

# **Determinants of Inflation in Nepal**

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## **Abstract**

*In the context of Nepal, this study investigates the long- and short-term factors that affect inflation with monthly time series data of fiscal year 2016/17 to 2021/22 (72 observations) employing the ARDL bounds test and error correction technique of econometric analysis. In order to identify the order of integration, the stationary of all variables were investigated by running PP test. Variables are found to be stationary at level I (0) and first I(1) difference. In this study Consumer Price Index (CPI) is the dependent variable and Interest Rate (IR), Broad Money Supply (M<sub>2</sub>), Government Expenditure (GE) and Consumer Price Index of India (CPII) are the independent variables. The study shown that government expenditure is most significant determinant of inflation in the long-run followed by interest rate. This study has also shown that inflation is negatively related to broad money supply and government expenditure with high significant whereas interest rate and CPI of India are positively significant with inflation in short run. These results suggest that controlling government expenditure and interest rate are key to the success of the disinflation effort in Nepal and could be used as an intermediate target variable in the conduct of fiscal policy and monetary policy by the government of Nepal and the Nepal Rastra Bank Respectively.*

**Key Words:** Inflation, Money Supply, Determinant, Nepal, Government Expenditure

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## **I. Introduction**

Inflation refers to a significant thought in the history of economic theory and is used to describe a persistent increase in the general level of prices, such as those for goods and services, which reduces the purchasing power of a given currency. High inflation is detrimental to the economy and has a negative impact on economic performance. The decisions consumers and investors make can be distorted by inflation, even at moderate levels. Reduced output and greater unemployment rates are two additional costs of lowering inflation. It might be difficult to quantify how inflation affects social and economic outcomes, but high rates of inflation are commonly acknowledged to be bad for any economy. Because of this, reducing inflation is one of the government's top priorities for preserving a strong economy. Therefore, the monetary authority must identify and evaluate the causes and determinants of inflation. When cause and determinants are precisely understood, controlling inflation becomes considerably simpler. Inflation due to expansionary monetary or fiscal policy can be referred as demand pull inflation whereas if it is due to rise in wages or profits can be referred as cost push inflation.

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There are different theories in economic literature to explain the determinants of inflation. Some authors claim structure of economy as the determinants of inflation (Sunkel, 1960, Olivera, 1964, Maynard 1961). Monetarist authors blame increase in money supply as the root cause of the inflation (Friedman 1970, Schwartz 1973). On the other hand inflation is due to increase in costs (Machlup 1960).

Though there are earlier empirical studies on inflation in Nepal (Joshi, 2021; Chaudhary & Xiumin, 2018), there is still room for more empirical research on Nepal's inflationary factors. First, earlier studies have taken less number of observation of yearly data. In case where an attempt has been made to analysis determinants of inflation in Nepal (Chaudhary & Xiumin, 2018) by using ordinary least square regression model for times series data. However, ARDL Bounds test is used for cointegration test of effect of Money Supply on Inflation in Nepal (Joshi, 2021), author used yearly 54 observation with only one independent variables. The reliability of these estimates in determinants of inflation in Nepal is doubtful and their policy relevance is in disrepute. In the current study, these issues are addressed. This paper uses modern econometrics models to identify the key determinants of inflation in Nepal using the most current monthly time series data covering the period fiscal year 2016/17 to 2021/22. This studies applies cointegration and error correction technique based on the autoregressive distributed lag (ARDL) approach to cointegration to estimate both the long and short run multipliers of the key determinants of Nepalese inflation. Further, we augment our model with weighted average lending rate, broad money supply, government expenditure and consumer price index of India. Imports from India accounts for around 63.10% for the fiscal year 2021/22 (NRB 2022) of total imports of Nepal hence its expected impact on Nepalese inflation is positive. Therefore, consumer price index of India is also taken as the dependent variables. The primary objective of this study is to examine the effect of determinants of inflation in Nepal.

The rest of the paper is structured as follows. Brief review of the literature is undertaken in Section II, Section III Research methodology, Results and analysis Section IV, Discussion Section V, Conclusion and Implication are taken in Section VI.

## II. Theoretical Framework

### Empirical Reviews

Moser (1994) Study variables affecting inflation in Nigeria. Based on the conditions of the money market equilibrium, an error correction model of the inflation process is created. The findings support that the inflationary process in Nigeria is mostly explained by monetary growth, which is primarily caused by expansionary fiscal policy.

Khan & Gill (2010) focuses on the factors that influence long-term inflation in Pakistan utilizing the four price indicators CPI, WPI, SPI, and GDP Deflator (time period of 1971-72 to 2005-06). It has been determined that the depreciation of the currency rate and the rise in the cost of imports are to blame for the sharp increases in the CPI, WPI, SPI, and GDP deflator. The expectation impact has also benefited all of the indices. Contrary to popular belief, budget deficits do not, over time, increase any of Pakistan's four inflation indicators. This contradicts the widespread belief that budget deficits cause inflation.

