_t^- = \sum_{j=1}^{t} \min(\Delta lnFD_j, 0)$$
(5)

Shin et al. (2014) have modified equation (3) in accordance with the methodology outlined by Pesaran and Shin (1998) and Pesaran et al. (2001), and have subsequently transformed it into an ARDL structure:

$$\Delta lnGDP_t = \alpha + \rho lnGDP_{t-1} + \omega_1^+ lnFD_{t-1}^+ + \omega_2^- lnFD_{t-1}^- + \omega_3 lnDevExp_{t-1} + \omega_4 lnNonDevExp_{t-1} + \sum_{j=1}^{p} \delta_j \Delta lnGDP_{t-j} + \sum_{j=0}^{q} [\theta_j^+ lnFD_{t-j}^+ + \theta_j^- lnFD_{t-j}^- + \phi_j lnDevExp_{t-j} + \varphi_j lnNonDevExp_{t-j}] + \mu_t \quad (6)$$

The equation (6) denotes that p and q represent the lag orders of the regress and regressors, respectively. The long-term relationship between variables is represented by the coefficients ($\omega_1^+, \omega_2^-, \omega_3, \omega_4,$) , while the short-term relationship is reflected by the coefficients $\sum_{j=0}^{q-1}$ $[\theta_j^+, \theta_j^-, \phi_j, \phi_j]$. The variables β_1^+ and , β_2^- denote the long-term nonlinear elasticities for *lnFD*⁺ and *lnFD*⁻, respectively, and are expressed as $\left[-\frac{\omega_1^+}{\rho}\right]$ and $\left[-\frac{\omega_2^-}{\rho}\right]$, respectively. The variable μ_t represents the presence of white noise.

The dynamic multipliers for both models can also be obtained using Eq. (6):

$$m_k^+ = \sum_{j=0}^{k}\left[\frac{\partial lnGDP_{t+j}}{\partial lnFD_j^+}\right], m_k^- = \sum_{j=0}^{k}\left[\frac{\partial lnGDP_{t+j}}{\partial lnFD_j^-}\right]$$

where k takes the values of 0, 1, 2, or 3 and the values of m_k^+ and m_k^- converge towards the asymmetric long-run coefficients $\beta_1^+ = \left[-\frac{\omega_1^+}{\rho}\right]$, $\beta_2^- = \left[-\frac{\omega_2^-}{\rho}\right]$, respectively, as k approaches to infinity.

6 Empirical Results and Discussion

6.1 Descriptive Statistics

The descriptive statistics provide important insights into the distributional properties and characteristics of the variables used in the analysis of the Indian economy (See Table 2). The average value of GDP (LnGDP) is 27.47 with relatively low dispersion (standard deviation = 0.72), indicating a stable growth pattern over the study period. Fiscal deficit (LnFD) has a mean of 1.66 with moderate variability (standard deviation = 0.27), reflecting fluctuations in fiscal imbalances across years.

Table 2: Descriptive Statistics

Variables	Mean	Median	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob Value
LnGDP	27.47	27.43	28.63	26.32	0.72	0.90	1.73	2.85	0.24
LnFD	1.66	1.69	2.21	0.93	0.27	-0.38	2.89	1.06	0.58
LnDev-Exp	2.04	2.05	2.44	1.69	0.19	0.23	2.22	1.45	0.48
LnNonDev-Exp	2.07	2.09	2.27	1.90	0.09	-0.94	2.47	0.55	0.75

***Source**: Authors own Calculation*

Developmental expenditure (LnDevExp) and non-developmental expenditure (LnNonDevExp) record mean values of 2.04 and 2.07, respectively, suggesting a relatively balanced composition of government spending. The variability in developmental expenditure (standard deviation = 0.19) is slightly higher compared to non-developmental expenditure (standard deviation = 0.09), indicating more fluctuations in productive government spending.

The skewness values indicate that LnGDP and LnDevExp are positively skewed, whereas LnFD and LnNonDevExp exhibit negative skewness. The kurtosis values for all variables are below three, indicating a platykurtic distribution. Furthermore, the Jarque–Bera statistics are statistically insignificant (p-values > 0.05), implying that the variables are approximately normally distributed. These results confirm that the data satisfy the normality assumption, making them suitable for further econometric analysis.

