

Determinants of Inflation in NepalSubas Gautam¹

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Abstract

By establishing a monetary and financial environment in which markets may operate without being concerned about irregular changes in the purchasing power of money, long-term economic growth can be achieved. The major goals of this study were to look at the inflation fluctuations in Nepal, to display the weighted structure of the CPI there, and to investigate the factors that affect inflation. The stationarity of the time series data was examined using the ADF test, and the cointegration between the variables was examined using the Engle-Granger test. The OLS method was used to estimate the long-run model. For the model's short run dynamism, the ECM model was also used. Throughout the research years, the inflation tendency has experienced significant swings. . Inflation peaked at 132.8 million in the fiscal year 1920, and it peaked at 4.1 in the fiscal year 1975. The ADF test result reveals that all variables become stationary only after the first difference, or I (1), for all variables utilized in this investigation. The long run OLS model is free from spurious regression, according to the Engle-Granger cointegration test, which shows that variables are cointegrated. The long-run OLS model demonstrates that government spending and Indian inflation have a positive and considerable impact on Nepalese inflation. For instance, an increase of 1% in the Indian consumer price index, government spending, and the currency rate results in increases of 0.70, 0.12, and 0.16 percent in the NCPI, respectively. According to the results of the ECM model, government spending and the Indian consumer price index have a positive and considerable impact on the consumer price index in Nepal in the short term. When government spending and the Indian consumer price index both grow by 1%, the corresponding increases in Nepal's consumer price index are 0.69 and 0.13 percent, respectively. While in the near term, the exchange rate has little impact on the consumer price index for Nepal. The NCPI and other explanatory variables are convergent into long-run equilibrium, according to the coefficient of ECM (-1), which is negative and significant at the 1% level.

Keywords: Inflation, CPI, Economic growth, Consumer price,

Introduction

There is no universally accepted definition of inflation; rather, it is simply the increase in the average price level during a specific time period coupled with a decline in the purchasing power of money. The inflation rate between any two periods of time is calculated using the percentage increase in the relevant price index from the first to the second period.

High inflation makes long-term economic planning more challenging and motivates organizations and individuals to narrow their emphasis on the most fruitful pursuits and their time horizons in order to manage inflation risk (Bernanke, 2006). Rising inflation rates cause private business owners to cut back on investment, which ultimately hinders the growth of the economy as a whole. The legitimacy and purchasing power of money are, nevertheless, safeguarded by price stability. Economic growth and stability are anticipated to occur when prices are stable, and moderate long-term interest rates are predicted. Additionally, it fosters the effectiveness of market participants.

Long-term economic growth is attainable through creating a monetary and financial climate in which markets may function without being concerned about erratic changes in the purchasing power of money. Therefore, maintaining price stability should be the major goal of monetary policy. Batini and Pianalto (2005) inflation (or less frequently, price inflation) refers to a long-term general increase in the level of prices in a given economy. Each unit of currency purchases less goods and services when the general price level increases; as a result, inflation reflects a loss of real value in the medium of exchange and unit of account within the economy.

Numerous things could have an impact on inflation. Price levels, budget deficits, money supply, and real GDP have all been steadily increasing in Nepal for many years. This does not demonstrate that one causes the other, though. This study looks at how Nepal's inflation varies, how the consumer price index is weighted, and what influences inflation there.

In almost all economies, the consumer price index is the most frequently cited price index for gauging inflation in consumer goods. By definition, this index solely tracks changes in the prices of consumer products and services, not those that are utilized in manufacturing.

The achievement of a high economic growth rate with a reduced price level is one of the primary goals of macroeconomic strategies in both developed and developing nations. The primary goals of Nepal's monetary policy are to achieve high and sustained economic growth and low levels of inflation. But the nation is experiencing high levels of inflation and weak economic expansion. All economic operations are distorted by the presence of high inflation. The lowest income groups and pensioners who live on fixed incomes are directly impacted by high inflation rates. Similar to that, it also affects the production industry. The inflation rate in Nepal is unstable. High population density, low per capita earnings, and a sizable proportion of the population employed in agriculture are prominent characteristics that affect inflation in South Asian countries. Because of their reliance on imported capital, machinery, and oil, countries are more susceptible to supply shocks from trade and other sources. More so than business people, those with limited purchasing power, low income groups, and wage earners suffer; an increase in building prices also has a detrimental effect on economic expansion. The primary goal of the article is to analyze the determinants of inflation in Nepal in order to get knowledge of these factors.

