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Effect of Public Debt on Economic Growth of Nepal

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Abstract

The study investigates the effect of public debt on economic growth of Nepal over the period 1990 to 2024. The main objective of this study is to examine the effect of public debt on the economic growth of Nepal. The study considers external debt and internal debt as independent variables, gross capital formation and inflation rate as control variables, and GDP as the dependent variable. It utilizes secondary panel data from ten major commercial banks in Nepal. The results indicate that external debt has a positive and significant impact on GDP growth both in the short and long term, implying that external borrowing contributes to sustained economic development. In contrast, internal debt shows a negative effect on economic growth in the short run and an insignificant effect in the long run, suggesting that domestic borrowing may create short-term economic pressure. The effect of inflation appears mixed: current inflation does not significantly influence growth, but lagged inflation negatively affects GDP, indicating delayed harmful effects of rising prices.

Keywords: External Debt, Internal Debt, Gross Capital Formation, Inflation Rate,

Introduction

Public debt refers to the borrowing undertaken by a government from both domestic and international sources, including individuals, financial institutions, and foreign nations. Such borrowing is typically used to finance public services, infrastructure projects, and budget deficits. While debt can be a useful means for supporting development and essential public initiatives, excessive borrowing can harm a nation's economy. In both developed and developing economies, there exists a critical threshold beyond which rising debt and higher taxes can discourage investment, production, and overall growth. Thus, maintaining a balance between borrowing and taxation is vital for sustaining economic progress. Understanding how public debt affects economic growth is essential, as it influences fiscal stability, investment capacity, and the government's ability to fund long-term development in key sectors such as infrastructure, health, and education. Properly managed debt can serve as a catalyst for growth, but when fiscal imbalances persist, governments are often compelled to cut spending or raise taxes to restore financial stability (Islam & Biswas, 2005).

Economic growth refers to the continuous rise in the production of goods and services within an economy over time. Public debt has been instrumental in improving infrastructure, education, and healthcare, all of which contribute to overall development. In Nepal, various institutional challenges hinder smooth business operations, making public debt an essential means to address such constraints. According to Acharya (2015), public debt acts as a major financial source for promoting Nepal's economic growth. However, reliance on external borrowing has been increasing relative to domestic debt. Since the 1970s, the country has experienced a growing fiscal deficit, rapid population growth, and inflation, all of which have widened the financial resource gap (Khanal, 2000).

The relationship between public debt and economic growth is particularly complex in developing countries like Nepal. As a low-income economy, Nepal needs real GDP growth fueled by productive investments in key sectors such as transportation, communication, education, and health—areas that directly influence economic progress (Babatunde, 2018). While public debt serves as an important fiscal tool to bridge funding gaps and support development, excessive borrowing may lead to higher debt servicing burdens, inflationary pressure, and fiscal imbalance. Given Nepal's susceptibility to external shocks like natural disasters and global economic fluctuations, effective debt management is essential. The government's ability to manage and repay debt prudently determines whether borrowing contributes to or constrains long-term sustainable growth. In recent years especially following the COVID-19 pandemic Nepal's

dependence on external borrowing has intensified, raising concerns about fiscal sustainability. Therefore, it is essential for Nepal to carefully assess and manage its debt portfolio to ensure that borrowed funds are used efficiently and generate sufficient economic returns. When managed prudently, public debt can be a powerful tool for achieving sustainable economic growth. Conversely, unchecked debt accumulation can hinder progress and impose severe fiscal burdens. Effective use of borrowed resources, combined with strategic investment planning, is crucial for ensuring that public debt contributes positively to Nepal's long-term development and provides opportunities for employment and prosperity.

Objectives of the Study

The primary aim of this study is to examine the impact of public debt on Nepal's economic growth. More specifically, the study seeks to achieve the following objectives:

- To analyse the relationship between public debt and economic growth in Nepal.
- To assess the effect of both internal and external debt on economic growth in short and long term.

Hypothesis

In examining the effect of public debt on Nepal's economic growth, hypotheses are formulated to explore the significant relationships among the key variables, with gross capital formation and inflation rate serving as control variables to strengthen the study's internal validity. Based on this conceptual framework, the study proposes the following hypotheses:

H1: The external debt has a significant effect on GDP growth in Nepal.

H2: There is significant effect of internal debt on GDP growth in Nepal.

Review of Literature

Theoretical Review

Classical and Neoclassical Theories: Classical economists were generally critical of public borrowing. Public debt, when prudently managed, can support these investments. Modigliani (2000), building on Buchanan's (1988) insights, argued that national debt can reduce private capital and burden future generations but acknowledged that if debt finances productive capital formation, it can yield intergenerational benefits.

Keynesian Theory: The Keynesian school of thought, emerging after the Great Depression, presented a more favorable view of public borrowing, especially during economic downturns. John Maynard Keynes (1936) argued that economies could remain in prolonged underemployment equilibrium without self-correcting mechanisms. In such cases, government borrowing and spending are necessary to utilize idle labor and capital.