Following the preliminary examination of the descriptive properties of the variables, the next step is to assess their stationarity to avoid spurious regression results. In this regard, unit root tests are employed to determine the order of integration of the series before proceeding to cointegration analysis.

6.2 Unit Root Testing

The unit root tests confirm the stationarity properties of all variables used in the study, which is a necessary condition for reliable time-series econometric analysis (see Table 3). The results of the ADF and PP tests indicate that variables such as LnGDP, LnFD, LnDevExp, and LnNonDevExp are non-stationary at the level, but become stationary after first differencing, as reflected by statistically significant test statistics at the 1% level.

Table 3: Unit Root Test

Variables	ADF Test		PP Test	
	I(0)	I(1)	I(0)	I(1)
LnGDP	0.02 (0.95)	-6.13 (0.00)*	0.05 (0.96)	-6.13 (0.00)*
LnFD	-2.85 (0.06)	-4.32 (0.00)*	-2.85 (0.06)	-6.77 (0.00)*
LnDevExp	-2.02 (0.28)	-5.99 (0.00)*	-2.10 (0.25)	-5.98 (0.00)*
LnNonDevExp	-2.52 (0.12)	-5.61 (0.00)*	-2.65 (0.09)	-5.76 (0.00)*

Source*: Author's own Calculation*

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Both ADF and PP tests provide consistent evidence that all variables are integrated of order one, I(1). The absence of any variable integrated of order I(2) validates the application of the ARDL and NARDL approaches, which are suitable for handling variables with mixed orders of integration.

These findings establish the appropriateness of proceeding with cointegration analysis to examine the long-run and short-run dynamics among fiscal deficit, government expenditure, and economic growth in India.

6.3 Empirical Analysis Linear ARDL Framework

Before applying the ARDL bounds testing approach, it is essential to examine the stationarity properties of the variables to ensure that none of the series is integrated of order two, I(2). The results of the unit root tests indicate that all variables are integrated of order one, I(1), thereby satisfying the necessary precondition for the application of the ARDL model.

Given this, the ARDL bounds testing approach proposed by Pesaran et al. (2001) is employed to investigate the existence of a long-run equilibrium relationship among the variables. One of the key advantages of the ARDL framework is that it can be applied irrespective of whether the underlying variables are purely I(0), purely I(1), or mutually cointegrated.

Accordingly, the next step involves estimating the bounds test to determine whether a stable long-run relationship exists among fiscal deficit, government expenditure, and economic growth.

6.3.1 ARDL Bounds Test Results

The ARDL bounds testing approach is applied to examine the existence of a long-run relationship among the variables. The results are presented in Table 4. The computed F-statistic is 9.24, which exceeds the upper bound critical values at the 5% and 10% significance levels. Therefore, the null hypothesis of no level relationship is rejected, confirming the presence of cointegration among the variables.

Table 4: Bounds Test Result

Test-statistics	Value	Significance	I (0)	I (1)
F-statistics k	**9.24** 3	5%	2.79	3.67
		10%	2.37	3.20

Source*: Author's own Calculation*

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6.3.2 ARDL Long-Run Results

The long-run coefficient estimates reveal that fiscal deficit (LnFD) carries a negative coefficient of -2.78, but it is statistically insignificant (p = 0.24), indicating that fiscal deficit does not exert a significant long-run influence on economic growth in the linear framework. Similarly, developmental expenditure (LnDevExp) and non-developmental expenditure (LnNonDevExp) also show negative coefficients (-1.55 and -2.41, respectively), but both remain statistically insignificant *(See Table:5).*

Table 5: Long Run Linear ARDL Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFD	-2.79	2.37	-1.18	0.24
LNDEV_EXP	-1.56	2.05	-0.76	0.45
LNNON_DEV_EXP	-2.41	2.49	-0.97	0.34
C	4.22	5.84	7.57	0.00

Source*: Authors own Calculation*

Economically, these results suggest that variations in fiscal deficit and expenditure components do not translate into consistent long-term growth effects. In the Indian context, this may reflect inefficiencies in public spending allocation, delays in the transmission of fiscal policy, or offsetting effects between productive and non-productive expenditures.

