Impact of Money Supply and Inflation on Economic Growth in Nepal

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Abstract

The relationship between money supply and economic growth has been receiving more attention than any other subject in the field of monetary economics in recent years. Inflation is an increase in prices that can be translated as a decreases in purchasing power overtime. This paper examines the effect of money supply and inflation on economic growth from 1974/75 to 2020/21. The ARDL co-integration approach is used in the study to determine the relationship between the variables for determining if there is long term co-integration among variables where the bound test has been used. The Narrow Money, Broad Money and Consumer Price Indexare the independent variables respectively with GDPas the dependent variable. The whole dynamics of inflation in developing economies are different, so the idea that inflation is always a monetary phenomenon is important to revisit and reevaluate, especially in relation to developing economies. The study shows that CPI is positively related with economic growth. The evidence suggest that CPI has strong impact on economic growth in the developing countries like Nepal.

Key words: Economic Growth, Inflation, GDP, ARDL, CPI, and money supply.

I. Introduction

Inflation is an increase in prices that can be translated as a decrease in purchasing power over time. The rate of decline in purchasing power is reflected in the average price increase over a period of time for a basket of selected goods and services. Inflation is in contrast to deflation, which occurs when prices fall and purchasing power increases. Economists agree that inflation is a rise in general price level.

The impact of inflation is an important part of macroeconomic issues in today's world. The impact is far-reaching, affecting multiple macroeconomic variables such as savings, investment, income, real interest rates and real wages (Choudhary, 2018). Inflation can be expressed as the determinant of financial development among numerous factors (Barro, 1995). Inflation is usually wide range of measures such as general price increases or an increase in the cost of living in the country. According to Christiano&Fitzgerald (2003), when the rate of inflation is adequately low, families and organizations don't have to accept price fluctuations variances while making daily production decisions.

A continuous rise in price level is termed as inflation (Parkin & Bade, 2001).A country's money supply has a large impact on whether inflation occurs. The government enacts specific monetary and fiscal policies to promote the long-term well-being of its citizens as it assesses economic conditions, price stability targets, and unemployment rates. These monetary and fiscal policies can change the money supply, and changes in the money supply can cause inflation.Inflation must be within a certain threshold of 6% or higher. This restriction could threaten economic growth (Bhusal, 2011).

Price stability is a measure of inflation or price levels create uncertainty in the economy and can affect economic growth (Chimobi, 2010). Inflation occurs when a country's money supply grows faster than the country's economic output. Inflation can hamper the pace of economic development because there is significant positive relationship is found between inflation and economic growth (Adhikari, 2014).

Quantity theory assumes that the value of money and the resulting inflation are driven by the supply and demand of money. There are situations in which an increase in the money supply

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does not cause inflation, but instead causes other economic conditions such as hyperinflation or deflation. Furthermore, according to the quantity theory of money, an increase in the price level is proportional to an increase in the money supply.

Money supply growth and Gross Domestic Product (GDP) growth becomes very handy (Jamie, 2005) – if money supply growth is rapidly outpacing economic growth, there will soon be more money chasing after the same amount of goods (Karfakis, 2004).

The Monetarists believe that monetary policy affects prices, but not real GDP or unemployment. The Keynesians, on the other hand, believe that changes in money supply leads to changes in real output and prices. There are several researches related the role of money and economic growth, which has been investigated the relationship between these variables in the developed and developing countries.

The influence of the money supply on economic growth can be traced back to classical and Keynesian monetary theory, also known as the quantity theory of money. Classical monetary theory is based on Irving Fisher's equation of exchange, or what he called the theory of value. In a statement quoted by Jhingan (2005), Irving Fisher argues that ``when the quantity of money in circulation increases, other things remain the same, the price level rises in direct proportion, and the value of money increases will fall and vice versa."

On the contrary, Keynes' attack on classical quantity theorists led to a reformulation of the quantity theory of money, which caused a shift from a monetary theory of price to a monetary theory of production. The Keynes statement quoted by Jhingan (2005) states "it is through the theory of output that value theory and monetary theories are brought into just a position with each other". According to Keynes, as long as there is unemployment, output will change in proportion to the money supply, and prices will not change. And at full employment, prices change in proportion to the money supply.