Review of Literature

The views of classical economists including Jean Bodin, Richard Cantillon, John Locke, David Hume, Adam Smith, and William Petty on inflation was the steadily rising general price level. Through the development of Quantity Explanation, Irving Fisher, a renowned classical economist, was the first to develop a systematic theory of inflation known as the "classical theory of inflation."

Theory of Money. According to quantity theory,

$$MV = PT \dots (1)$$

According to the conventional presumptions, the short-run real output (T) and money velocity (V) are both given. Depending on the monetary policies “of the nation's” central bank, the money supply (M) can change. As a result, prices increase in direct proportion to the expansion of the money supply.

The above equation can be written as

$$P = \frac{MV}{T} \dots (2)$$

This merely indicates that there is a direct and positive correlation between the amount of money in circulation and the level of prices. According to the classical theory of inflation or quantity theory of money, inflation is a universally occurring financial phenomenon.

The Cambridge economists, commonly referred to as neo classical economists, created the neo classical theory of inflation. The Cambridge school proposed that inflation was caused by a rise in the demand for money. The quantity theory of money in Cambridge is given as:

$$M_D = KPQ$$

Where M_D = Demand for money

Q = real output

P = general price level and

K = the constant proportional of total income people want to hold in the form of money

The Cambridge equation yields the price level equation as

$$P = M_D / KQ$$

This equation suggests that, given K and Q, the general price level rises in direct proportion to the rise in the demand for money. Given the value of K, the rate of inflation can be calculated as follows. If K and Q are both variables, the rate of inflation depends on the difference between the rate of rise in money demand and the total of the rates of changes in K and Q.

$$P = m + r$$

Where,

P = rate of price rise,

m = rate of increase in money demand (M_D) And

r = rate of rise in real income or output (Q)

Keynes proposed the idea that rising aggregate demand is what drives inflation. However, according to Keynes, the aggregate demand may rise as a result of rising real factors such as rising consumer demand as a result of rising MPC, rising investment demand as a result of rising marginal efficiency of investment (MEI), and rising government spending. Even if there is a steady supply of money, such fluctuations could still occur. A demand supply gap known as a "inflationary gap" results from an increase in overall demand while overall supply remains steady. According to Keynes, when the overall demand for goods and services exceeds the total supply of output, an inflationary gap develops in the economy.

As we know that,

$$Y = C + I + G$$

Where,

Y= aggregate supply or national output/income

C= consumption expenditure

G = government expenditure

In order for an economy to run normally, income should be distributed and spent in such a way that total production costs, including profit and taxes, are equal to total output demand. When total demand for all purposes, including investment, consumption, and government spending outpaces the availability of goods at the going rate, prices rise. Keynes described inflation as a full employment event. Keynes divides inflation into two types: semi-inflation and real-inflation, with respect to full employment. According to him, generally increasing prices beyond the complete equilibrium are referred to as real inflation, whilst generally increasing prices below the whole equilibrium are referred to as semi-inflation.

John Muth developed the idea of rational expectations, and contemporary classical economists like Thomas J. Sargent and Robert E. Lucas have since added support to it. Economic agents create rational expectations based not only on previous data but also on any current and prior information that is relevant. The expectations, however, may be unrelated to one another. People anticipate that prices will increase if the monetary authority announces a monetary stimulus in advance.

Khatun and Ahamad (2012) looked into the key elements that affected inflationary trends in Bangladesh from FY 1981 to FY 2009. The short-run and long-run elasticity of the determinants of inflation have been determined using an unconstrained error correction model based on the Autoregressive Distributed Lag (ARDL) bounds F-test. The empirical findings showed that domestic rice production had a sizable negative short-run impact on inflation. On the other hand, domestic petroleum prices and the supply of broad money (M2) have a negligible but beneficial influence on inflationary tendencies. According to the analysis, the most important policy alternatives for reducing Bangladesh's inflationary pressure are improved domestic rice production and efficient fiscal-monetary integration.

By taking into account the dislike of inflation, optimal tax considerations, time consistency issues, distortionary non-inflationary policies, and other factors as significant determinants of inflation, Campillo and Miron (1996) examine the determinants of inflation across 62 countries from 1973 to 1994. The estimated standard error of the White (1980) method was employed by the authors using the Ordinary Least Squares (OLS) method. They discovered that whereas economic fundamentals like economic openness and efficient taxation are very important predictors of inflation, institutional issues like central bank independence and exchange rate mechanisms are comparatively less influential.