Such findings are in line with empirical studies like Kollias et al. (2013) and Magazzino (2012), which report weak or statistically insignificant long-run relationships between fiscal variables and economic growth, particularly in developing and emerging economies where structural rigidities and policy inefficiencies may dilute long-term impacts.

6.3.3 Short-Run Dynamics (ECM Results)

The short-run results, however, present a different picture. Developmental expenditure shows a significant short-run impact on economic growth, with a negative contemporaneous coefficient (-0.13) and a positive lagged effect (0.08), indicating short-term adjustment dynamics. Non-developmental expenditure also exhibits a negative and statistically significant effect (-0.14) on growth in the short run.

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Table 6: Short-Run Results of Linear ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNDEV_EXP)	-0.13	0.02	-5.68	0.00*
D(LNDEV_EXP(-1))	0.08	0.02	3.39	0.00*
D(LNNON_DEV_EXP)	-0.14	0.05	-2.97	0.01*
CointEq(-1)	-0.014	0.00	-2.40	0.00*

Source*: Authors own Calculation*

The error correction term is negative and highly significant (-0.014), confirming the stability of the long-run relationship. However, the magnitude of the coefficient indicates a slow speed of adjustment, suggesting that deviations from equilibrium are corrected gradually over time.

These results imply that while fiscal variables may influence growth in the short run, their long-run effects remain weak within the linear ARDL framework. Similar short-run significance alongside weak long-run effects has been documented by Loizides and Vamvoukas (2005) and Ramos-Herrera and Prats (2020).

6.3.4 Diagnostic Test Results of Linear ARDL

The reliability and robustness of the estimated ARDL model are evaluated using a series of diagnostic tests, as reported in Table 7. The adjusted R^2 value of 0.65 indicates that the model explains a substantial proportion of variation in economic growth.

Table 7: Diagnostic Test Results

Residuals Diagnostic Test	Statistics	p-value
Adjusted R^2	0.65	
Serial Correlation test	1.32	0.20
Heteroskedasticity test	1.62	0.16
Normality test	4.35	0.00
Functional Form	0.67	0.42

Source*: Authors own Calculation*

The Breusch–Godfrey LM test confirms the absence of serial correlation, as the p-value (0.20) is statistically insignificant. Similarly, the Breusch–Pagan–Godfrey test suggests that the model does not suffer from heteroskedasticity, with an insignificant p-value of 0.16. The Ramsey RESET test also indicates correct model specification, as the null hypothesis cannot be rejected (p = 0.42).

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However, the Jarque–Bera test reveals that the residuals are not normally distributed (p = 0.00), indicating some deviation from normality. Despite this, the overall diagnostic results suggest that the model is stable and econometrically sound for further analysis.

Although the ARDL results confirm the presence of a long-run relationship among the variables, the estimated long-run coefficients remain statistically insignificant. At first glance, this may suggest that fiscal deficit and government expenditure do not have a meaningful impact on economic growth in India. However, such a conclusion may be misleading, as it is based on the restrictive assumption of symmetry inherent in the linear ARDL framework.

The linear model assumes that positive and negative changes in fiscal variables exert identical effects on economic growth. In reality, fiscal policy operates differently across expansionary and contractionary phases. For instance, an increase in fiscal deficit may stimulate growth through higher public spending and demand generation, whereas a reduction in deficit, often associated with fiscal consolidation, may adversely affect growth. Similarly, developmental and non-developmental expenditures are likely to have differing impacts depending on their direction and composition.

The insignificant long-run results obtained from the ARDL model may therefore be attributed to this averaging effect, where opposite impacts offset each other within a symmetric framework. Empirical studies such as Baharumshah et al. (2017) and Ramos-Herrera and Prats (2020) provide evidence that fiscal variables often exhibit asymmetric effects on macroeconomic performance, particularly in developing economies.

In view of these limitations, the present study extends the analysis by employing a nonlinear framework, which allows for the decomposition of fiscal deficit into its positive and negative components, thereby capturing the true nature of fiscal policy transmission on economic growth.

