Effect of Inflation and Money Supply on Output Growth in Nepal

Sushil Rana

Abstract— This paper examines the effect of inflation and money supply on output growth in Nepal over the period of 45 years from mid-July 1975 to 2019. Autoregressive distributed lag (ARDL) model is applied in this study in order to investigate the existence of the long-run and short-run relationships between the variables. Furthermore, this study uses natural logarithm of real GDP as a proxy for output growth, natural logarithm of broad money (M2) as a proxy for money supply and percentage change in Consumer Price Index (CPI) as a proxy for inflation rate. The results of ARDL bounds test reveal that inflation and money supply are cointegrated with economic growth over the study period. In addition, money supply in Nepal leads to output growth in the long-run as well as short-run, however, inflation negatively effects output growth both in the long-run and short-run. Based on these results, it can be concluded that money supply in Nepal can stimulate output growth, whereas inflation can be detrimental to economic growth. Thus, government should plan monetary policy to maintain a tolerable and lower rate of inflation, so as to boost the economy of the country.

Index Terms— Economic Growth, Inflation, Money Supply, ARDL, Long-run, Short-run, Cointegration, Bounds test

1 INTRODUCTION

THERE are several factors affecting the economic growth of the country. Among such factors, moderate inflation rate and money supply are significantly responsible for sustainable economic growth thereby creating employment opportunities, decreasing poverty, and increasing per capita income and living standard (Phibian, 2010). It is imperative to understand the joint effect of money supply and price level on output since knowledge of such relationship helps government and central bank to formulate monetary policies that promote sustainable economic growth as well as it also reveals the implications of those policies. Relationship between these variables has become a widely debated topic among researchers in the field of economics. On the one hand, monetarists argue that there exists negative relationship between inflation and output. Structuralists, on the other hand, opine that the relationship is rather positive. In a similar vein, monetarists also believe that money supply may lead to growth in output in the short-run, but not in the long-run. While earlier studies have only focused on either the impact of money supply on economic growth or inflation on economic growth in Nepal, this study differs by measuring the combined effect of monetary policy variables (money supply and inflation) on output. Furthermore, this study also investigates both the long-run and short-run relationships between monetary policy indicators and economic growth.

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The rest of the paper is organized as follows: section 2 presents the review of related literature, section 3 outlines the methodology being used, section 4 presents the results and discussions, and section 5 concludes the study.

2 LITERATURE REVIEW

This section is categorized into three parts. The first- and second-part deal with individual effect of inflation on output, and effect of money supply on output growth respectively, whereas the third part is concerned with the combined effect of money supply and inflation on economic growth.

2.1 Empirical evidence about the Impact of Inflation on Economic Growth

The study conducted by Thirwal and Barton, (1971) in 17 industrial countries demonstrated a positive relationship between inflation and economic growth given that the inflation rate remains below 8 percent per annum and is not adjusted for change in population, whereas a negative relationship exists if the inflation rate exceeds 8 percent.

Bhusal and Silpakar, (2012) estimated the threshold level of inflation in Nepal to be at 6 percent. They employed Granger Causality Test on yearly data between 1975 and 2010 to exhibit the existence of positive and unidirectional relationship from inflation to economic growth.

Bhatta, (2015) also reported the threshold level of inflation in Nepal to be at 6 percent by using the method of Sarel, (1996) and Khan and Senhadji, (2001). He argued that economic growth is positively affected if the inflation rate is below 6 percent, but is negatively affected if the rate is more than 6 percent.

Sergii, (2009) calculated level of threshold of inflation rate in six CIS nations with the help of annual data between 2001 and 2008. He implemented the non-linear least squares and bootstrap method to reveal that inflation of more than 8 percent slows down economic growth, whereas that of below 8 percent boosts economic growth.

Nepal Rastra Bank, (2017) estimated the turning point of inflation to be 6.25 percent using the Ordinary Least Squares method and 6.40 percent using Hansen, (2000) method. Annual data between 1978 and 2016 was used to arrive at such conclusion.

Adhikari, (2014) implemented Distributed Lag Models on the annual data of GDP and Consumer Price Index (CPI) from 1975-2012 to suggest that current economic output of Nepal is negatively affected by existing period's inflation, but is positively affected by previous period's inflation.