Friedman continued to support this view, especially in a situation where the money supply grew faster than the economic growth rate. However, inflation has real effects on other macroeconomic variables.

II. Theoretical Framework

Karki, Banjara and Dumre (2020) states that there is no consensus on the relationship between inflation and economic growth. This study took references of many available data sources such as Economic Survey Reports (FY 2003/04, 2008/09, 2012/13 and 2018/19) and World Bank data base. Correlation analysis was employed to find out the relation between inflation and economic growth in Nepal. MS-Excel and STATA (version 12) was used for this purpose. The study finds overwhelming support in favor of a certain inflation threshold suitable for growth.

Collins, Benjamin and Xuegong (2017) showed a long-run positive relationship between money supply and inflation based on an Ordinary Least Squares. It is clear that the growth rate of real GDP and the growth of money supply are the main determinants of inflation in Ghana- both in the short-run and the long-run, with money supply being the key determinant.

Shrestha's (2010) research findings are the Price, GDP, M1 and M2 all are stationary at first difference level. GDP and price are co-integrated with M1 and M2. Therefore, both M1 and M2 are important variables to consider (Shrestha, 2010). According to monetarist thinking, inflation is a purely monetary phenomenon. However, for Nepal, his analytical data from 1980 to 2009 found that the price was not affected by the money supply, but that the money supply was driven by the price level.

Dinh Doan Van (2019) found out that the continuous increase in the money supply causes inflation in the long-term, but the continuous increase in the money supply growth does not cause inflation in a short time. The data was taken from 2012-2016 and OLS technique was used to analyze the explanatory variable and the relationship between money supply growth and inflation.

NRB (2001) examined the money-price relationship in Nepal. The study estimated the moneyprice relationship by using quarterly data from third quarter of 1975 to second quarter of 1999. The study showed the delayed impact of money on prices in Nepal disapproving the theory of money and price which suggests an instantaneous relationship between money and price. The study occupied ADF to test unit root and Engel- Granger co-integration test to check long run relationship among variables. M1 compared to M2 was found to have stronger relationship with prices in Nepal. The results of the paper also showed that there was no structural shift in money price relationship during the study period.

Acharya (2019) states that Nepal should focus on growth of time deposit component of broad money supply in long-run for economic growth and control of inflation. Acharya applied the data from 1974/75 to 2017/18, this paper intended to find out the relationship between money supply, income and price level in Nepal. The paper has established the relationship between real money supply (both M1 and M2) with respect to real GDP, nominal money supply (both M1 and M2) with respect to price level and nominal GDP with respect to price level separately.

Adhikari (2014) found that Inflation is only harmful if it is more than galloping. The results show a mixed impact of inflation on economic growth. If inflation is rising in the current period, economic agents will not have enough time to adapt to high inflation. As a result, rising inflation will have a negative impact on economic growth. In contrast, if inflation was high in the previous period, the economic agent will have time to adjust and moderate inflation for a year. As a result, inflation had a positive impact on economic growth.

Bhusal and Silpakar (2011) studied the growth and inflation relationship to estimate threshold level of inflation in Nepal via Granger causality test by using annual data for the period 1975 to 2010.

The study reported positive and unidirectional relationship between the inflation to economic growth and found threshold value of inflation to be 6 percent.

Bhatta (2015) found threshold at 6 per cent level of inflation rate for Nepal, above which the growth is negatively affected while below threshold growth, is positively affected.

NRB (2017) has estimated the optimal inflation rate in Nepal using ordinary least square method for period from 1978-2016. The study concluded that there exists threshold effect of inflation and indicated the turning point of inflation to be 6.25 per cent. It suggested that Nepal should adopt an inflation target range around the computed optimal inflation rate to reduce the inflation expectation and encourage economic growth.

Chaudhary (2018) examined the determinants of inflation in Nepal where money supply, consumer price index, Indian prices and real GDP are taken as determinants significantly influencing inflation in Nepal and the conclusion is money supply and Indian prices cause inflation in the long run.