6.3.5 Transmission from Linear ARDL to Nonlinear Framework

The results obtained from the linear ARDL model highlight an important limitation in explaining the relationship between fiscal variables and economic growth. Although the bounds test confirms the existence of a long-run relationship, the estimated long-run coefficients remain statistically insignificant. This may create a misleading conclusion that fiscal policy variables do not significantly influence economic growth in India.

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This outcome can be attributed to the restrictive assumption of symmetry inherent in the ARDL framework, which assumes that positive and negative changes in fiscal variables exert identical effects. However, in reality, fiscal policy responses are often asymmetric, and such a linear approach may fail to capture the true nature of these dynamics.

To address this limitation, the analysis is extended to a nonlinear framework using the NARDL model, which allows for a more comprehensive examination of asymmetric effects.

6.4 Empirical Analysis Non-Linear ARDL (NARDL) Framework

The limitations observed in the linear ARDL model necessitate the adoption of a nonlinear framework to better capture the dynamics of fiscal policy. The insignificance of long-run coefficients in the ARDL model does not imply the absence of a relationship, but rather reflects the inability of the linear specification to account for asymmetric adjustments.

In reality, fiscal policy operates through uneven and direction-dependent mechanisms. An increase in fiscal deficit, often driven by expansionary government spending, may stimulate economic activity through demand-side channels. In contrast, fiscal consolidation measures, aimed at reducing deficits, may exert contractionary effects on output. Similarly, the growth impact of developmental and non-developmental expenditures may vary depending on their composition, timing, and efficiency.

The linear ARDL framework averages these opposing effects, thereby masking the underlying relationships and leading to statistically insignificant estimates. This necessitates the use of a nonlinear approach that can explicitly model such asymmetries.

Accordingly, this study employs the Nonlinear Autoregressive Distributed Lag (NARDL) model, which decomposes fiscal deficit into positive and negative partial sums. This decomposition allows the model to capture asymmetric effects in both the short run and the long run, providing a more realistic representation of fiscal policy transmission.

Furthermore, similar to the ARDL approach, the NARDL model can be applied when variables are integrated of order I(0) or I(1), but not I(2), thereby satisfying the stationarity conditions established through unit root testing. This ensures methodological consistency while enhancing the explanatory power of the model.

Thus, the transition from a linear to a nonlinear framework is both empirically justified and methodologically necessary to uncover the true nature of the relationship between fiscal deficit and economic growth in India.

6.4.1 NARDL Bounds Test and Asymmetry (Wald Test Results)

Following the limitations observed in the linear ARDL framework, the nonlinear ARDL (NARDL) model is estimated to capture asymmetric effects of fiscal deficit on economic growth. The bounds test results provide strong evidence of cointegration among the variables. The computed F-statistic is **21.51, see Table 8**, which is significantly higher than the upper bound critical value at the 1% level (**4.37**), thereby rejecting the null hypothesis of no long-run relationship. This confirms a robust and stable long-run equilibrium between economic growth, fiscal deficit, and government expenditure components under the nonlinear specification

Table 8: NARDL Bounds Test and Wald Test Results:

Test Type	Statistic	Value	Significance / p-value	Conclusion
Bounds Test	F-statistic (k = 4)	21.51	> Upper bound (1%)	Cointegration exists
Critical Value (I(0)) 3.29				
Critical Value (I(1)) 4.37				
Wald Test (Asymmetry)	F-statistic	11.1	0.0025*	Reject symmetry
	t-statistic	3.33	0.0025*	Significant
	Chi-square	11.1	0.0009*	Significant

Source*: Author's own Calculation*

Compared to the linear ARDL model, where the F-statistic was relatively lower (**9.24**) as present in Table 8, the NARDL model exhibits a much stronger cointegrating relationship. This suggests that incorporating asymmetry enhances the explanatory power of the model and better captures the underlying macroeconomic dynamics.