Adu & Marbuah (2011) analyzed using the bounds test and other econometric methods of the variables influencing the dynamics of inflation in Ghana. Real production, nominal exchange rate, broad money supply, nominal interest rate, and fiscal deficit, according to authors, are key factors in Ghana's inflationary process. Targeting supply-side limitations will assist in reducing price inflation to the extent that output growth has the greatest influence on inflation by far.

Nguyen et al. (2012) examines the factors that caused CPI inflation in Vietnam from 2001 to 2009 using a straightforward macroeconomic inflation model. Researchers conclude that inflation is persistent and that the money supply, oil prices, and rice prices have the biggest effects on CPI inflation. These findings are based on a variety of time series estimate methodologies.

Ayub et al. (2014) investigate the causal relationship between Pakistan's inflation rate and its nominal interest rate. It is discovered that there is a long-term equilibrium link between Pakistan's inflation and nominal interest rate over the years 1973 to 2010.

Nwachukwu et al. (2014) investigated the "Error Correction Model Analysis of Determinants Inflation Rate in Nigeria" for the years 1970 to 2013. VECM test revealed that inflation, Gross Domestic Product (GDP) and exchange rate are negatively related and positively related to broad money supply (M2) and domestic credit.

Chaudhary & Xiumin (2018) investigates the effects of macroeconomic factors on Nepal's inflation between 1975 and 2016. The analysis only takes into consideration the broad money supply, real GDP, and Indian prices. The findings imply that all variables taken into account are important over the long term, indicating that these variables are what determines inflation in Nepal. The outcomes are in line with monetary theory. According to an ordinary least square regression model, the money supply and Indian prices are the main causes of inflation in the long run.

Kandil & Morsy (2019) examines the internal and external factors that determine inflation in the GCC using an empirical model. The most important foreign element appears to be inflation in the major trading partners. Additionally, the increased use of credit and overall spending as a result of oil earnings have intensified inflationary pressures. Binding capacity limits also account for greater inflation in the short run in light of rising government spending. However, the rise in government expenditure is relieving capacity restrictions and will ultimately assist to curb price inflation by focusing on supply-side bottlenecks.

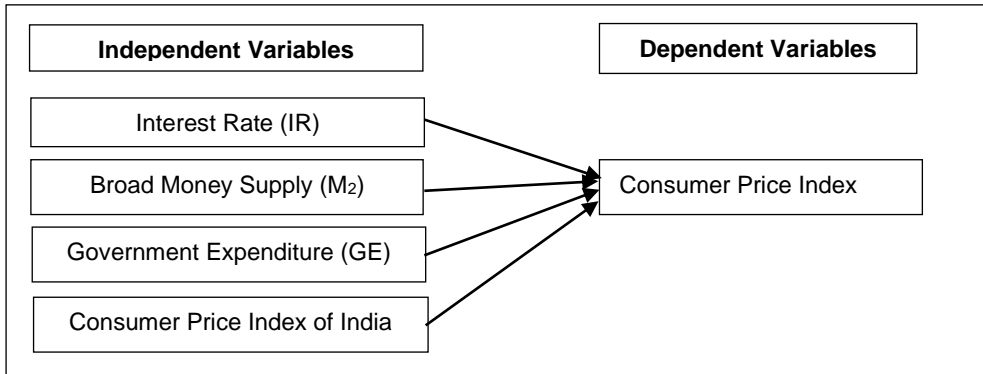
Iya & Aminu (2021) studied the causes of inflation in Nigeria between 1980 and 2012. Granger causality test was used to determine whether the relationship between inflation and the money supply, government spending, exchange rate, and interest rate was causal. Cointegration and vector error correction techniques were also used. The Johansen cointegration result demonstrates that inflation and independent variables had a long-term relationship. The vector error correction finding also supported the presence of a long-term link between the model's variables, with the only factors influencing interest rates being the money supply and exchange rate. According to the OLS findings, money supply and interest rates had a beneficial impact on inflation, while government expenditure and exchange rate influenced inflation negatively.

Joshi (2021) study the long- and short-term relationships between the money supply and inflation in the context of Nepal. The result indicates that the variables' long-run cointegration reveals a long-run link, and the error correction term is discovered to be adverse (-0.98) and significant ( $p=0.02$ ). The study proposes that decision-makers should concentrate on the control of inflation by implementing monetary and fiscal policy mechanisms in order to lessen the impact of the money supply on inflation. A slowing of inflation in the rate of economic growth is desirable, and a good reduction in inflation will contribute to national stability and development.