Kasidi and Mwakanemela, (2013) studied the effect of inflation on economic development in Tanzania for the period 1990 to 2011. They employed Johansen Cointegration Test to find that while there is no cointegration and long-run association between inflation and economic growth, inflation has a negative impact on economic growth.

Jayathileke and Rathnayake, (2013) examined the relationships between the economic growth and inflation of three countries in Asia during the period 1980 to 2010. Johansen Cointegration Test and Bound Test approach were used to conclude that countries with no macroeconomic stability suffer from inflation, while those with stable macroeconomic condition and high economic growth are positively benefited by it.

Osuala et al., (2013), used a time series data covering the period of 31 years in Nigeria to reveal a statistically significant and positive relationship between inflation and economic growth by using VAR approach, but the causality test did not show any causality between these two variables.

Behera, (2014) investigated the impact of inflation on economic growth in six South Asian countries using time series data from 1980 to 2012. He implemented Error Correction Model and Granger Causality Test to depict a high degree of positive correlation between inflation and economic growth. The cointegration test further revealed a long-run relationship between inflation and economic growth in Malaysia.

Majumder, (2016) applied Granger Causality and Error Correction Model to arrive at the conclusion that there is statistically significant and long-run positive relationship between economic growth and inflation in Bangladesh during the period of 1975 to 2013.

2.2 Empirical evidence about the Impact of Money Supply on Economic Growth

In the USA, Feldstein & Stock, (1993) applied a multiple regression model using quarterly time series data on money, output, interest rate, and inflation over the period from 1959(Q1) to 1992(Q2). The results showed that M2 is a statistically significant predictor of nominal GDP growth at 1 percent level of confidence. However, correlation between these two variables is relatively weak.

Adeyeye et al., (2006) empirically studied the impact of interest rate and money supply (proxied by bank loan) on the GDP. Ordinary least square method was employed on yearly data spanning from 1970 to 2003. The results illustrated that bank loan is significant, and has negative impact on economic growth.

Shrestha, (2010) conducted a study in order to examine the relationship between Money Supply and GDP in Nepal, using annual data from 1980 to 2009. His findings from Granger Causality Test suggested that though money supply has a causal relationship with GDP, cointegration analysis revealed that Price and GDP is no longer cointegrated with M1 and M2.

Suleiman, (2010) used ordinary least square method on annual data between 1970 and 2007 in order to conclude that money supply has a negative impact on the real GDP of Nigeria.

In Pakistan, Hameed, (2011) applied a regression model on annual data from 1980 to 2009 to demonstrate that while money supply has a substantial impact on GDP, interest rate has a negligible relationship.

Chaitip et al., (2015) examined relationship between money supply and output in eight Asian countries using panel ARDL model with the help of annual data from 1995 to 2013. Their study revealed that money supply M1 has long-run relationship with economic growth along with an adjustment speed to long term equilibrium.

2.3 Empirical evidence about the Impact of Inflation and Money Supply on Economic Growth

Sharma, Kumar and Hatekar, (2010) investigated money, price and output relationship using a bi- variate methodology developed by Lemmens et al., (2008). Their study revealed the existence of relationship between money and output over the short-run, but in the long-run, money supply determines prices, not output. Moreover, output and prices do not Granger cause money supply, reflecting exogeneity of money supply.

Mishra, (2010) used annual data between 1950-51 and 2008-09 to elucidate bidirectional causality between money supply and output, but unidirectional causalities from inflation to money supply, and inflation to output growth. He also revealed short-run bidirectional causality between money and price and short-run causality from output to price.

Denbel, Ayen and Regasa, (2016) examined the causal relationship among inflation, money supply and economic growth in Ethiopia for the period 1970/71 to 2010/11.They used Johansen Cointegration Test and VECM to depict the existence of long-run bidirectional causality between inflation and money supply and unidirectional causality from economic growth to inflation. In the short-run, unidirectional causality is found from money supply and economic growth to inflation concluding that inflation is a monetary phenomenon in Ethiopia and is negatively and significantly affected by economic growth.

Gatawa, Abdulgafar and Olarinde, (2017) investigated the impact of money supply, inflation, and interest rate on economic growth in Nigeria using the time series data from 1973-2013. They used VAR Model and Granger Causality Test to reveal the positive impact of broad money supply, while inflation and interest rate has a negative impact on growth in the long-run. Furthermore, money supply and interest rate negatively affect economic output, but none of the variables granger caused economic growth.