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In addition to cointegration, the Wald test is employed to examine the presence of asymmetry in the relationship. The results strongly reject the null hypothesis of symmetry, as indicated by the significant F-statistic (**11.10, p < 0.01**). This confirms that positive and negative changes in fiscal deficit do not have identical effects on economic growth. The joint evidence from the bounds test and Wald test highlights two important findings. First, there exists a strong long-run relationship among the variables when nonlinearities are considered. Second, this relationship is inherently asymmetric, meaning that fiscal policy shocks operate differently depending on their direction. These results clearly demonstrate that the linear ARDL framework provides an incomplete picture, whereas the NARDL model offers a more comprehensive understanding of fiscal policy transmission in the Indian economy.

6.4.2 NARDL Long-Run Asymmetric Dynamics under the NARDL Framework

After confirming the presence of a long-run relationship and asymmetry among the variables, the long-run coefficients of the NARDL model are estimated and presented in Table 5.8. The results reveal a strong and statistically significant asymmetric relationship between fiscal deficit and economic growth in India.

In the long run, both positive and negative changes in fiscal deficit exhibit statistically significant effects, but with notable differences in magnitude. The coefficient of **positive shocks in fiscal deficit ($lnFD^+$ = -0.48)** is negative and significant, indicating that an increase in fiscal deficit adversely affects economic growth. This finding reflects the adverse macroeconomic consequences of excessive government borrowing, including crowding-out of private investment, rising interest rates, inflationary pressures, and increasing debt servicing burdens.

Table 9: NARDL Long-Run Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNFD_POS	-0.48	0.17	-2.83	0.01*
LNFD_NEG	-1.23	0.19	-6.35	0.00*
LNDEV_EXP	0.52	0.24	2.18	0.04*
LNNON_DEV_EXP	1.14	0.30	3.78	0.00*
C	3.34	1.03	2.61	0.00*

Source*: Author's own Calculation*

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Conversely, the coefficient of **negative shocks in fiscal deficit ($lnFD^{-}$ = -1.23)** is larger in magnitude and highly significant, suggesting that fiscal consolidation exerts a stronger contractionary impact on economic growth. This implies that reductions in fiscal deficit, often achieved through expenditure compression or fiscal tightening, may dampen aggregate demand and slow down economic activity. The magnitude difference between $lnFD^{+}$ and $lnFD^{-}$ clearly confirms the presence of long-run asymmetry, which remained undetected in the linear ARDL framework.

These findings are consistent with earlier empirical studies such as **Fischer (1993)** and **Fölster and Henrekson (2001)**, which highlight the negative growth implications of persistent fiscal imbalances. Similarly, **Gupta et al. (2005)** emphasize that fiscal consolidation, although essential for macroeconomic stability, may have contractionary effects on output in the short-to-medium term. More recent evidence from **Taylor et al. (2012)** and **Zareen and Qayyum (2015)** also supports the view that fiscal adjustments do not exert uniform effects on growth and may vary depending on economic conditions. In the Indian context, studies such as **Sharma and Mittal (2019)** and **Yusuf and Mohd (2021)** further validate the presence of asymmetric fiscal effects, particularly in developing economies characterized by structural rigidities and policy transmission lags.

In addition, both **developmental expenditure (0.52)** and **non-developmental expenditure (1.14)** exhibit positive and statistically significant effects on economic growth. This indicates that government spending, irrespective of its classification, contributes positively to long-run economic performance. Developmental expenditure promotes growth through infrastructure creation, human capital formation, and capital investment, while non-developmental expenditure supports administrative efficiency, welfare distribution, and aggregate demand stabilization.

Overall, the NARDL results provide a more nuanced understanding of fiscal policy dynamics in India by revealing the asymmetric nature of fiscal deficit effects. Unlike the linear ARDL model, which failed to detect any significant long-run relationship, the nonlinear framework uncovers strong and economically meaningful linkages, thereby offering a more realistic representation of fiscal policy transmission in the Indian economy.

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6.4.3 Short-Run Asymmetric Dynamics under the NARDL Framework

The short-run dynamics of the NARDL model further reinforce the presence of asymmetry in the relationship between fiscal deficit and economic growth. The results indicate that the impact of fiscal policy adjustments is not immediate and operates through lagged transmission mechanisms.