**Research Framework**

**Figure 1**

*Research Framework*



**III. Research Methodology**

In this study Consumer Price Index (CPI) is the dependent variable and Interest Rate (IR), Broad Money Supply (M<sub>2</sub>), Government Expenditure (GE) and Consumer Price Index of India (CPII) are the independent variables. The analysis used in this study cover monthly time series data of fiscal year 2016/17 to 2021/22 (72 observations) of Nepal. Data have been taken from annual Current Macro-Economic and Financial Situation of Nepal published by Rastra Bank (NRB). To establish the relationship between independent and dependent variables inflation function is used which is like this:

CPI = f (Interest rate, Broad money supply, Government expenditure, Consumer price index of India)

The function can also be represented in a log-linear econometric format thus:

$$CPI = \beta_0 + \beta_1 IR_t + \beta_2 \log(M_2)_t + \beta_3 \log(GE_t) + \beta_4 CPII_t + e_t$$

Where, CPI= Consumer Price Index

IR=Interest Rate

M<sub>2</sub>=Broad Money Supply

GE= Government Expenditure

CPII=Consumer Price Index of India

$\beta_0$  = Intercept

$\beta_1, \beta_2, \beta_3, \beta_4$ = coefficient of independent variables

$e_t$  = Error term

**IV. Results and Conclusion**

The sequence of integration of the data is investigated using the Philips-Perron (PP) unit root test prior to calculating the long-run and dynamic error correction inflation models.

**Unit Root Test**

A time series data is considered to be stationary if its mean and variance are invariant. Stationary is a crucial criteria for time series data. With the help of this test, the issue of spurious regression will be solved by looking at the order in which the data are integrated. PP unit root test has been applied to test stationary of the data as suggested by Phillips & Perron (1988).

**Table 1**

*Results of Unit Root Test*

Variables	Adj. t-Stat (At level)	Adj. t-Stat (At first difference)	Conclusion
CPI	1.0416 (0.9967)	-6.7089 (0.0000)	I (1)
IR	-1.6546 (0.4497)	-6.8690 (0.0000)	I (1)
LN <sub>M2</sub>	-0.7466 (0.8275)	-10.8335 (0.0001)	I (1)
LN <sub>GE</sub>	-6.3870 (0.0000)	-17.8569 (0.0001)	I (0)
CPII	1.6141 (0.9994)	-5.6921 (0.0000)	I (1)

(Numbers in the parenthesis are probability values.)

*Note:* Author's calculations from Eviews 12 SV, 2022

Table 1 clearly shows only government expenditure is stationary at level because P-value is less than 5% at level. Other all variables are stationarity at first difference because their p-value is less than 5% at first difference. Thus, we have a case of a mixed order of integration of variables I(1) and I(0) and so this support using the ARDL cointegration approach.

**Bounds Test for Cointegration Relationship**

Bounds testing strategy is employed suggested by Pesaran et al. (2001) within the ARDL framework to test for cointegration. One benefit of employing the ARDL bounds test is that it may be used independently of the stationarity characteristics, whether the regressors are exclusively I(0) or I(1), or whether they are mutually integrated.

**Table 2**

*Bounds Test for Cointegration Relationship*

	Critical value bounds of the F –statistic: intercept and no trend					
	99%		95%		90%	
K=4	I (0)	I (1)	I (0)	I (1)	I (0)	I (1)
	3.29	4.37	2.56	3.49	2.2	3.09
F Statistics	4.7309 (Cointegration)					

*Note:* Author's calculations from Eviews 12 SV, 2022

Table 2 presents results from the bounds test for cointegration between inflation and its determinants. Given that the calculated F-statistics exceed the upper bound critical values at either 1 or 5% significance levels, the results demonstrate the rejection of the null hypothesis that there is no cointegration when inflation is normalized in each of the estimated models. As a result, there is strong evidence that inflation and its covariates have a long-term steady state relationship. Therefore Interest Rate (IR), Broad Money Supply (M<sub>2</sub>), Government Expenditure (GE) and Consumer Price Index of India

(CPII) are long-run forcing determinants of inflation of Nepal.

**Table 3**

*Estimated Long-Run Inflation Models*

Variables	Coefficients	t-Statistics	Probability
IR	0.7518	2.9289	0.0051
LN <sub>M</sub> <sub>2</sub>	12.9933	1.6378	0.1076
LN <sub>GE</sub>	0.6381	3.8985	0.0003
CPII	-167.1886	94.5326	0.0829

*Note:* Dependent variable = CPI, ARDL (1,4,2,4,1) selected for Model

*Note:* Author's calculations from Eviews 12 SV, 2022

Government expenditure is by far the most significant determinant of inflation in the long-run followed by interest rate. A percentage point increase in interest rate and government expenditure, would increase inflation by about 0.7518% and 0.6381% respectively.