Bawumia and Aradu (2003) point out that the empirical evidence for broad money growth in Ghana from 1983 to 1999 is clear. It reflects the fact that we are determined to Apart from the fact that the Central Bank (Bank of Ghana) is not independent, the money supply and the policies governing it are based on the discretion of governments in power, not on rules.

Research Questions

1) Is money supply the cause of inflation in Nepal?

2) What are the effects of inflations on economic growth?

3) How does the fluctuations on money supply effect on economic growth?

Objectives of the Study

1) To study the relationship of money supply and inflation in context of Nepal.

2) To examine effect of inflation on economic growth.

3) To know effect of money supply on economic growth.

Research Hypothesis

H_0: Null hypothesis - That money supply and inflation has no significant impact on economic growth.

(We reject H_0; if there is a significant impact)

H_1: Alternative hypothesis - That money supply and inflation has significant impact on economic growth.

(We do not reject H0; if there is a significant impact)

II. Research Methodology

Total money supply can be grouped into two broad categories as defined by Nepal Rastra Bank: These are narrow money (M1) and broad money (M2). M1 indicates currency in circulation plus current account deposits with commercial banks while M2 is M1 plus savings and time deposits. The study seeks to explore the relationship between GDP as dependent variable and M1, M2, Inflation and CPI as independent variables.

Before establishing relationships, it is important to check the time series data to determine whether the variables used in the study are individually stationary. Wrong relationships are created if the variables are not stationary.

The multiple regression model is adopted for this study. The relationship between money supply, inflation and economic is obtained by using ordinary least square (OLS) method.

In this study GDP is the dependent variable and Broad money (M1), Narrow money (M2) and consumer price index (CPI) are the independent variables. U_i represent all omitted variables from the model and also the random errors from the process of estimation. The analysis used in this study cover annual time series of 1974/75-2020/21 (47observation) of Nepal. Data have been taken from relationship between independent and dependent variables economic growth function is used which can be expressed as:

GDP = (broad money m1+ narrow money m2 + consumer price index CPI +Ui

The function can also be represent in a log linear econometrics format thus:

Log GDP= β0+β1log m1+β2logm2+β3logCPI +Ui

Where

GDP= Gross domestic Product

βo = intercept

β1=coefficient of variables M1

β2= coefficient of variables M2

β3=coefficient of variables CPI

Variables	At level	At 1 difference	Constan and trend

Ui=error term

The random error term assumed to be normally identically and independently distributed.

IV. Results and Conclusions

Unit root test

 Stationary is an essential test for time series data and a time series data is said to be stationary if it has invariant mean and variance. This test will examine the order of integration of the data and eradicate the problem of spurious regression. Augmented dickey fuller (ADF) test has been applied to test stationary of the data as suggested by Dickey and fuller (1979).

$$\Delta y_t = a0 + a1t + y_{t-1}$$

Null hypothesis (Ho): variables are not stationary

Alternative hypothesis (H1): variables are stationary

Ln gdp			
Ln m1			
Lnm2			

(numbers in the parenthesis are probability values)

 Source: Authors calculations

Gross domestic product (GDP), broad money m1 and narrow money m2,and consumer price index are tested by Augmented Dickey Fuller test to find the variables are stationary or not. In case of 1 difference variable M1 and M2 is stationary because p value is less than 5% .Similarly at level CPI is stationary because p value is less than 5% .If the variables are significant at level and 1 difference at that time ARDL model is applied to find the relation .Results of model is presented in following figure.

Table 1

Null Hypothesis: LNGDP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.237690	0.9259
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

To determine the exact order of integration of log of real GDP, the series can be tested for the presence of the unit root at the first difference. Table 1 reports the results from the ADF tests for the log of real GDP at first difference.

Table no 2:

Null Hypothesis: D(LNGDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.352278	0.0000
Test critical values:	1% level	-3.584743	
	5% level	-2.928142	
	10% level	-2.602225	

*MacKinnon (1996) one-sided p-values.

The probability associated with the ADF statistics shows that log of real GDP is stationary at first difference. It is also supported by the value of t statistic that is higher than the 5 percent critical value.