In the short run, the coefficient of **lagged negative changes in fiscal deficit ($D(LNFD^{-}(-1))$ = 0.12)** is positive and statistically significant, suggesting that past reductions in fiscal deficit contribute positively to economic growth. This may reflect improved macroeconomic stability, reduced borrowing costs, and enhanced investor confidence following fiscal consolidation. However, the contemporaneous and higher-order lag effects remain statistically insignificant, indicating that the adjustment process is gradual rather than instantaneous.

Table 9: NARDL Short-Run Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNFD_NEG)	0.00	0.03	-0.19	0.85
D(LNFD_NEG(-1))	0.12	0.03	3.76	0.00
D(LNFD_NEG(-2))	0.03	0.03	1.12	0.27
D(LNDEV_EXP)	-0.07	0.02	-3.38	0.00
D(LNNON_DEV_EXP)	0.03	0.05	0.69	0.50
CointEq(-1)	-0.21	0.02	-12.37	0.00

***Source**: Author's own Calculation*

Developmental expenditure exhibits a **negative and significant short-run effect (-0.07)**, which may be attributed to implementation delays, inefficiencies, and gestation lags associated with public investment projects. In the Indian context, large-scale infrastructure and development projects often involve time lags before yielding productive outcomes, thereby generating short-term adjustment costs.

On the other hand, non-developmental expenditure remains statistically insignificant in the short run, suggesting that such expenditures do not have an immediate impact on economic

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growth. This may be due to their recurrent nature, which primarily supports administrative functions and consumption rather than directly enhancing productive capacity.

The error correction term (**-0.21**) is negative and highly significant, confirming the existence of a stable long-run equilibrium relationship. The magnitude indicates that approximately **21% of disequilibrium is corrected in each period**, implying a relatively faster speed of adjustment compared to the linear ARDL model. This highlights the efficiency of the nonlinear framework in capturing the dynamics of adjustment.

These findings are consistent with empirical studies such as **Gupta et al. (2005)** and **Zareen and Qayyum (2015)**, which emphasize that the short-run effects of fiscal policy are often uneven and dependent on timing, composition, and macroeconomic conditions. Similarly, **Yusuf and Mohd (2021)** highlight that fiscal policy adjustments in developing economies exhibit lagged and asymmetric transmission effects.

Overall, the short-run results complement the long-run findings by demonstrating that fiscal policy operates through complex and time-dependent channels, further justifying the use of the NARDL framework over the linear ARDL model.

6.4.4 Diagnostic Tests and Model Stability (NARDL)

To assess the reliability of the estimated NARDL model, a series of diagnostic tests is conducted for serial correlation, heteroskedasticity, functional form, and normality of residuals. The results are presented in Table 5.9. The model shows a reasonably good fit, with an **R-squared of 0.7649** and an **adjusted R-squared of 0.7281**, indicating that the explanatory variables account for a substantial proportion of variation in economic growth.

The Breusch–Godfrey LM test indicates the absence of serial correlation, as the reported F-statistic (**0.55**) is statistically insignificant with a p-value of **0.5853**. Likewise, the Breusch–Pagan–Godfrey test confirms the absence of heteroskedasticity, since the corresponding F-statistic (**1.44**) and p-value (**0.2165**) fail to reject the null hypothesis of constant variance.

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Table 11: Diagnostic Test Results: NARDL Model

Diagnostic Test	Statistic	p-value	Conclusion
R^2	0.76		Good fit
Adjusted R^2	0.72		Good explanatory power
Serial Correlation (BG LM Test)	0.55	0.58	No serial correlation
Heteroskedasticity (BP-Godfrey)	1.44	0.21	Homoscedastic
Functional Form (RESET Test)	0.59	0.44	Correctly specified
Normality (Jarque-Bera)	0.21	0.89	Residuals are normal

***Source**: Author's own Calculation*

The Ramsey RESET test further suggests that the model is correctly specified, with an insignificant F-statistic (**0.59**) and p-value (**0.4475**), implying no evidence of omitted variable bias or functional form misspecification. In addition, the Jarque–Bera statistic (**0.21**) with a high probability value (**0.8985**) confirms that the residuals are normally distributed.

In addition to these diagnostic tests, the stability of the NARDL model is further examined using the CUSUM and CUSUM of squares (CUSUMSQ) tests. The graphical results indicate that both the CUSUM and CUSUMSQ statistics remain within the 5% critical bounds throughout the sample period. This confirms that the estimated coefficients are stable over time and that there are no structural instabilities in the model.