Acharya, (2019) applied correlation analysis to investigate the relationship among GDP, consumer price index, money supply, foreign assistance and government expenditure using yearly data between 1975 and 2015. She found that consumer price index, money supply, government expense and foreign assistance have strong, significant and positive relationship with GDP.

3 DATA AND METHODOLOGY

3.1 Data Sources

This study is based on the analysis of time series data extracted from various sources. Since Nepal has not embraced the practice of announcing quarterly GDP yet, annual data spanning from mid-July 1975 to mid-July 2019, is taken for this study. Data series on real GDP (RGDP), inflation (INFL), and broad money supply (M2) were retrieved from various issues of Economic Survey published by Government of Nepal, Ministry of Finance and Quarterly Economic Bulletin circulated by Nepal Rastra Bank.

3.2 Brief Description of Variables

Real Gross domestic product (RGDP): Real GDP is a measure of value added in the economy in a given year which is adjusted for price changes. On the other hand, Gross Domestic Product (GDP) is the aggregate monetary value of all finished goods and services produced within a country's national boundary in a given year, which is calculated in terms of local currency. Since GDP relies upon monetary value of goods and services and is subject to inflation, RGDP is used to capture the overall economic performance of the country.

Inflation rate (INF): It is the rate at which the average price of a given basket of goods and services in an economy increases over a period of time. The inflation rate is generally expressed in percentage and indicates a decline in the purchasing power of a country's currency. For our model, the annualized percentage change in the consumer price index over time is used as a proxy for rate of inflation.

Money Supply (M2): Money supply is the sum total of all forms of money in circulation at a given period of time. In Nepal, there are mainly two types of money supply: narrow money (M1), and broad money (M2). Narrow money refers to the sum of currency held by public (C) and demand deposit (including other deposits of Central bank), while broad money is defined as the sum of narrow money and time deposits (saving, fixed, call and margin deposits). Nepal Rastra Bank publishes these monetary aggregates on a monthly basis.

Dummy (D): Dummy variable is used to illustrate the structural break in the model. It is given a value of 1 or 0, where D=1 and D=0 represent presence and absence of structural breaks in the model respectively.

3.3 The Model

The dependent variable in our model is real GDP (economic growth), while independent variables are INF (inflation rate), M2 (money supply) and D (dummy variable). We have specified the following function,

$$RGDP_t = f(INF_t, M2_t, D_t) \qquad (1)$$

To make our equation linear, we take the natural log of equation (1) except on inflation rate as shown below;

$$LRGDP_t = \alpha_0 + \alpha_1 INF_t + \alpha_2 LM2_t + \alpha_3 D_t + u_t \qquad (2)$$

Where u_t is the stochastic error term. α_1, which is the coefficient of INF, is the elasticity of LRGDP with respect to INF. Especially, it measures the degree of responsiveness of LRGDP to changes in the level of INF ceteris paribus. In the same way, α_2 and α_3 also represent their respective coefficients and elasticities and thus exhibit similar behavior as α_1.

3.4 Methodology

3.4.1 Unit Root Test

After estimating the ordinary least squares (OLS), we proceed to test for stationarity or unit roots of our variables. In a stationary process, the mean, variance and autocorrelation characteristics do not change over time. Testing the stationary property of all variables is essential in order to avoid spurious regression and to figure out their order of integration. To perform this, we use two formal unit root tests: The Augmented Dickey-Fuller (ADF) and the Phillip-Perron (PP) unit root tests. The distribution of the ADF test assumes homoscedastic error terms and to resolve any potential problems generated by such assumption, PP test is applied which has relatively less restrictive assumption regarding the distribution of the error terms. Besides, it also corrects any possible serial correlation and heteroskedasticity in the errors. The ADF test takes the following equation:

$$\Delta Y_t = \beta_1 + \delta Y_{t-1} \sum_{i=1}^{m} \alpha_i \Delta Y_{t-i} + \varepsilon_t \qquad (3)$$

We test the null hypothesis, $H_0: \delta = 0$ (series is non-stationary) against the alternative hypothesis, $H_1: \delta < 0$ (series is stationary).