Overhang Hypothesis: The Debt Overhang Hypothesis, advanced by Krugman (1988) and Sachs (1989), Debt suggests that when a country's debt level becomes excessively high, investors lose confidence in the government's ability to repay, deterring further investment. In such situations, expected returns from new investments are diverted toward servicing existing debt rather than fostering growth. Consequently, both domestic and foreign investors become hesitant to invest, leading to reduced capital formation and sluggish economic progress.

Empirical Review:

Khan et al. (2022) investigated the impact of external debt on Pakistan's economic growth using the Solow Growth Model and annual data from 1976–2021. Using the Ordinary Least Squares (OLS) method, the study found that these variables significantly influenced GDP, highlighting the important role of external debt and macroeconomic factors in Pakistan's economic growth.

Madhuhansi and Shantha (2021) examined Sri Lanka's public debt and economic growth from 1980–2019. Using ADF, JB, cointegration, and ECM analyses, they found rising domestic and external debt, both of which significantly reduced

economic growth. Domestic debt had a stronger long-term negative effect, while external debt had a stronger short-term impact.

Abubakar and Mamman (2021) analyzed Nigeria's debt and private investment (1981–2018) using linear and non-linear ARDL models. Total debt, external debt, and debt servicing significantly reduced private investment, while domestic debt had asymmetric effects. Overall, higher public debt discouraged private investment.

Fseifes and Warrad (2020) examine the long-run relationship between public debt and economic growth in Jordan (1980–2018) using FM-OLS. They find that while investment, labor force growth, and trade openness boost growth, public debt negatively affects it in the long run. The study also reveals a non-linear, inverted U-shaped relationship: debt only harms growth significantly when it exceeds 78% of GDP. The findings highlight the importance of managing and reducing public debt over time.

Rawat (2019) analyze the link between external debt, domestic debt and economic growth for Pakistan. To serve the purpose, the study uses the data for the time period from 1987 to 2018. Various econometric techniques i.e, fully modified ordinary least squares model, dynamic ordinary least squares model have been employed to estimate the proposed model. The empirical findings suggested that there exist a negative relationship between growth and debt whether it is external or domestic.

Shrestha (2023) analyzed Nepal's real GDP determinants (1975–2021) and found a long-run relationship among key variables. Both internal and external debt positively contributed to real GDP, suggesting that effective use of public debt can strengthen Nepal's real sector performance.

Adhikari (2023) used the ARDL model to assess external debt's impact on Nepal's growth (1978–2020). Balance of payments significantly boosted GDP, while external debt and reserves had positive but insignificant effects. The study highlights that efficient use of external borrowing can support market expansion, productivity, and overall GDP growth.

Sapkota (2023) found that from 1990–2021, internal debt reduced Nepal's long-run growth, while external debt had a positive and significant impact in both the short and long run, consistently supporting economic expansion.

Gurung and Rijal (2023) found that in Nepal (1975–2022), external debt and GDP had a bidirectional short-run causal relationship, while internal debt showed no causality. They also found no long-term co-integration, indicating external debt affects GDP only in the short term.

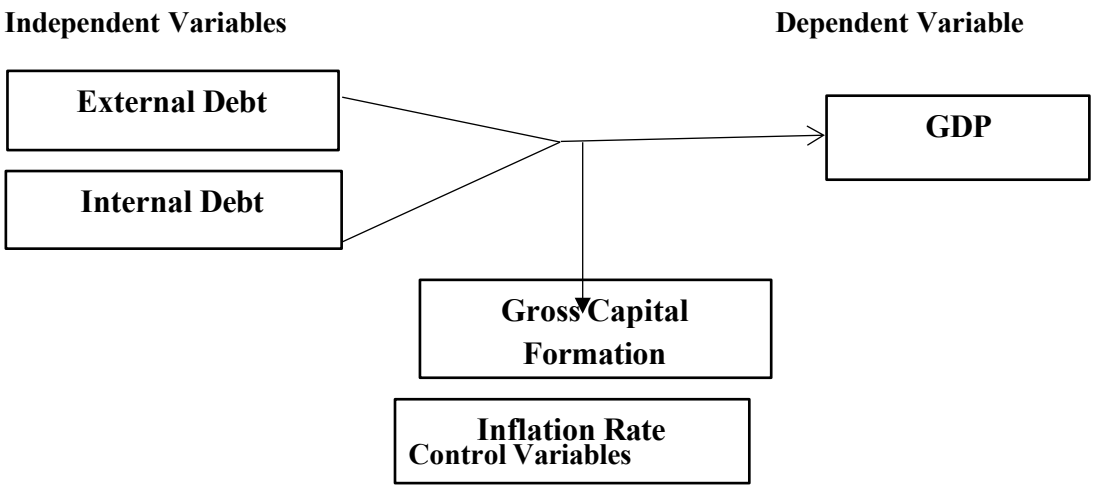
Upadhyaya and Pun (2022) applied a VAR model to test Granger causality between public debt and economic growth in Nepal (1978–2020). The results showed no statistically significant causal relationship, indicating that public debt does not directly drive economic growth.

