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The Impact of Monetary Policy on Economic Growth in Nepal: An Empirical Analysis

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Abstract
This research study investigates the impact of monetary policy on economic growth in Nepal. Data was taken from the sources of national account of World Bank from the year 1965 to 2020 for this purpose. Augmented Dickey- Fuller unit root test was performedto avoid spurious regression. Johansen co-integration test was applied after conforming all variables were integrated in order I (1) then Vector Error Correction model was used to find out the speed of adjustment towards long run equilibrium. The coefficient of VECM was negative and significant that shows long run relationship between monetary policy and GDP Growth. Granger Causality results show two-way causality between money supply andGDP Growth. The result supports the impact of monetary policy on economic growth of the country. It can reduce unemployment, promote investments and stabilize the economy so monetary authorities and policy makers should focus on healthy monetary policy for economic growth of the country.
Keywords: Co-integration, Exchange rate, GDP growth, Money supply, Unit root
***JEL Classification Code*:** E01, E51, E52, E58,

1. Introduction

The study into the impact of monetary policy on economic growth which is studied with the major concerns is an ongoing issue among the researchers. Lack of consensus found among them generating different views regarding this issue. Economic growth is an increase in national income and level of production by a country over a certain time period. It is also termed as prosperity, economic progress and economic welfare (Joshi, 2022). It is a long run rise in capacity to produce diversified goods and services to the society. The growing capacity is based on technological advancement and institutional and ideological adjustment in demand (Kuznets, 1957). Economic growth refers to the capacity of producing additional goods and services as compared to the previous period. A major goal of every country in this world is sustainable economic growth.Economic growth is possible to be boosted and minimizing diminishing return can be done through the discovery of new ideas and technological advancement (Romer, 1994).

In Neo- classical and Endogenous models, economic growth is the result of accumulation of capital and human capital and technological process which plays a major role is determined exogenously, Solow (1956), Lucas (1988) and Barrow (1991).In new growth theories economic growth is not only attached with physical capital but it is the result of human capital mainly the education which is the major determinant of the standard living differentiation.

Monetarists assert that increase in money supply will not affect GDP Growth but it will affect only on inflation but Keynsians assume that the role of money supply is limited due to liquidity trap and the interest elasticity of investment is low, thus increase in income can lead money demand to rise and rise in money not in opposite (Abou, 2014).

The economic policy of the government integrates the system of government budget, taxation, money supply, the rate of interest, labor market, national ownership etc. (Gnawali, 2019). The economic policy has two dimensions: fiscal policy and monetary policy which are

the major policies used by the policy makers to influence the economy. Monetary policy deals with the actions of central bank regarding money supply and interest rates. It is the manipulation of money supply to influence macroeconomic outcomes such as inflation, GDP Growth, unemployment and exchange rate (Mahara,2020). The macroeconomic environment should be made highly conducive to maintain high investment, saving and economic growth in the economy which are reflected into price stability, interest rate stability and exchange rate stability. One of the objective of monetary policy is economic growth that it is a major means to uplift standard living of the people and achieving it(Timalsina et al., 2014).

Being a developing country,the economic growth is the major concern of the people inthe country and monetary policy is one of the tools of the growth when it is properly formulated and implemented. In this regard, a research question is relevant- what is the impact of monetary policy on economic growth of Nepal? Again there arises the next question what relationship can be found between them? Based on these research questions, the major purpose of the study is to find out the impact of monetary policy on economic growth of Nepal and it also tries to examine the relationship between them. Johansen co-integration test was applied after Augmented Dickey- Fuller Test of unit root. VECM and Granger Causality Test were applied after the test of co-integration in this study.

2. Literature Reviews

In this study, differentliteratureinstances are critically reviewed to obtain the relationship of monetary policy on economic growth in the context of developed and developing countries.Thestudy is difference from other studies that the variables used are different and focused on the impact of monetary policy on GDP growth and the relevant factors are described in the following literature review table.

Concerning the impact of monetary policy on GDP growth and the relevant factors, Gnawali (2019) mentioned that the objective of the study was to investigate the relationship between money supply and economic growth by considering GDP, narrow money (M1), broad money (M2) and foreign assistance as variables , and using the co-integration, VECM and Causality as the research method.