Using data from 1971 to 2014, Aydin (2017) examined how inflation affected economic growth for the Organization of Islamic Cooperation (D-8 countries: Bangladesh, Egypt, Indonesia, Iran, Malaysia, Nigeria, Pakistan, and Turkey). To make the usage of the GMM estimator valid and guarantee its consistency, the data set was produced by calculating the five-year averages of the variables utilized in the study. To determine the ideal inflation rate for the D-8 countries, the dynamic panel threshold model was utilized in the study. In this study, the

researcher used real GDP per capita growth as an independent variable and the inflation rate as the main explanatory factor. Population growth, gross capital formation as a percentage of GDP, and the lagged GDP per capita value are comparable variables.

Byanjanakr (2020) used time series data from 1975 to 2018 to examine the causes of inflation in Nepal. He used the ARDL approach to cointegration, where the price level is the dependent variable and the independent variables are Indian inflation, money supply (M2), government deficit, nominal exchange rate, and crude oil price. According to the report, the most important factor affecting inflation in Nepal is rising inflation in India. In a similar vein, both the exchange rate and the government deficit have long- and short-term positive effects on pricing. According to the study, a government deficit results in an expansion of the money supply, which puts pressure on prices. The report recommended developing a system for observing price development in the Indian market.

Gyanwaly (2012) used annual data from the years 1964 to 2011 to evaluate the direction of causation between money, price, and income in Asian nations including Nepal, India, Sri Lanka, Myanmar, and Korea. Using the traditional Granger F test and ECM models, the bivariate Granger causality test was run for both co-integrated and non-integrated variables. The study found that while the degree of endogeneity in terms of price and income variables marginally varies from one country to another, the money supply is an endogenous variable in all of them. Money affects both price and income, and it also receives feedback from either, or both, of these factors.

Methodology

The NCPI and other independent variables are examined over the long term using the OLS method, and the stationarity of the independent variables is tested using the Engle-Granger test. To evaluate the short-term associations between NCPI and other explanatory variables, the Error Correction Model (ECM) is used. The cointegration test is used to look at how well the variables are correlated. The study's data analysis employed both a descriptive and analytic approach. In order to assess the trend of inflation in Nepal and the weighted average of the CPI in Nepal, various graphs, tables, and figures will be used in the descriptive analysis of the data.

To analyze the data and discover the factors that influence inflation in Nepal, various econometric tools, including the ADF unit root test, Granger causality test, Breusch-Godfrey LM test for serial correlation, and OLS technique are utilized.

Augmented Dickey Fuller Test (ADF) This test was developed by Dickey and Fuller in 1970 and named after them as Dickey Fuller test. The Augmented Dickey- Fuller Test as follows:

The equation for no intercept and no trend is,

$$\Delta Y_t = \gamma Y_{t-1} + \sum_{k=1}^k c_k \Delta Y_{t-k} + e_t \dots \dots \dots (a)$$

The equation for only intercept and no trend is,

$$\Delta Y_t = \alpha + \gamma Y_{t-1} + \sum_{k=1}^k c_k \Delta Y_{t-k} + e_t \dots \dots \dots (b)$$

The equation for both intercept and trend is,

$$\Delta Y_t = \alpha + \gamma Y_{t-1} + \beta t + \sum_{k=1}^k c_k \Delta Y_{t-k} + e_t \dots \dots \dots (c)$$

Where $\Delta Y_t =$ First difference. If the series is stationarity without any differencing, it is said to be I (0) or integrated with order 0. Similarly, if the series is stationarity after a first difference is said to be I(1) or integrated of order 1.

This test is used to perform the cointegration between the variables when the variables are non- stationarity at level but stationarity at first difference. Engle and Granger (1987) suggested a cointegration test, which consists of estimating the cointegration regression by OLS, obtaining the residual U_t and applying the unit root test for U_t .