Research Framework

A theoretical framework consists of concepts, and together with their definitions and reference to relevant scholarly literature that is used for the researcher's interested study. The theoretical framework for the proposed study is presented below:

Figure 1

Research Framework



Note. Adopted from Sapkota (2023)

Definitions of Variables

Gross Domestic Product (GDP)

GDP measures the total value of goods and services produced in a country and reflects overall economic performance. This study examines how Nepal's GDP is affected by external and internal public debt, inflation, and investment. While well-used public debt can support growth through productive spending, excessive and unsustainable debt can create instability, reduce investment, and slow economic progress.

External Debt

External debt is the money Nepal borrows from foreign lenders to support development and infrastructure projects. Studies show mixed results: some (Adhikari, Akhanolu, Sapkota, Thao) find that external debt can support economic growth when used wisely and invested in productive sectors. Others (Madhuhansi & Shantha, Rawat) warn that too much external debt can create a debt overhang, reduce investment, and harm growth. Overall, the impact of external debt depends on proper management and efficient use.

Internal Debt

Internal debt is the money the Nepalese government borrows from domestic banks, institutions, and the public. While it can support economic growth when used moderately, excessive internal borrowing may raise interest rates, crowd out private investment, and slow the economy. Studies show mixed results: some find a positive impact on GDP, while others like Sapkota (2023) report weak or negative long-term effects.

Control Variables

Inflation Rate

Inflation measures how quickly prices rise over time. Moderate inflation can signal economic growth, while high inflation often linked to excessive borrowing reduces purchasing power and discourages investment. Many studies find that higher inflation slows GDP growth, though others report insignificant effects, sug[illegible] inflation's impact depends on overall economic stability and effective monetary policy.

Gross Capital Formation (GCF)

Gross capital formation (GCF) involves investments in physical assets like infrastructure and machinery, boosting a nation's productive capacity and growth. Public borrowing can support GCF, but excessive debt without returns may harm fiscal stability. Studies (Shrestha, 2023; Adhikari & Gajurel, 2020) show a strong positive link between GCF and GDP, highlighting the importance of efficient and sustainable investment for long-term economic development.

Research Methodology

This study uses a descriptive and causal-comparative research design to examine relationships between variables. It analyzes 35 years of annual data (1990–2024) using purposive sampling based on data availability and reliability. Secondary data were sourced from public and open-access platforms, including the World Bank, Nepal Rastra Bank, IMF, and Nepal's National Planning Commission.

Correlation Analysis

Correlation analysis is the statistical tools that can be used to describe the degree to which one variable is linearly related to another. In this study, correlation coefficient is used to determine the relationship between different factors. It is denoted by r. symbolically,

$$r = \frac{\mathrm{Cov}(X, Y)}{\sigma X . \sigma Y}$$

r is the Pearson correlation coefficient.
Cov (X, Y) is the covariance between variables X and Y.
σ x is the standard deviation of X.

σ y is the standard deviation of Y.

Augmented Dickey-Fuller (ADF) Test

The Augmented Dickey-Fuller (ADF) test checks if a time series is stationary or has a unit root. If the test statistic is more negative than the critical value, the series is stationary; otherwise, it is non-stationary. It helps determine if differencing or transformations are needed for further analysis.

VAR Lag Order Selection Criteria

VAR lag order selection criteria help determine the optimal number of lagged observations to include in a Vector Autoregression (VAR) model. Choosing the appropriate lag length is crucial to capture dynamic relationships among variables without overfitting. Common criteria include the Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC or BIC), Hannan-Quinn Criterion (HQ), and Final Prediction Error (FPE). Typically, the optimal lag length minimizes these criteria, ensuring the VAR model represents the data dynamics efficiently and reliably.

Autoregressive Distributed Lag (ARDL) Model

The ARDL model analyzes short- and long-run relationships in time series, handling variables of mixed integration orders (I(0) or I(1)). Using lagged values, it captures dynamics, tests for long-run equilibrium via bounds testing, and estimates both long- and short-run effects, making it efficient for small samples.

ARDL Bounds Test for Co-integration

The Bounds Test in ARDL checks for long-run equilibrium among variables (I(0) or I(1)) using an F-statistic. If the statistic exceeds the upper bound, co-integration exists; below the lower bound, it does not; in between, results are inconclusive. It avoids the need for pre-testing unit roots.

Breusch-Godfrey Serial Correlation LM Test

The Breusch-Godfrey LM test detects serial correlation in regression residuals, including higher-order autocorrelation. A significant LM statistic indicates serial correlation, which can affect the reliability of estimates and inference.

Ramsey RESET (Regression Equation Specification Error Test)

The Ramsey RESET test checks for model misspecification, such as omitted variables or neglected nonlinear relationships. It adds powers of predicted values (e.g., squared or cubic terms) to the regression and tests their joint significance. If significant, it indicates model misspecification, suggesting the need to include missing variables, interactions, or nonlinear effects. Passing the test indicates that the model is correctly specified.

Model Specification

To analyze the effect of public debt on Nepal's economic growth, the model can be expressed as applied by Mbah et al. (2016) and Kharusi and Ada (2018). The functional form of the model is converted into a linear or multiple regression equation to estimate the effect of independent variables on GDP.