3.4.2 ARDL Bounds Test of Cointegration

To analyze long-run and short-run relationships among variables under study, instead of using cointegration approaches by Engle and Granger, (1987) and Johansen and Juselius, (1990), Autoregressive Distributive Lag (ARDL) bounds test developed by Pesaran et al., (2001) is implemented due to its various advantages. To illustrate,

ISSN 2229-5518

ARDL model allows test for the existence of relationships between variables regardless of whether the underlying regressors are purely I(0), purely I(1) or mixture of both, but none of the variables should be I(2). While traditional methods of cointegration estimate the long-run relationship by employing a system of equations, the ARDL method uses only a single reduced form of equation (Pesaran & Shin, 1995). Furthermore, ARDL technique generally provides unbiased estimates of the long-run model and valid t-statistic, even when some of the regressors are endogenous (Odhiambo, 2011). Since ARDL test is also suitable even when the sample size is small, it has superior small sample properties compared to the Johansen and Juselius, (1990) cointegration test (Pesaran & Shin, 1995).
The estimated ARDL model is given below:

$$\Delta LRGDP_t = \alpha_0 + \sum_{i=1}^{p} \alpha_{1i} \Delta LRGDP_{t-i} + \sum_{i=0}^{q} \alpha_{2i} \Delta INF_{t-i} + \sum_{i=0}^{q} \alpha_{3i} \Delta LM2_{t-i} + \lambda_1 LRGDP_{t-1} + \lambda_2 INF_{t-1} + \lambda_3 LM2_{t-1} + D_t + \upsilon_t \quad (4)$$

Where υ_t is the white-noise error term and Δ represents the first difference operator. The coefficients λ_1 to λ_3 and α_1 to α_3 represent the long-run and short-run dynamics of the model respectively.
In order to investigate the existence of the long-run relationship among the variables in the system, the bound tests approach to cointegration developed by Pesaran et al., (2001) has been used. This test is based on the Wald or F-statistic and follows a non-standard distribution. Under this, the null hypothesis of no cointegration $\lambda_1=\lambda_2=\lambda_3=0$ is tested against the alternative of cointegration $\lambda_1\neq\lambda_2\neq\lambda_3\neq0$. Pesaran et al., (2001) provide lower critical bound assuming I(0), and upper critical bound assuming I(1) in the ARDL model. If the estimated F-statistic value is higher than I(1), the null hypothesis of no cointegration is rejected (presence of cointegration); but if it is less than I(0), we fail to reject the null of no cointegration (absence of cointegration). However, if it lies within the I(0) and I(1), the result is considered to be inconclusive. After bounds test confirms the presence of cointegration among the variables, the long-run and short-run coefficients can be investigated as shown below in equations 5 and 6 respectively.

$$LRGDP_t = \alpha_0 + \sum_{i=1}^{p1} \alpha_{1i} LRGDP_{t-i} + \sum_{i=0}^{q1} \alpha_{2i} INF_{t-i} + \sum_{i=0}^{q2} \alpha_{3i} LM2_{t-i} + D_t + \mu_t \quad (5)$$

$$\Delta LRGDP_t = \alpha_0 + \sum_{i=1}^{p1} \alpha_{1i} \Delta LRGDP_{t-i} + \sum_{i=0}^{q1} \alpha_{2i} \Delta INF_{t-i} + \sum_{i=0}^{q2} \alpha_{3i} \Delta LM2_{t-i} + D_t + \psi ECT_{t-1} + \vartheta_t \quad (6)$$

In equation 6, ψ is the speed of adjustment and ECT_{t-1} represents the error correction term lagged by one time period. The value of ECT_{t-1}should be negative and fall between 0 and 1. Generally, ECT_{t-1} signifies the speed of adjustment to converge back to its long-run equilibrium.