If the value of R^2 is greater than d-w statistics, then the value of coefficients of regression equation are spurious. However, the coefficients of the regression model are super consistent if U_t is stationarity at level. To test the Engle-Granger Cointegration, first of all this study derive the following long run model by using OLS method:

$$\Delta Y_t = \beta_0 + \beta_{it} X_{it} + U_t \dots (i)$$

Equation shows the entire representation of the OLS model for model I (ii).

$$\Delta \text{LnNCPI}_t = \beta_0 + \beta_1 \Delta \text{LnICPI}_t + \beta_3 \Delta \text{LnGE}_t + \beta_4 \Delta \text{LnEXR}_t + U_t \dots (ii)$$

Further, we have applied Engle and Granger (1987) two-step procedure for cointegration analysis. In the first step, we estimate the long-run equilibrium equation; the cointegration holds if the error term of the long-run equation is stationarity.

$$Y_t = \beta_0 + \beta_i X_{it} + U_t \dots (iii)$$

Equation (iii) is the long-run equation. Equation (iii) has been represented in full extend in equation (iv).

$$\text{LnNCPI}_t = \beta_0 + \beta_1 \text{LnICPI}_t + \beta_3 \text{GE}_t + \beta_4 \text{EXR}_t + U_t \dots (iv)$$

Equation (iv) is long-run equilibrium equation and cointegration holds if error term (U_t) is stationarity (Gujarati, 2004).

After calculating the values of ECM for different periods then this study tested the stationarity of ECM. If the error correlation term or residual is stationarity at level then the variables in equation (1) are cointegrated and exist a long-run relationships among them. Similarly, stationarity test of ECM is also used to test whether the long-run model is spurious or not. The symptom of spurious regression if R-squared value is greater than DurbinWatson statistics. But the model is not spurious when the residual (ECM) is stationarity at level even R-squared is greater than Durbin-Watson Statistics.

Results and Discussion

Stationarity test of variables

The time series data should be stationarity. If the time series data are non-stationarity it may provide the spurious result. The percent study used Augmented Dickey Fuller (ADF) test to

test the stationarity of the variables at level and first difference. The result of ADF test is presented in following table 4.2

Table 1*Result of Augmented Fuller Unit Root Test*

Variables	Constant	P-value	Remarks
	t-statistics		
LnNCPI	-1.702840	0.4229	
LnICPI	-2.211218	0.2053	
LnEXR	-1.245212	0.6463	
LnGE	-1.084520	0.7139	
Δ LnNCPI	-4.973648	0.0002 ***	I(1)
Δ LnICPI	-6.346358	0.0000 ***	I(1)
Δ LnEXR	-7.380275	0.0000 ***	I(1)
Δ LNGE	-4.702838	0.0004 ***	I(1)

Source: Author's own calculation from E-views

Note: */**/** Significant at 10%, 5% and 1% level of significance respectively; the critical value at 1 percent is -3.596

The result of the ADF test statistics of concerned variables used in this study. If the variables are stationarity in level then that variables are known as I(0) and if variables are stationarity only after first difference then it is called I(1). The result of ADF test shows that all variables are non-stationarity at level but stationarity only after first difference. All variables LnNCPI, LnICPI, LnGE and LnEXR are stationarity at first difference so this study applies Engle Granger approach to test the long-run cointegration of the variables.

Engle-Granger Cointegration Test and Error Correction Model

According to Engle – Granger cointegration test the long run cointegration of the variables are tested by testing the stationarity of the residual term or error correlation term in the long run model. So before testing the stationarity of residual term, the long run model has derived by using OLS method as below in table 4.3

Table 2*Regression Result of long run model by Using OLS Method*

Dependent (NCPI)	Coefficient	Std. Error	t-statistics	Prob.
LnICPI	0.707715 ***	0.050623	13.98020	0.0000
LnEXR	0.165367 ***	0.020579	8.035701	0.0000
LnGE	0.128782 ***	0.022368	5.757524	0.0000
C	-1.382665	0.096020	-14.39974	0.0000

Diagnostic tests

R-squared	0.999520	S.D. dependent var	1.079054
Adjusted R-squared	0.999485	Akaike info criterion	-4.498785
S.E. of regression	0.024482	Schwarz criterion	-4.339773
Log likelihood	107.4721	Durbin-Watson stat	1.887488
F-statistic	29124.73		