$GDP_t=\beta_0 +\beta_1 D_t +\beta_2 ED_t +\beta_3 GCF_t +\beta_4 INF_t + \epsilon_t$

Where

GDP = Growth rate of real gross domestic product

ID = Growth rate of internal debt

ED = Growth rate of external debt

GCF = Growth rate of gross capital formation

INF= Inflation rate

β_0 = Constant term (intercept).
β_1, β_2, β_3, β_4 = Coefficients representing the impact of each independent variable on
ε_t = Error term representing unobserved factors influencing GDP.

Results and Discussion

Table 1

Augmented Dickey-Fuller (ADF) Unit Root Test Results
Null Hypothesis: The Variable has a Unit Root

Variable	Test Specification	t-Statistic
At Level		
GDP_GR	With Constant	-5.6733**
	With Constant & Trend	-5.9199**
	Without Constant & Trend	-1.1867
ED	With Constant	-2.3507
	With Constant & Trend	-1.9921
	Without Constant & Trend	-2.2*
ID	With Constant	-1.6342
	With Constant & Trend	-3.1001
	Without Constant & Trend	-0.47
INFR	With Constant	-5.2861**
	With Constant & Trend	-5.0995**
	Without Constant & Trend	-1.5273
GFCGR	With Constant	-5.7298**
	With Constant & Trend	-5.6754**
	Without Constant & Trend	-5.4588**
At First Difference		
d(GDP_GR)	With Constant	-6.5884**
	With Constant & Trend	-6.4228**
	Without Constant & Trend	-6.5466**
d(ED)	With Constant	-5.4627**
	With Constant & Trend	-5.5206**
	Without Constant & Trend	-5.3909**
d(ID)	With Constant	-7.9213**
	With Constant & Trend	-8.2011**
	Without Constant & Trend	-8.038**
d(INFR)	With Constant	-2.4768
	With Constant & Trend	-8.6068**
	Without Constant & Trend	-2.5712*
d(GFCGR)	With Constant	-5.6474**
	With Constant & Trend	-5.5857**
	Without Constant & Trend	-5.7097**

Note. **. Correlation is significant at the 0.01 level (2-tailed), *. Correlation is significant at the 0.05 level (2-tailed), Lag length selection based on Schwarz Information Criterion (SIC).

The ADF test shows that GDP growth and GFCGR are stationary at levels (I(0)), while external and internal debt are stationary after first differencing (I(1)); inflation is trend-stationary. None are I(2), making the ARDL approach suitable. ARDL efficiently handles mixed I(0) and I(1) variables, allowing simultaneous estimation of short- and long-run effects of debt, capital formation, and inflation on Nepal's GDP, while capturing dynamic and delayed impacts accurately.

Table 2

Descriptive Statistics of Variables (1990–2024)

Statistic	GDP_GR	ED	ID	GFCGR	INFR
Mean	4.188	2.469	2.467	6.748	7.525
Median	4.258	2.144	1.864	9.108	7.740
Maximum	7.899	5.763	5.967	45.473	21.054
Minimum	-2.100	0.706	0.867	-28.850	2.435
Standard Deviation	2.026	1.451	1.551	14.034	3.480
Skewness	-0.776	0.562	0.967	-0.047	1.544
Kurtosis	4.467	2.145	2.699	3.968	7.605
Jarque–Bera	6.649	2.912	5.582	1.380	44.836
Probability (JB)	0.036	0.233	0.061	0.502	0.000
Observations	35	35	35	35	35

Table 2 presents descriptive statistics for GDP growth, external debt, interest rate, gross capital formation, and inflation (1990–2024). Nepal's average GDP growth was 4.19% and inflation 7.53%. GFCGR showed high variability (SD = 14.03) with extreme values, while most variables were positively skewed. GDP growth and inflation were non-normally distributed.

Table 3

Correlation Matrix with p-values (1990–2024)

Variables	GDP_GR	ED	ID	GFCGR	INFR
GDP_GR	1.000				
ED	0.173	1.000			
ID	-0.206	-0.017	1.000		
GFCGR	0.624**	-0.171	-0.178	1.000	
INFR	0.015	0.211	-0.233	-0.141	1.000

Note. **. Correlation is significant at the 0.01 level (2-tailed)

Table 3 shows correlations: GDP growth is strongly and positively linked to government spending ($r = 0.624$, $p < 0.01$), while correlations with external debt, internal debt, and inflation are weak and insignificant. Government expenditure emerges as the key variable associated with GDP growth.

Table 4

VAR Lag Order Selection Criteria for the Model with Endogenous Variables: GDP_GR, ED, ID, GFCGR, INFR (1990–2024)

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-393.4648	NA	21164.730	24.1494	24.3761	24.2257
1	-322.6171	115.933	1341.827	21.3707	22.7312	21.8285

Lag	LogL	LR	FPE	AIC	SC	HQ
2	-294.5244	37.457	1244.280	21.1833	23.6775	22.0225

Note. LogL = Log-likelihood; LR = Likelihood Ratio Test; FPE = Final Prediction Error; AIC = Akaike Information Criterion; SC = Schwarz Criterion; HQ = Hannan–Quinn Criterion.

Based on the conventional criteria (AIC, FPE, and HQ), lag 2 is selected as the optimal lag length, as it minimizes most information criteria and balances model complexity with explanatory power. Selecting an appropriate lag ensures the VAR model captures dynamic interactions among the variables without overfitting or losing degrees of freedom.