The research study showed that money supply was positively significant and foreign assistance was negatively significant with GDP growth. The objective of the study carried out by Mahara (2020) was to examine the impact of money supply on GDP growth by taking real GDP and broad money supply (M2) as variables, and ARDL Bounds Test as the method. The study revealed the positive and significant relationship between money supply and economic growth in the long run. The research study conducted by Kunwar (2020) aimed to investigate the relationship between money supply and economic growth by employing GDP, broad money and consumer price index as variables, and using ARDL – VECM Model as the method. The research study showed a significant long run relationship between M2 and GDP growth. The objective of the research study executed by Friedman (1974) was to analyze the interaction between monetary policy, the financial sectors and development by holding monetary policy, financial sectors and development as variables , and the special analysis of the roles of the external and financial sector as the method.

The research study revealed that the shocks and size of adjustment in developing countries were greater than in developing countries. A research study conducted by Gorodnichenko et al. (2007) with the purpose of providing an explanation on Fed's success in accommodating growth and stable inflation showed the significant relationship between inflation and inflationary expectation and economic growth. They considered price level, inflation rate and output as variables, and partial price level targeting as the method. The objective of the research study brought forth by Adefeso et al. (2010) was to explain the relationship of fiscal and monetary policy on economic growth and their study indicated that monetary policy had stronger effect on GDP than fiscal policy. Their study employed GDP,

money supply, openness and government expenditure as variables and used co-integration and error correction model as the method. Nouri et al. (2011) carried out a research study to examine the impact of money supply on economic growth by using money supply and economic growth as variables, and ordinary least square as the method. It depicted that money supply had positive impact on economic growth. Chang et al. (2013) carried out a research study to find out the economic growth and social welfare implication of monetary policy by taking per capita consumption, per capita money holding, and price level as variables, and the standard endogenous growth model as the method. The study showed that the expansion in money supply decreased the fertility and increase economic growth. Chaitip et al. (2015) conducted a research study to find out the influence of money supply on economic growth by taking money supply, demand deposit, and GDP Growth as variables, and panel unit root, ARDL model, pooled mean group estimator as the method. The study revealed that money supply was associated with economic growth. The purpose of a research study carried out by Klotz et al. (2014) was to shed light on the role of China's on global price. Their research study involved global commodity prices, economic activity and monetary policy as variables and granger causality and generalized impulse response functions as the method. The study revealed that economic activity granger caused both energy and metal prices. Hussain et al.(2017) carried out a research study to assess the impact of broad money supply on per capita growth of GDP by holding money supply, per capita GDP and real interest rate as variables, and VECM Model as the method. The result showed that the money supply had significant impact on per capita GDP.Doan- Van(2020) conducted a research study to find out the impact of money supply and inflation on economic growth by taking the money supply, CPI and GDP as variables and Correlation and t- test for analysis. The research study showed that the money supply and inflation were closely associated and money supply directly affected economic growth. The study carried out by Li et al. (2020) with the purpose of measuring the monetary policy uncertainty showed that MPU depressed the economy and decreased in output. Their study took monetary policy uncertainty, inflation rate, GDP and money supply as variables and Bayesian MCMC estimation as the method. Shangle et al. (2020) carried out a research study to examine the responses of monetary policy on global oil price changes by using money supply and oil price as variables, and computable general equilibrium model. The study showed thattightened monetary policy was ineffective to reduce negative effects of the shocks in economic growth but expansionary policy had positive impact on growth. A research study carried out by Mohseni et al. (2020) with the objective of investigating the effect of monetary policy on economic growth showed that monetary expansion in inflation is complete in two assets model and incomplete in three assets model. The variables in the study were two assets model and three assets model and the research model was money supply, inflation and GDP growth.

3. Materials and Methods

The study is based on macroeconomic variables such as GDP growth, money supply, exchange rate, foreign exchange reserve and gross fixed capital formation. It is a descriptive and analytical study based on the data from the source of national account of World Bank from 1965 to 2020. For long run relationship Johansen co-integration test is applied after Augmented Dickey- Fuller unit root test. Then Vector Error Correction Model is used to test speed of adjustment and Granger Causality test is applied to find the mutual causality between the variables.