Autocorrelation

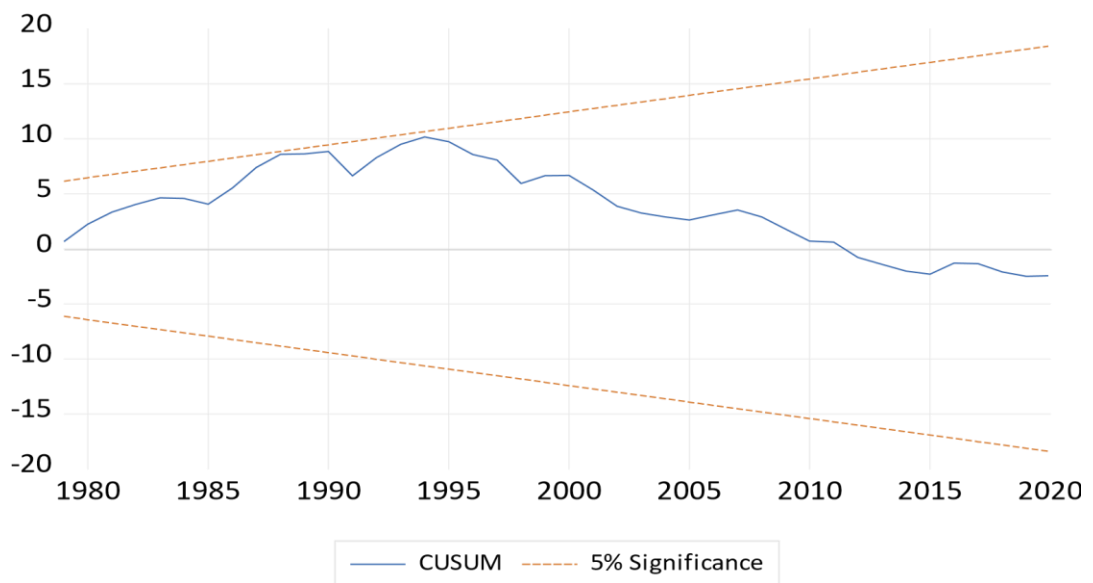
Breusch-Godfrey Serial Correlation LM Test **0.277**

Source: Author's own calculation using *evIEWS10* Note:

* $p < .1$, ** $p < .05$, *** $p < .01$, ^{ns} $p > .1$

Figure 1

CUSUM Test of OLS



Source: Author's own derivation using *evIEWS10*

Table 2 displays the regression results from the OLS model along with the diagnostic tests. All the variables, Indian CPI, GE and EXR are significant at 1 percent level of significance. Since time series data suffers from serial correlation, the study uses both D-W test and Breusch-Godfrey Serial Correlation LM Test, both of these tests signify the absence of serial correlation. Further, the CUSUM Test clearly indicates stability in the equation during the sample period at 5 percent significance.

Table 3*Regression result of short run Error Correction Model I: DNCPI as Dependent Variable.*

Dependent D(NCPI)	Coefficient	Std. Error	t-statistics	Prob.
DlnICPI	0.696003 ***	0.094377	7.374684	0.0000
DlnGE	0.130086 ***	0.047360	2.746783	0.0090
DlnEXR	0.041926 ^{ns}	0.040147	1.044331	0.3026
ECM(-1)	-0.822863 ***	0.156613	-5.254121	0.0000
C	0.007114	0.010202	0.697318	0.4896
Diagnostic tests				
R-squared	0.665785	S.D. dependent var		0.037003
Adjusted R-squared	0.632364	Akaike info criterion		-4.651839
S.E. of regression	0.022436	Schwarz criterion		-4.451098
Log likelihood	109.6664	Durbin-Watson stat		1.810609
F-statistic	19.92087			
Prob(F-statistic)				=0.0000
Autocorrelation				
Breusch-Godfrey Serial Correlation LM Test				1.015342

Source: Author's own calculation using *evIEWS10*

Note: * $p < .1$, ** $p < .05$, *** $p < .01$, ^{ns} $p > .1$

Table 3 is the short run error correction model and the coefficient of short run model shows the short run coefficient of the variables with respect to DNCPI. In the short run, Indian consumer price index and government expenditure have positive and significant effect on consumer price index of Nepal. Where, exchange rate has no significant effect on Nepalese consumer price index in short run.

The coefficient of Indian consumer index (DlnICPI) is 0.696 which shows that there is positive relationship between Indian CPI and Nepalese CPI. The short-run impact of ICPI is 0.696. The coefficient of GE gives the short-run impact of GE is 0.13 percent in Nepalese CPI.