Table 5

ARDL Model Results for the Dependent Variable: GDP_GR (1992–2024)

Variable	Coefficient	Std. Error	t-Statistic
GDP_GR(-1)	-0.523	0.135	-3.879**
GDP_GR(-2)	-0.202	0.104	-1.956
ED	0.826	0.325	2.538*
ED(-1)	0.229	0.421	0.545
ED(-2)	-0.694	0.304	-2.279*
ID	-1.236	0.243	-5.085**
ID(-1)	1.183	0.229	5.159**
GFCGR	0.052	0.016	3.163*
GFCGR(-1)	0.061	0.020	3.124**
INFR	-0.106	0.061	-1.736
INFR(-1)	-0.027	0.064	-0.427
INFR(-2)	0.183	0.060	3.035*
C (constant)	5.394	1.065	5.067**

Note. ** indicate coefficient is significant at 0.01, * indicate coefficient is significant at 0.05,

Table 5 shows the full ARDL model for GDP growth, capturing both short-term changes and lagged effects. External debt positively impacts GDP in the short run, while internal debt reduces it initially but shows delayed positive effects. Government spending and inflation also influence growth through both immediate and lagged effects.

Table 6

Model Summary

Statistic	Value
R-squared	0.868
Adjusted R-squared	0.789
Standard Error (S.E.)	0.939
F-statistic	10.974
Prob (F-statistic)	0.000
Akaike Info Criterion	2.999
Schwarz Criterion	3.588
Hannan–Quinn Criterion	3.197

Statistic	Value
Durbin–Watson Statistic	1.529

Note. Lag selection was based on Akaike Information Criterion (AIC). Model selected: ARDL (2, 2, 1, 1,2).
Endogenous variables: GDP_GR, ED, ID, GFCGR, INFR. Exogenous variable: C (constant).
P-values < 0.10 are considered statistically significant.
Table 6 presents the ARDL model summary. The R-squared value of 0.868 indicates that 86.8% of the variation in GDP growth is explained by the model. The model is statistically significant (F = 10.974, p < 0.001), suggesting that the selected regressors jointly influence GDP growth. The Durbin–Watson statistic of 1.529 indicates mild positive autocorrelation in the residuals.

Table 7
ARDL Long Run Form and Bounds Test Results
Dependent Variable: Δ(GDP_GR)
Model: ARDL(2,2,1,1,2); Sample: 1990–2024 (n = 33)

Variable	Coefficient	Std. Error	t-Statistic
C	5.3944	1.0646	5.067**
GDP_GR(-1)	-1.7250	0.1938	-8.903**
ED(-1)	0.3611	0.1575	2.292*
ID(-1)	-0.0528	0.1280	-0.412
GFCGR(-1)	0.1131	0.0232	4.884**
INFR(-1)	0.0501	0.0703	0.713
Δ(GDP_GR(-1))	0.2024	0.1035	1.956
Δ(ED)	0.8256	0.3253	2.538*
Δ(ED(-1))	0.6938	0.3044	2.279*
Δ(ID)	-1.2363	0.2431	-5.085**
Δ(GFCGR)	0.0520	0.0165	3.163**
Δ(INFR)	-0.1059	0.0610	-1.736
Δ(INFR(-1))	-0.1834	0.0604	-3.035**

Note. ** indicates significance at the 1% level and * at the 5% level.

Table 7 shows ARDL short-run dynamics: increases in external debt boost GDP, while internal debt and inflation reduce it. Lagged effects capture delayed responses. The error correction term confirms adjustment toward long-run equilibrium, highlighting cointegration and the positive role of external debt and investment, alongside short-term drawbacks of internal debt and inflation.

Table 8
Levels Equation (Long-Run Coefficients)

Variable	Coefficient	Std. Error	t-Statistic
ED	0.2093	0.0836	2.505*
ID	-0.0306	0.0731	-0.419
GFCGR	0.0655	0.0151	4.333**
INFR	0.0291	0.0409	0.710
C	3.1271	0.4312	7.253**

Note. ** indicates significance at the 1% level and * at the 5% level.

Table 8 shows ARDL long-run results: external debt positively and significantly boosts GDP, internal debt has an insignificant negative effect, and gross fixed capital formation strongly supports sustained economic growth.

Bounds Test for Cointegration

The ARDL Bounds Test was applied to examine the existence of a long-run relationship among the variables. The F-statistic is compared with critical bounds values (Pesaran et al., 2001) to determine cointegration.

Table 9

Bounds Test for Cointegration

Test Statistic	Value
F-statistic	18.6466
k (number of regressors)	4

The F-statistic = 18.6466 is greater than the upper bound critical value at the 1%, 5%, and 10% significance levels (based on Pesaran et al., 2001), indicating the presence of a long-run cointegration relationship among the variables. This result confirms that the variables share a stable equilibrium in the long run, validating the use of an ARDL long-run model.