4 RESULTS AND DISCUSSIONS

4.1 Table 1: Descriptive Statistics

	LRGDP	INF	LM2
Mean	26.58581	8.311111	25.26669
Median	26.62651	8.300000	25.36497
Maximum	27.57976	21.10000	28.90698
Minimum	25.68667	-0.700000	21.44811
Std. Dev.	0.574723	4.233107	2.182190
Skewness	-0.019714	0.536832	-0.062221
Kurtosis	1.759616	3.659313	1.866645
Jarque-Bera	2.887702	2.976468	2.437462
Probability	0.236017	0.225771	0.295605
Sum	1196.362	374.0000	1137.001
Sum Sq. Dev.	14.53347	788.4444	209.5259
Observations	45	45	45

The descriptive statistics for all three variables are presented in Table 1. A distribution is considered normal if the value of skewness and kurtosis are respectively 0 and 3. From Table 1, it can be seen that skewness values of LRGDP, INF and LM2 are close to 0 and therefore mirror a normal distribution. The values of the standard deviation indicate that inflation and money supply are relatively more volatile compared to real GDP. From the probability values of Jarque-Bera statistic of all three variables, we fail to reject the null hypothesis at 5% level of significance implying that these variables have a normally distributed curve.

4.2 Table 2: Chow Break-Point Test

Chow Breakpoint Test: 1986
Null Hypothesis: No breaks at specified breakpoints
Varying regressors: All equation variables
Equation Sample: 1975 2019

F-statistic	8.671030	Prob. F(3,39)	0.0002
Log likelihood ratio	22.99621	Prob. Chi-Square(3)	0.0000
Wald Statistic	26.01309	Prob. Chi-Square(3)	0.0000

From Table 2, Chow Break-Point Test reveals the presence of structural break at breakpoint 1986, since we fail to reject the null hypothesis of no breaks. So, we introduce a dummy variable D=1, 0 where 1 and 0 respectively signifies existence and absence of structural break. One of the reasons for the existence of structural break at point 1986 could be credited to liberal economic policies that were adopted due to persistent BOP crisis during the early 1980s (Nepal Rastra Bank, 2016). These reforms were introduced in 1987 under the backing of the Structural Adjustment Program (SAP) with the financial support of the IMF. During this decade, major policy changes were also implemented in the form of interest-rate deregulation in 1989; shifting from direct to indirect methods of monetary control, prioritizing Open Market Operations (OMO), and so forth.

4.3 Table 3: Unit Root Test for stationarity

Variable	ADF Test (Intercept)		PP Test (Intercept)	
	Level	First Difference	Level	First Difference
LRGDP	0.9678	-6.0422*	1.2624	-7.3971*
INF	-5.6243*	-4.9261*	-5.7592*	-18.238*
LM2	-0.7568	-4.6933*	-0.9560	-4.7262*

Variable	ADF Test (Trend and Intercept)		PP Test (Trend and Intercept)	
	Level	First Difference	Level	First Difference
LRGDP	-3.1503	-6.1267*	-3.1073	-7.5413*
INF	-5.6374*	-4.9436*	-5.7659*	-23.061*
LM2	-2.4140	-4.7054*	-2.0877	-4.7518*

Note: The presented values are test statistics. " * " indicates that results are significant at 1 percent level.

From Table 3, it can be observed that both ADF and PP tests reveal similar results. LRGDP and LM2 are non-stationary at levels, but become stationary after first difference at 1% level of significance, whereas INF remains stationary at level as well as after first difference. Hence, our series are integrated of order I(0) and I(1), but none of them are I(2) which is prerequisite before applying the ARDL model.

4.4 Table 4: Optimal Lag Length Selection

Endogenous variables: LRGDP INF LM2

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-97.56031	NA	0.027100	4.905381	5.030764	4.951039
1	76.03342	313.3155*	8.85e-06*	-3.123581*	-2.622048*	-2.940950*
2	83.55298	12.47147	9.59e-06	-3.051365	-2.173681	-2.731761
3	90.29413	10.19395	1.09e-05	-2.941177	-1.687344	-2.484600
4	96.98841	9.143407	1.27e-05	-2.828703	-1.198720	-2.235153

Note: " * " indicates lag order selected by the criterion.

Most favorable lag length of the model is obtained by using Vector Autoregressive (VAR) lag order selection criteria. Results from Table 4 have verified that the maximum lag length appropriate for the model is '1', which is chosen on the basis of minimum values generated by each of the criterions. Similarly, Akaike Information Criterion (AIC) also has suggested that 1 lag should be taken for the ARDL model

4.5 Cointegration and ARDL model Results

In order to verify the existence of long-run relationship among the variables under consideration, ARDL bounds test of cointegration is performed on equation (4). The results of this test are shown in Table 5.