The stability of the model is particularly important in the context of the Indian economy, which has undergone several structural changes over the sample period, including economic reforms, fiscal adjustments, and external shocks. The absence of instability in both CUSUM and CUSUMSQ tests suggests that the NARDL model reliably captures the underlying relationship between fiscal deficit and economic growth without being affected by structural breaks.

Overall, the combined evidence from diagnostic and stability tests confirms that the NARDL model is econometrically robust, well-specified, and stable, thereby strengthening the validity of the estimated asymmetric results.

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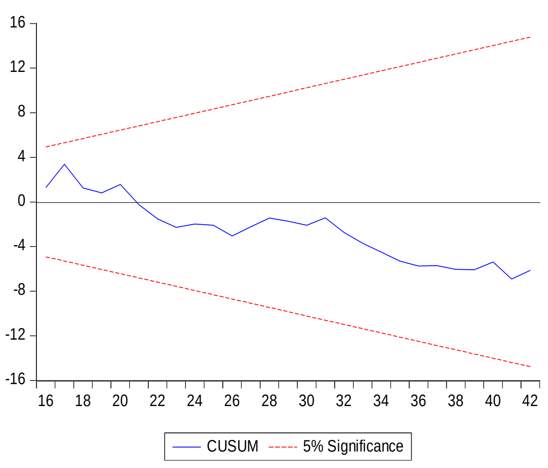
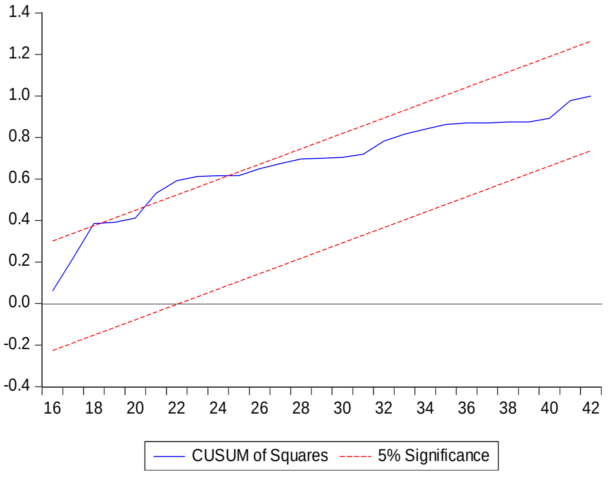
Figures 2 and 3: CUSUM and CUSUMSQ Stability Analysis (NARDL Model)





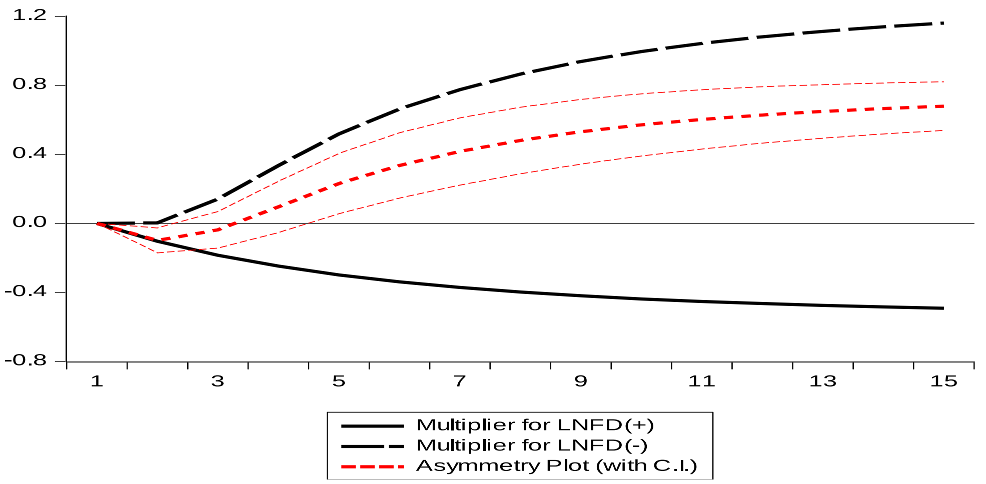
Source*: Author's own Calculation*

Source*: Author's own Calculation*

6.4.5 Dynamic Multiplier Analysis

To further examine the asymmetric adjustment process, the dynamic multiplier effects of positive and negative changes in fiscal deficit on economic growth are plotted in Figure 4. The dynamic multiplier traces the path through which economic growth responds over time to a unit change in fiscal deficit, allowing for a clear visualization of both short-run and long-run asymmetries.