Table 10

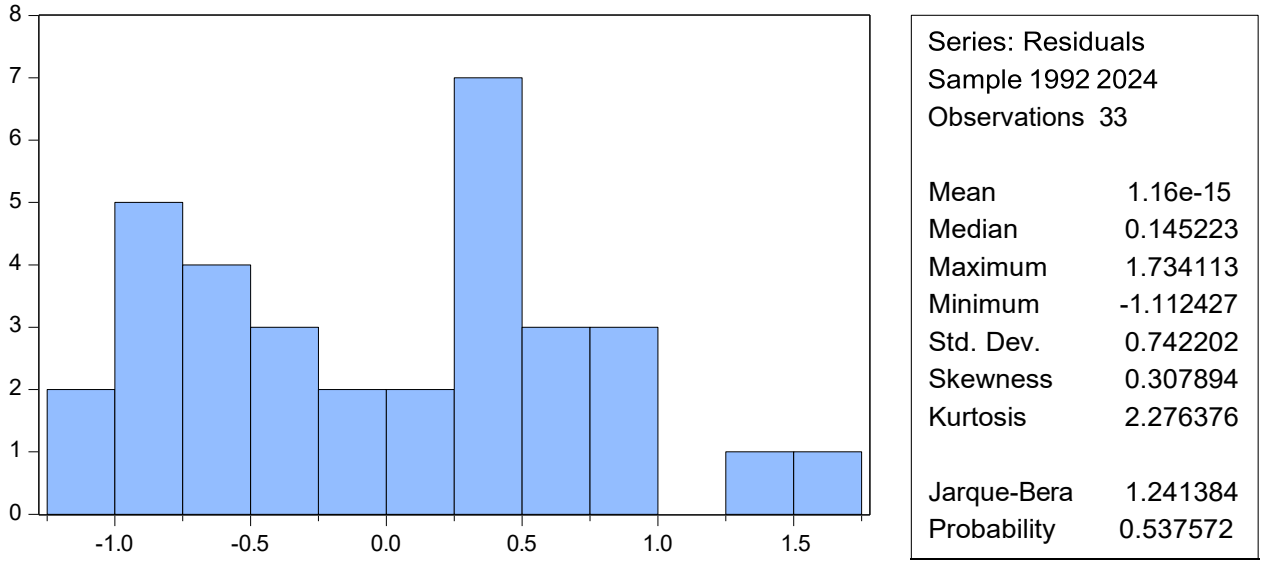
ARDL Error Correction Regression Table

Variable	Coefficient	Meaning (Effect on GDP Growth)	p-value
D(GDP_GR(-1))	0.2024	Past GDP growth positively affects current growth	0.01
D(ED)	0.8256	Increase in current external debt boosts GDP growth	0.00
D(ED(-1))	0.6938	External debt from last year also boosts GDP growth	0.02
D(ID)	-1.2363	Higher interest rates reduce GDP growth	0.00
D(GFCGR)	0.0520	Increase in govt. spending helps increase growth	0.00
D(INFR)	-0.1059	Current inflation reduces GDP growth	0.04
D(INFR(-1))	-0.1834	Past inflation has even stronger negative effect	0.00
CointEq(-1)*	-1.7250	Speed of returning to long-run equilibrium (very fast)	0.00
R-squared	0.9450	94.5% of changes in GDP explained by this model	
Durbin-Watson	1.53	No serious autocorrelation in residuals	

Table 10 shows ARDL short-run results: external debt boosts GDP, while internal debt and inflation reduce it. Government spending positively impacts growth. The significant negative error correction term indicates rapid adjustment to long-run equilibrium. The model explains 94.5% of short-term GDP variation with no serious autocorrelation.

Figure 2

Histogram and statistics table



The histogram and statistics show that the regression residuals are centered around zero, fairly symmetrical, and roughly normally distributed. The Jarque-Bera test (p = 0.54) confirms no significant deviation from normality, indicating the model fits the data well and meets normality assumptions.

Diagnostic Tests

Diagnostic tests were carried out to ensure the validity and robustness of the ARDL model. These included the Breusch-Godfrey serial correlation test, the Ramsey RESET test for model specification, and the CUSUM and CUSUM of Squares tests for parameter stability.

Breusch-Godfrey Serial Correlation LM Test

An ARDL regression was conducted with 33 observations from 1992 to 2024. The Breusch-Godfrey test was used to check for serial correlation up to lag 2.

Table 11

Breusch-Godfrey Serial Correlation LM Test

Test Statistic	Value	df	p-value
F-statistic	0.94	(2, 18)	.41
Obs*R-squared (Chi-square)	3.13	2	.21

Model summary statistics:

- R^2=0.09, Adjusted R2=−0.61
- Standard Error of Regression = 0.94
- Durbin-Watson statistic = 1.90
- F(14, 18) = 0.13, p=.9998

The Breusch–Godfrey Serial Correlation LM test was conducted to check for autocorrelation in the regression residuals. The results (F (2, 18) = 0.94, p = 0.41; ObsR^2 = 3.13, p = 0.21) indicate that the null hypothesis of no serial correlation cannot be rejected. Similarly, the coefficients of lagged residuals (p > 0.05) were insignificant, and the Durbin Watson statistic (1.90) was close to 2, further confirming the absence of serial correlation. Thus, the regression model does not suffer from serial correlation issues.

Ramsey RESET Test for Model Specification

The Ramsey Regression Equation Specification Error Test (RESET) was conducted to check for omitted variable bias and model misspecification by including the squared fitted values of the dependent variable as an additional regressor.