4.5.1 Table 5: ARDL Bounds Test for Co-integration

Test Statistic	Value	k
F-statistic	6.508	2
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	3.17	4.14
5%	3.79	4.85
2.5%	4.41	5.52
1%	5.15	6.36

As reported in Table 5, the F-statistic for ARDL bounds test is 6.508, which is greater than lower bound (5.15) and upper bound (6.36) critical values at 1 percent level of significance, indicating that there is adequate evidence to reject the null of no cointegration. This verifies that there exists a long-run relationship between output growth, inflation rate and money supply in Nepal during the period mid-July 1975-2019. In other words, these variables have long-run equilibrium and tend to move together in the long-run. Now the next step is to implement the ARDL model to estimate the long-run and short-run coefficients. The long-run and short-run results of the ARDL(1,0,0) model are reported in Panel A and Panel B of Table 6 respectively.

4.5.2 Table 6: Results of ARDL (1, 0, 0) Model

Panel A: Long Run Coefficients (Dependent variable - LRGDP)

Regressor	Coefficient	Std. Error	t-Statistic	Prob.

INF	-0.003973	0.001789	-2.220354	0.0323
LM2	0.265361	0.005136	51.66765	0.0000
D	0.003410	0.006832	0.499136	0.6205
C	8.426768	1.852000	4.550091	0.0001

Panel B: Short run Coefficients (Dependent variable - ΔLRGDP)

Regressor	Coefficient	Std. Error	t-Statistic	Prob.
Δ(INF)	-0.001677	0.000834	-2.011835	0.0512
Δ(LM2)	0.112012	0.025447	4.401854	0.0001
Δ(D)	0.003410	0.010740	0.317536	0.7525
ECT_{t-1}	-0.422112	0.093168	-4.530652	0.0001

R-squared	0.352650	Mean dependent var	0.043025
Adjusted R-squared	0.321072	S.D. dependent var	0.022666
S.E. of regression	0.018676	Akaike info criterion	-5.057378
Residual sum of square	0.014301	Schwarz criterion	-4.935728
Log likelihood	114.2623	Hannan-Quinn crit.	-5.012264
F-statistic	11.16755	Durbin-Watson stat	2.273875
Prob(F-statistic)	0.000134		

The long-run results reported in Panel A of Table 6 portray a negative relationship between inflation and real GDP, but a positive relationship between money supply and real GDP. The coefficient of inflation is negative and statistically significant at 5 percent level, implying that inflation has a negative effect on economic growth. This result is consistent with the discoveries made by Thirwal and Barton, (1971) and Sergii, (2009) who reported that inflation negatively affects country's GDP if it exceeds 8 percent. In particular, Bhatta, (2015) identified the threshold level of inflation in Nepal to be at 6 percent and contended that, if the inflation rate surpasses this threshold limit, it has a negative effect on output growth. His findings also confirm the result of the present study since the mean inflation rate for the period under investigation (1975-2019) is 8.31 percent as shown in Table 1 (Descriptive statistics). Contrarily, the long-run result associated with money supply is positive and statistically significant at 1 percent level, suggesting that money supply positively affects economic growth in the long-run. This outcome conforms to the study conducted by Shrestha, (2010), Suleiman, (2010), Chaitip et al., (2015). Likewise, coefficient of dummy variable (D) representing structural break is positive, but statistically insignificant.

Panel B of Table 6 illustrates the short-run dynamics of the ARDL (1, 0, 0) model and the results are nearly similar to that of long-run. It can be observed that inflation rate is marginally and statistically significant at 10 percent level, indicating that rate of inflation in the short-run, also has an adverse effect on output growth. However, the coefficient of money supply (M2) is positive and statistically significant at 1 percent level, suggesting that it is beneficial to output growth in Nepal, even in the short-run. Even though coefficient of dummy variable D is positive, it is statistically insignificant. More importantly, the coefficient of ECT_{t-1} is statistically significant at 1 percent level with negative sign as per the expectation of this study. The coefficient of ECT_{t-1} shows the speed of adjustment toward long-run equilibrium if any disequilibrium exists in the short-run. The coefficient of ECT_{t-1} is -0.4221, implying that deviations in the short-run towards the long-run equilibrium are corrected by 42.21 percent each year.