A number of diagnostic tests were used to guarantee the accuracy of the predicted parameters in the error correction model. Our findings demonstrate the absence of serial correlation, heteroskedastic errors, and non-normality of residual.

**Table 4**

*Results of Residual Diagnosis*

Particulars	F-stat	Observed R- square	P-value
BG serial correlation LM test	1.9683	56.1198	0.0802
Heteroscedasticity BPG test	1.3505	20.2371	0.2048
Normality JB test	-	-	0.3584

*Note:* Author's calculations from Eviews 12 SV, 2022

In table 4, The BG serial LM test shows that there are no serial correlations in the residuals because the observed R-square has a p-value of 0.0802, which is greater than 5% level of significance. Similar to this, the BPG test demonstrates homoscedastic residuals where the observed R square's p-value of 0.2048 is greater than 5% level of significance. Finally, the JB test demonstrates that the residuals are normally distributed, with a p-value of 0.3584

being more significant than 5% threshold. Table 5 displays the short-run outcomes calculated using the ARDL framework and its related diagnostic tests.

**Table 5**

*Error Correction Representation for the Selected Autoregressive Distributed Lag (ARDL) Model*

Variables	Coefficients	t-Statistics	Probability
$\Delta IR$	0.6787	2.4513	0.0177
$\Delta LNM_2$	-30.8246	-3.1972	0.0024
$\Delta LNGE$	-0.3182	-5.1084	0.0000
$\Delta CPII$	0.4144	4.9121	0.0000
$ECT_{t-1}$	-0.2543	-5.5829	0.0000
Model Summary			
R-Squared	0.7588		
Adjusted R-Squared	0.7114		
F-Stat.	15.5674		
P-Value	0.0000		
DW-Stat.	2.045		
AIC	1.8104		
SIC	2.2021		

*Note:* Dependent variable = CPI, ARDL (1,4,2,4,1) selected for Model

*Note:* Author's calculations from Eviews 12 SV, 2022

The F-statistic demonstrates a very good fit of the model, demonstrating its capacity for prediction. The high R-Squared values shows that 75.88% of the variations in inflation are explained by variations in the estimated determinants. The D-W test value exceeds R-square, indicating that there are no spurious variables in the regression model. Inflation is negatively related to broad money supply and government expenditure with highly significant whereas interest rate and CPI of India are positively significant with inflation in short run.

The findings also demonstrate that error correction factors have the correct sign (negative) and are statistically significant at the 1% level, demonstrating that long-term equilibrium may be reached after a system shock. The coefficient of  $ECT_{t-1}$  measures the adjustment speed of inflation to long-run equilibrium due to changes in the inflation covariates. Following a deviation from the long-run in the previous period, convergence to the steady state is corrected by 25.43% in the current year.

### Discussion

Government expenditure and interest rate are significant determinant of inflation in the long-run. The rate of inflation increases as government spending and interest rate increases. Positive relationship government expenditure and the rate of inflation on the other hand are consistent with economic theory, this result is consistent with empirical evidence Nwachukwu et al. (2014). Lowering of interest rates which leads to increased growth is likely to lead to a decline in the rate of inflation which is consistent with Adu & Marbuah (2011). Inflation is negative significant with broad money supply in short run, this result is inconsistent with Nwachukwu et al. (2014); Iya & Aminu (2021). Inflation is negative significant with government expenditure in short run, this result is consistent with some empirical evidence Iya & Aminu (2021). Whereas interest rate positively significant with inflation in short run and consistent with some other empirical results Ayub et al. (2014); Iya & Aminu (2021). CPI of India is also positively significant with inflation of Nepal in short run, Chaudhary & Xiumin (2018) also found the similar result.

### Conclusion and Implication

In this paper, cointegration and error correction methods were used to analyze the factors that influence inflation in Nepal. Results obtained using the ARDL method for cointegration it was proven that the significance of Interest Rate (IR), Broad Money Supply (M<sub>2</sub>), Government Expenditure (GE) and Consumer Price Index of India (CPII) in explaining inflation in Nepal. The role of interest rate and government expenditure is very important in explaining inflation in both the long-run and short-run. These results suggest that controlling government expenditure and interest rate are key to the success of the disinflation effort in Nepal and could be used as an intermediate target variable in the conduct of fiscal policy and monetary policy by the government of Nepal and the Nepal Rastra Bank respectively. Broad money supply and CPI of India has significant relationship with the inflation of Nepal. These findings imply that the short-term success of Nepal's disinflation strategy depends on managing monetary expansion and imports from India.

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