Table 12

Ramsey RESET Test for Model Specification

Test Statistic	Value	df	p-value
t-statistic	2.10	19	.0495
F-statistic	4.40	(1, 19)	.0495

Model Fit Statistics

- R^2=0.89, Adjusted R^2=0.82
- Standard Error of Regression = 0.87
- F(13, 19) = 12.19, p<.0001
- Durbin-Watson statistic = 2.01
- Akaike Information Criterion (AIC) = 2.85
- Schwarz Criterion (SC) = 3.49
- Log Likelihood = -33.04

The Ramsey RESET test results indicate potential functional form misspecification in the ARDL model. Both the t-statistic (2.10, p = 0.0495) and F-statistic (4.40, p = 0.0495) are significant at the 5% level, leading to the rejection of the null hypothesis that the model is correctly specified. Additionally, the significance of the squared fitted values points to possible nonlinearities or omitted variables. Despite a strong overall model fit (R^2 = 0.89, Adjusted R^2 = 0.82) and a Durbin-Watson statistic of 2.01, indicating no autocorrelation, the RESET results suggest that the model may benefit from functional adjustments, such as incorporating nonlinear or interaction terms, to enhance robustness and accuracy.

Stability Diagnostic: CUSUM Test

The stability of the ARDL model coefficients was examined using the CUSUM and CUSUM of Squares (CUSUMSQ) tests. The plots in Figures 1 and 2 show that both statistics remain within the 5% significance limits throughout the study period, indicating that the model's parameters are stable over time. This confirms that the short-run and long-run estimates obtained from the ARDL analysis are structurally reliable.

Figure 3

CUSUM Test Plot

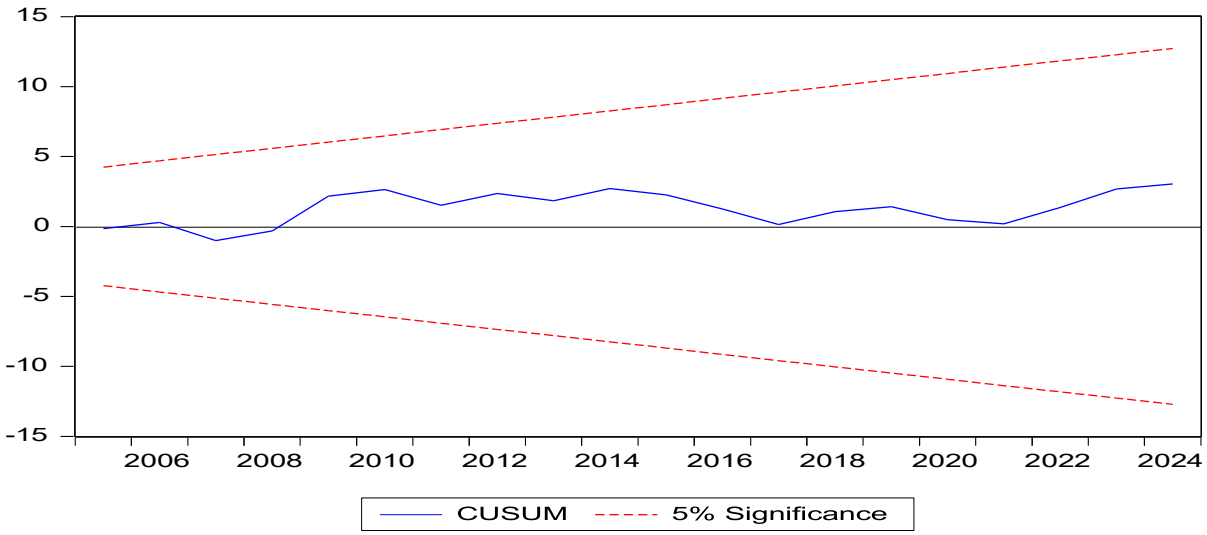
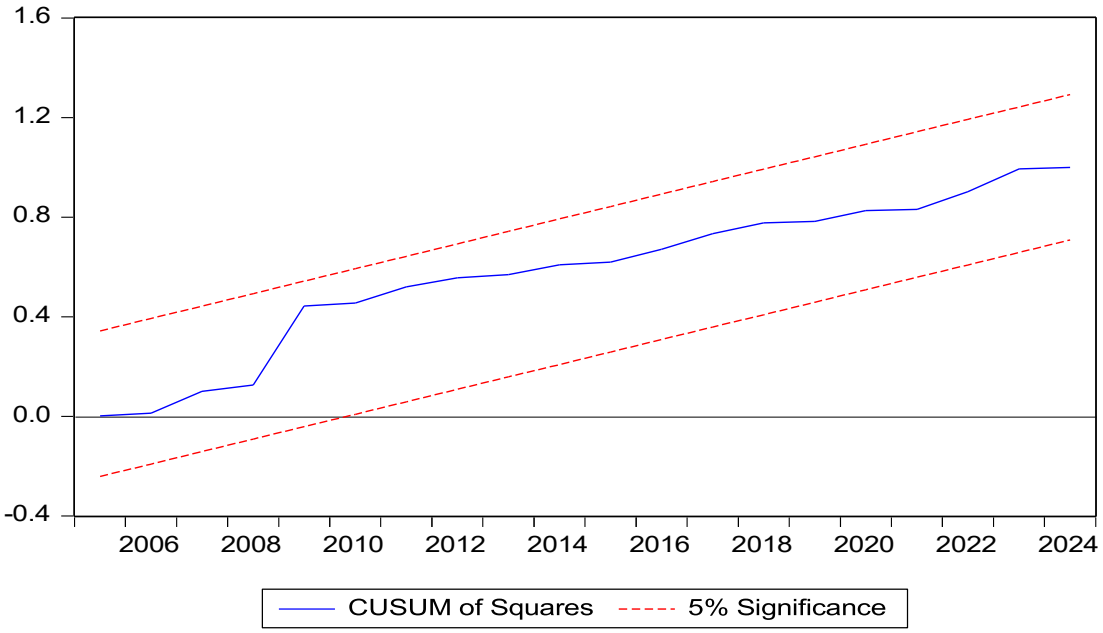