4.6 Table 7: ARDL (1, 0, 0) Model Diagnostic Tests

Diagnostic test	F-statistic	Probability value (p)
Serial Correlation LM Test	F(1,38) = 1.555078	0.2200
Heteroskedasticity Test	F(4,39) = 2.394070	0.0669
Normality	JB =5.016012	0.081430

Diagnostic tests are also carried out to evaluate the adequacy of the model specifications. The results of diagnostic tests of the ARDL (1, 0, 0) model are given in Table 7. The results reveal that long run and short run estimates are free from serial correlation, heteroskedasticity, and non-normality of the error term. The stability of the ARDL parameters is also tested by applying the CUSUM and CUSUMSQ tests developed by Brown, Durbin and Evans, (1975).

Figure 1: Plot of Cumulative Sum of Recursive Residuals

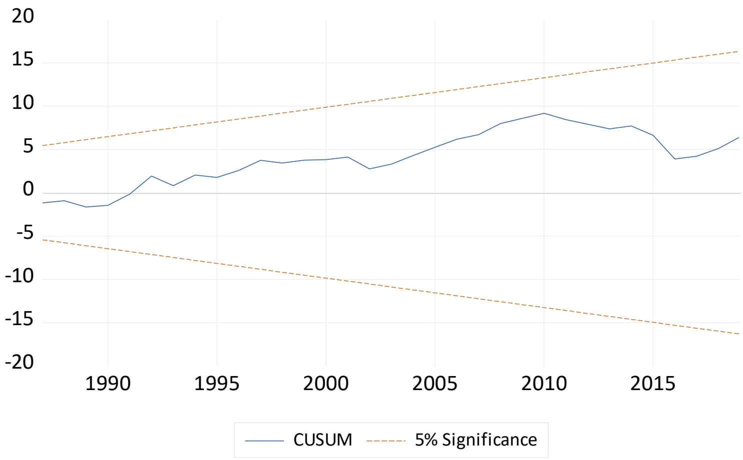

Figure 2: Plot of Cumulative Sum of Squares of Recursive Residuals

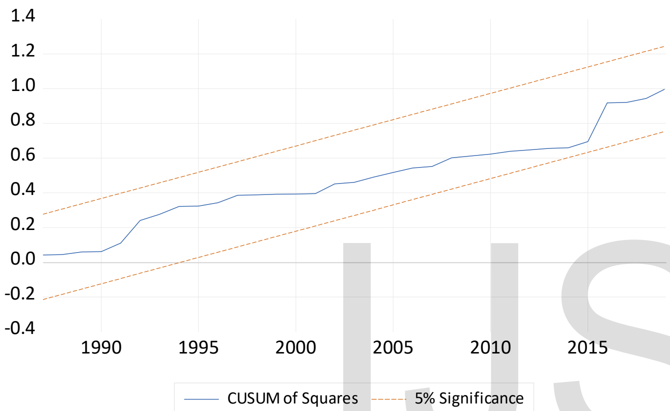

Figure 1 and 2 show plots of the cumulative sum of recursive residuals (CUSUM) and cumulative sum of squares of recursive residuals (CUSUMSQ) respectively. These results depict that the ARDL parameters are stable as graphs of the CUSUM and CUSUMSQ are within the critical bounds at 5 percent level of significance. Thus, the model is stable and confirms the stability of the long-run coefficients of the regressors.

5 CONCLUSION

This paper examines the effect of inflation and money supply on economic growth in Nepal. Results from the ARDL model show evidence of long-run and short-run relationships between economic growth (real GDP) and broad money supply (M2) as well as between economic growth and inflation rate. Based on the findings of this study, it can be concluded that money supply has contributed positively to economic growth in Nepal in the long-run as well as short-run, while inflation has negatively affected economic growth both in long-run as well as short-run. The reason being that average inflation rate for the period under study (1975-2019) is 8.31 percent which is harmful to economic growth according to the study carried out by Thirwal and Barton, (1971), Sergii, (2009) and Bhatta, (2015). To conclude, this study recommends that to stimulate output growth in Nepal, government and central bank should implement expansionary monetary policy along with attempting to maintain a lower rate of inflation.

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