As can be seen from the above table 3 the result of error correction model indicates that the coefficient of the speed of adjustment (ECM_{t-1}) is 0.8228 with t-statistic -5.25 and corresponding probability 0.0000. This coefficient is found to have the correct sign and statistically significant at 1 percent level explaining the fact that NCPI and explanatory variables are converging in the long-run.

The value of R-squared is 0.6657. This means in short run, 66.57 percent of total variation in NCPI is explained by explanatory variable and remaining 33.43 percent is due to error. Likewise, the probability value of F-statistic is less than 1 percent that shows that there is overall significant of short run model.

The Durbin- Watson test statistic value is 1.81 and result of LM test shows that the observed R-squared is 2.282769 with probability Chi-square 0.3194 (see appendix IV). This both result indicates the short run ECM model is free from autocorrelation. Coefficient of ECM states that 82% disequilibrium of last year is corrected by this year.

Table 4*Regression result of short run Error Correction Model II: DNCPI as Dependent Variable*

Dependent D(NCPI)	Coefficient	Std. Error	t-statistics	Prob.
DlnICPI	0.669272 ***	0.134942	4.959717	0.0000
DlnGE	0.96146 **	0.050921	1.888132	0.0667
DlnEXR (-1)	0.034602 ^{ns}	0.044521	0.777220	0.4418
ECM(-1)	-0.744734 ***	0.169567	-4.391969	0.0001
DlnM2	0.149681*	0.089623	1.670123	0.1031
C	-0.011195	0.014548	-0.769499	0.4464
Diagnostic tests				
R-squared	0.650352	S.D. dependent var		0.035127
Adjusted R-squared	0.604346	Akaike info criterion		-4.660771
S.E. of regression	0.022095	Schwarz criterion		-4.417472
Log likelihood	108.5370	Durbin-Watson stat		1.583274
F-statistic	14.13616			
Prob (F-statistic)	=0.0000			

Source: Author's own calculation using eviews10

Note: * $p < .1$, ** $p < .05$, *** $p < .01$, ^{ns} $p > .1$

Table 4 is the short run error correction model and the coefficient of short run model shows the short run coefficient of the variables with respect to DNCPI. In the short run, Indian consumer price index, government expenditure and money supply have positive and significant effect on consumer price index of Nepal. Where, exchange rate has no significant effect on Nepalese consumer price index in short run.

The coefficient of Indian consumer index (DlnICPI) is 0.669 which shows that there is positive relationship between Indian CPI and Nepalese CPI. The short-run impact of ICPI is 0.669. The coefficient of Government Expenditure (DlnGE) is 0.96 which shows that there is positive relationship between Indian GE and Nepalese CPI. The short-run impact of GE is 0.96 percent. Money Supply (DlnM2) is significant at 10 % level in short run.

As can be seen from the above table 4 the result of error correction model indicates that the coefficient of the speed of adjustment (ECM_{t-1}) is 0.744 with t-statistic -4.39 and

corresponding probability 0.0001. This coefficient is found to have the correct sign and statistically significant at 1 percent level explaining the fact that NCPI and explanatory variables are converging in the long-run.

In the table 4, the value of R-squared is 0.6503. This means in short run, 65.03 percent of total variation in NCPI is explained by explanatory variable and remaining percent is due to error. Likewise, the probability value of F-statistic is less than 1 percent that shows that there is overall significant of short run model.

The Durbin- Watson test statistic value is 1.58. Coefficient of ECM states that 74% disequilibrium of last year is corrected by this year.

Short run Error Correction Model III has been attached in appendix VI which shows that M2 and ICPI are significant at 5% and 1% level of significance respectively. GE and EXR are insignificant in short run.

Conclusion

By evaluating pertinent research and utilizing Nepal as the reference nation, the primary goal of this study was to determine the relationship between inflation, Indian inflation, exchange rate, and government spending. It is obvious that the key factors influencing inflation in Nepal are the growth of Indian inflation, the cost of exchange, and government spending. According to this study, prices in Nepal are heavily influenced by Indian prices due to a lackluster domestic supply that is complemented by an increase in Indian imports. Controlling inflation is a difficult issue for a country like Nepal, which has open borders with large nations and relies significantly on imported goods for both daily needs and other forms of development. Outside-country supply shocks are the main cause of inflation in this situation. The monetary authorities' job of controlling inflation is thus made more difficult and complex by the seeming lack of impact of the monetary and fiscal policies designed to do so. It does not, however, imply that there is no place at all for such policy implications.

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