Figure 2
CUSUM of Squares (CUSUMSQ) Test Plot



Major Findings of the Study

External Debt Effects on GDP Growth

- Short-run Impact: External debt exerts a strong and positive immediate effect on GDP growth, with a coefficient of 0.8256 and a p-value of 0.0196, indicating that increases in external borrowing significantly boost economic activity in the short term.
- Lagged Short-run Impact: The positive effects of external debt extend into subsequent periods, as reflected by a significant coefficient of 0.6938 (p = 0.0338) for lagged external debt. This suggests that the benefits of external borrowing persist beyond the initial period.
- Long-run Impact: Over the long term, external debt continues to positively influence GDP growth, with a coefficient of 0.2093 (p = 0.0210), highlighting that sustained external borrowing contributes to ongoing economic development in Nepal.

Internal Debt Effects on GDP Growth

- Short-run Impact: Internal debt has a significant negative impact on GDP growth, with a coefficient of -1.2363 and a p-value of 0.0001, indicating that increased domestic borrowing tends to constrain economic growth in the short term.
- Long-run Impact: The long-term effect of internal debt is negative but statistically insignificant (coefficient = -0.0306, p = 0.68), suggesting that internal borrowing does not have a meaningful impact on GDP growth over time.

Gross Fixed Capital Formation (GFCFR) Effects on GDP Growth

- Short-run Impact: Investment has a positive and statistically significant effect on GDP growth in the short term, with a coefficient of 0.0520 (p = 0.0049), indicating that immediate increases in investment enhance economic activity.
- Long-run Impact: In the long term, the effect remains positive and significant (coefficient = 0.0655, p = 0.0003), confirming that sustained investment contributes to long-term economic growth.

Inflation Effects on GDP Growth

- Current Inflation (Short-run): The short-term effect of current inflation is negative (-0.1059) but only marginally insignificant (p = 0.098), suggesting weak evidence that inflation immediately reduces GDP growth.
- Lagged Inflation: Inflation from the previous period has a significant negative impact on current GDP growth, with a coefficient of -0.1834 (p = 0.0065), indicating delayed adverse effects of inflation on economic performance.
- Long-run Impact: The long-term coefficient for inflation is positive (0.0291) but statistically insignificant (p = 0.486), implying that the relationship between inflation and GDP growth over the long run is unclear or negligible.

Hypothesis Testing

- H1: External debt has a significant effect on GDP growth in Nepal. The results strongly support this hypothesis. Both short-run and long-run coefficients for external debt are positive and statistically significant, confirming that external borrowing plays a vital role in driving economic growth. H1 is accepted.
- H2: Internal debt has a significant effect on GDP growth in Nepal. The findings partially support this hypothesis. Internal debt negatively affects GDP growth in the short run but has an insignificant long-term effect, suggesting that its influence is mainly short-term and contractionary. H2 is partially accepted.

Conclusion

The study finds that external debt boosts Nepal's GDP in the short and long term, while internal negatively affects short-term growth but has an insignificant long-term impact. Gross capital formation strongly supports GDP growth, and past inflation negatively affects growth, highlighting the need for investment and price stability.

Implication

Based on the results and conclusions, the study has several important practical and policy implications for regulators, and stakeholders:

- External debt positively supports Nepal's growth, indicating its strategic use for productive investments. The short-term negative impact of internal debt calls for careful management, with policymakers prioritizing growth-oriented external borrowing and keeping domestic debt sustainable.
- The strong positive role of gross fixed capital formation in both the short and long run highlights the importance of policies that encourage investment in infrastructure, machinery, and productive capacity. Facilitating a conducive environment for investment will be vital to sustain and accelerate economic growth.
- The significant adverse effect of lagged inflation on economic growth, maintaining low and stable inflation should remain a key macroeconomic objective. Policymakers need to implement effective monetary policies that prevent inflation from rising to levels that could hamper growth in the future.
- The differing effects of internal and external debt in the short and long run indicate the importance of managing not just the amount but also the composition and maturity profile of public debt. A balanced approach can help maximize growth benefits while minimizing risks associated with debt servicing and economic volatility.

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