Table 2

Null Hypothesis: LNM1 has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.669898	0.8441
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

To determine the exact order of integration of log of narrow money M1, the series can be tested for the presence of the unit root at the first difference. Table 3 reports the results from the ADF tests for the log of narrow money M1 at first difference.

Table 4

Null Hypothesis: D(LNM1) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.469482	0.0000
Test critical values:	1% level	-3.584743	
	5% level	-2.928142	
	10% level	-2.602225	

*MacKinnon (1996) one-sided p-values.

The probability associated with the ADF statistics shows that log of narrow money M1 is stationary at first difference. It is also supported by the value of t statistic that is higher than the 5 percent critical value.

Table 5

Null Hypothesis: LNM2 has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.516094	0.8784
Test critical values:	1% level	-3.584743	
	5% level	-2.928142	
	10% level	-2.602225	

*MacKinnon (1996) one-sided p-values.

To determine the exact order of integration of log of broad money M2, the series can be tested for the presence of the unit root at the first difference. Table 5 reports the results from the ADF tests for the log of broad money M2 at first difference.

Table 6

Null Hypothesis: D(LNM2) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.733056	0.0004
Test critical values:	1% level	-3.584743	
	5% level	-2.928142	
	10% level	-2.602225	

*MacKinnon (1996) one-sided p-values.

The probability associated with the ADF statistics shows that log of broad money M2 is stationary at first difference. It is also supported by the value of t statistic that is higher than the 5 percent critical value.

Table 7

Null Hypothesis: CPI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.319309	0.0001
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

*MacKinnon (1996) one-sided p-values.

To determine the exact order of integration of CPI ,the series can be tested for the presence of the unit root at level. The probability associated with the ADF statistics shows that CPI is stationary at zero difference. It is also supported by the value of t statistic that is higher than the 5 percent critical value. Table no 7 reports the results from the ADF tests for the CPI at zero difference.

Figure ---: choice of regression model in time series data following unit root test

The choice of regression models is largely determined by the time series properties of the underlying data. If the data are stationary in nature, use of OLS will result into unbiased and consistent estimates and thus it can be safely used to draw inferences. However, if the data are non-stationary, use of OLS may result into spurious relationship among the variables. In such a case, ARDL techniques can be used to check whether there is any long run relationship among the variables. If cointegration exists, short-run dynamics of the relationship as well as long run coefficients can be determined.

ARDL Model

Where the variables are non-stationary at levels but are difference stationary, ARDL methodology allow researchers to test for the presence of long run equilibrium relationship among variables. ARDL cointegration technique is preferable when dealing with variables that are integrated of different order, I(0), I(1) or combination of both and robust when there is a single long run relationship between the underline variables. ARDL approach to cointegration helps in identifying the cointegrating vectors.

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNGDP(-1)	0.615919	0.102491	6.009481	0.0000
LNM1	0.078498	0.142097	0.552427	0.5837
LNM2	0.230649	0.136222	1.693186	0.0980
CPI	0.005489	0.002045	2.684308	0.0104
C	1.147222	0.300749	3.814550	0.0005
R-squared	0.999029	Mean dependent var		10.26598
Adjusted R-squared	0.998934	S.D. dependent var		1.715254
S.E. of regression	0.055995	Akaike info criterion		-2.824802
Sum squared resid	0.128551	Schwarz criterion		-2.626037
Log likelihood	69.97044	Hannan-Quinn criter.		-2.750343
F-statistic	10546.20	Durbin-Watson stat		1.901783
Prob(F-statistic)	0.000000			

*Note: p-values and any subsequent tests do not account for model selection.

Error Correction Modeling:

Even if y and x variables are cointegrated, that is, there is a long run equilibrium relationship between them, there may be disequilibrium in the short run. This error term can be used to tie the short-run behavior of Y to its long-run value. The error correction models (ECM) first used by Sargan and later popularized by Engle and Granger corrects for disequilibrium (Bhatta, 2013). The Granger Representation Theorem says that if two variables y_t and x_t are cointegrated, then the relationship between the two can be expressed as Error Correction Model by:

$Y_t = \beta o + \beta_1 M1 + \beta_2 M2 + \beta_3 CPI + U_t$

Where,

βo = intercept

$\beta 1$=coefficient of variables M1

$\beta 2$= coefficient of variables M2

$\beta 3$=coefficient of variables CPI

U_t= a white noise error term,

Several techniques have been proposed to test the existence of cointegration in time series data including Engle Granger Test, Johansen Test and ARDL Test. However, each test has its own strengths and weaknesses. A careful sel ection of the test can provide us more precise and valid estimates of the parameters.