Figure 4: Cumulative Dynamic Effect of FD on GDP



Source*: Author's own Calculation*

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The results reveal a pronounced divergence between the responses of economic growth to positive and negative shocks in fiscal deficit. The multiplier associated with **positive changes ($LNFD^{+}$)** shows a gradual and sustained increase over time, indicating that expansionary fiscal policy initially exerts a moderate effect on economic growth, which strengthens in the long run. This suggests the presence of delayed transmission mechanisms, where the benefits of increased government expenditure materialize over time through investment, infrastructure development, and multiplier effects.

In contrast, the multiplier for **negative changes ($LNFD^{-}$)** follows a downward trajectory, indicating that fiscal consolidation has a contractionary effect on economic growth. The decline is more pronounced in the initial periods and stabilizes at a lower level in the long run, suggesting that reductions in fiscal deficit lead to a persistent dampening of economic activity.

The widening gap between the two multipliers clearly illustrates the presence of asymmetry in both the short run and long run. While expansionary fiscal shocks generate positive growth effects over time, contractionary shocks impose stronger and more immediate negative impacts. This asymmetric adjustment pattern reinforces the findings from the long-run and short-run estimations.

Furthermore, the confidence bands around the multipliers remain relatively narrow, indicating the statistical reliability of the estimated responses. The absence of overlap between the upper and lower bounds in later periods further strengthens the evidence of significant asymmetry.

Overall, the dynamic multiplier analysis confirms that the response of economic growth to fiscal deficit is nonlinear and path-dependent. These findings highlight the importance of considering asymmetric fiscal policy effects, particularly in a developing economy like India, where policy shocks operate through complex transmission channels and time lags.

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7 Conclusion

This study examines the relationship between fiscal deficit and economic growth in India using both linear (ARDL) and nonlinear (NARDL) frameworks. The empirical findings provide important insights into the nature of fiscal policy transmission and highlight the limitations of relying solely on linear specifications. The results from the ARDL model indicate that although a long-run relationship exists between the variables, the impact of fiscal deficit on economic growth is statistically insignificant. This suggests that the linear framework fails to capture the true underlying dynamics between fiscal policy and economic performance. Consequently, the null hypothesis of no significant impact of fiscal deficit on economic growth cannot be rejected under the ARDL specification. However, the findings from the NARDL model provide a more nuanced and robust understanding. The bounds test confirms a strong long-run relationship, while the Wald test establishes the presence of asymmetry. Both positive and negative changes in fiscal deficit are found to be statistically significant, with differing magnitudes. In particular, fiscal consolidation exerts a stronger contractionary effect compared to expansionary fiscal shocks. These results clearly indicate that fiscal policy effects are nonlinear and direction-dependent.

Based on the NARDL results, the null hypothesis of symmetry is rejected, and the alternative hypothesis of asymmetric effects is accepted. Furthermore, the hypothesis that fiscal deficit has no significant impact on economic growth is also rejected under the nonlinear framework. This demonstrates that ignoring asymmetry may lead to misleading conclusions regarding the role of fiscal policy. The short-run dynamics and dynamic multiplier analysis further support these findings by revealing lagged and uneven adjustment processes. The diagnostic and stability tests confirm that the model is econometrically sound and stable over the sample period. Overall, the study concludes that the relationship between fiscal deficit and economic growth in India is inherently asymmetric and cannot be adequately explained using linear models. The findings emphasize the importance of adopting nonlinear approaches such as NARDL to capture the true nature of fiscal policy effects. From a policy perspective, the results suggest that while expansionary fiscal policies may support growth, fiscal consolidation measures should be implemented cautiously, as they may have stronger adverse effects on economic activity.

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