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CointEq(-1)*	-0.384081	0.023820	-16.12429	0.0000
R-squared	0.361271	Mean dependent var		0.120687
Adjusted R-squared	0.361271	S.D. dependent var		0.066876
S.E. of regression	0.053448	Akaike info criterion		-2.998715
Sum squared resid	0.128551	Schwarz criterion		-2.958962
Log likelihood	69.97044	Hannan-Quinn criter.		-2.983823
Durbin-Watson stat	1.901783			

* p-value incompatible with t-Bounds distribution.

F-Bounds Test		Null Hypothesis: No levels relationship			
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	47.37646	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

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Long bound test:

ARDL Long Run Form and Bounds Test
Dependent Variable: D(LNGDP)
Selected Model: ARDL(1, 0, 0, 0)
Case 2: Restricted Constant and No Trend
Date: 11/12/22   Time: 08:42
Sample: 1 47
Included observations: 46

Conditional Error Correction Regression				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.147222	0.300749	3.814550	0.0005
LNGDP(-1)*	-0.384081	0.102491	-3.747453	0.0006
LNM1**	0.078498	0.142097	0.552427	0.5837
LNM2**	0.230649	0.136222	1.693186	0.0980
CPI**	0.005489	0.002045	2.684308	0.0104

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation Case 2: Restricted Constant and No Trend				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNM1	0.204380	0.366776	0.557232	0.5804
LNM2	0.600522	0.314820	1.907509	0.0635
CPI	0.014292	0.006810	2.098677	0.0420
C	2.986926	0.162168	18.41871	0.0000

EC = LNGDP - (0.2044*LNM1 + 0.6005*LNM2 + 0.0143*CPI + 2.9869)

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	47.37646	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66
Actual Sample Size	46	Finite Sample: n=50		
		10%	2.538	3.398
		5%	3.048	4.002
		1%	4.188	5.328
		Finite Sample: n=45		
		10%	2.56	3.428
		5%	3.078	4.022
		1%	4.27	5.412

Conclusion

The main aim of this study was to establish the relationship between money supply and inflation on economic growth by reviewing relevant studies using Nepal as the reference country. It is clear that the growth rate of inflation and the growth of money supply are the main determinants of real GDP in Nepal- both in the short-run and the long-run, with money supply being the key determinant. The coefficient for money supply from the estimated long-run inflation function confirms the Monetarists theory of inflation in the long-run. Base on the estimated result, the independence of the central bank is very important if policy makers want to reduce the effects of money supply and inflation in economic growth.

Nepalese money supply and inflation is really harmful in the point of view of economic growth or this inflation and supply of money has the significant role in promoting economic growth is still inconsistent. Even if there are some common or similar findings the relationship between three variables is still inconclusive and controversial. Some studies have revealed positive relationship between the inflation and the economic growth. The inflation and economic growth are one way related to each other, there is one way causal relationship from inflation to economic growth but not from economic growth to inflation.

The monetary policy is crucial and has a direct effect on economic growth. However, the government must ensure pricing stability and macroeconomic stability in order to establish a sustainable economy. One of the primary factors driving inflation in Nepal in recent years has been the expansion of the money supply. High inflation has an adverse effect on people's quality of living as well as the production and commercial activities of businesses, placing strain on the entire economy. Therefore, we should pay particular attention to the solutions of the money supply in order to overcome the current problems of inflation.

Last but not least, in addition to monetary issues, other factors like cost-push, demand pull, psychology, etc. also have an impact on inflation of Nepalese economy. Therefore, in order to overcome rising inflation, we must come up with sound monetary and fiscal policy solutions as well as reconstruct a sensible economy. As a result, we can sustain stability and economic growth in the long-term.

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