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Table 2 *Variables Description*

S.N.	Notations	Variables	Units of Measurement
1	GDP	Gross Domestic Product	Natural Logarithm
2	M2	Broad Money Supply	Natural Logarithm
3	EXR	Average Exchange Rate	Natural Logarithm
4	FER	Foreign Exchange Reserve	Natural Logarithm
5	GCF	Gross Fixed Capital Formation	Natural Logarithm

Theoretical Base

The Quantity Theory of Money in its classical and neoclassical form is the base of this research study. The equation including neoclassical form of this theory is:

$$MV = PT$$

Where, M = money supply, V = velocity of circulation, P = price level and T = physical volume of transaction in the market.

The Cambridge cash balance equation is

$$M = kPy$$

Where, M = stock of money, k = cash balance ratio P = price level and y = real national income.

Harrod-Domar's Growth Model (Keynesian Model)

The economic growth model explained by Harrod (1939) and Domar(1946) is the growth rate of output is determined by capital output ratio and rate of growth of saving which can be denoted as:

$$\frac{\Delta Q}{Q} = \frac{s}{k}$$

Where, Q = output, s = ratio of saving to output and k = capital output ratio that saving is a portion of national income S = sQ and k = $\frac{K}{Q}$ having no excess capacity in the economy I = S.

Solow Growth Model (Neoclassical Model)

In neoclassical model, thecapital accumulation and saving decision are taken as determinants of economic growth. In neoclassical model Solow (1956) model explains that long run per capita growth solely depends on advancement of technology where short run growth depends on technological progress and capital accumulation. In this model, labor and capital are combined in varying proportion where some portion of capital is saved and then invested. Labor force grows with an exponential rate and there is no excess capacity leads to saving and investment equality. In the same way, investment is taken as the change in capital stock where technology is an exogenous factor.

We can show that this occurs when the marginal product of capital equal $(\delta + \lambda)$

$$sQ^* = (\delta + \lambda)k^*,$$

where k* indicates steady state equilibrium value and $\frac{dk}{dt} = sQ - (\delta + \lambda)k^* = 0$ shows the steadystatewith population growth is λ.

Endogenous Growth Model

In Endogenous growth model- Kaldor's (1957) model states technology is an endogenous factor that is the function of investment. According to him more an economy invests and save the rate of growth will be higher.

Technology = f (Investment)

In the growth model of Arrow (1961) emphasis on 'learning by doing' and explains the long run growth is the result of investment, size of capital stock and human capital.

The model by Tobin, (1965) asserts that individuals will switch present consumption for future either by holding money or the process of acquiring capital. Inflation cause

individuals to substitute money into interest earning assets that leads to capital accumulation and economic growth.

Model Specification

In this study, GDP Growth is taken as dependent variable and broad money supply, exchange rate, foreign exchange reserve and gross fixed capital formation are the explanatory variables. The impact of monetary policy on economic growth is specified by the following model as:

$GDP_t = f(M2_t, EXR_t, FER_t, GCF_t)$ ----------(1)

The model mentioned above can be presented as follows:

$$GDP_t = \beta_0 + \beta_1 M2_t + \beta_2 EXR_t + \beta_3 FER_t + \beta_4 GCF_t + \varepsilon_t \text{----------(2)}$$

Where, GDP_t= GDP Growth Rate, $M2_t$ = Broad Money Supply, EXR_t = Average Exchange Rate, FER_t = Foreign Exchange Reserve, GCF_t = Gross Fixed Capital Formation and ε_t = Error Term

The model is transformed into log form to reduce the problem of heteroskedasticity and can be mentioned as:

$$LNGDP_t = \beta_0 + \beta_1 LNM2_t + \beta_2 LNEXR_t + \beta_3 LNFER_t + \beta_4 LNGCF_t + \varepsilon_t \text{---------- (3)}$$

Unit Root Tests

The unit root test is employed to test the stationary situation of the variables. When the variables have unit root they are termed as non- stationary. Various tests are available to test unit root but other tests have some alteration to allow for auto correlated residuals and Augmented Dickey- Fuller test is applied in this study. Stationary is the situation of constant mean, constant variance and constant auto- covariance for each lags.

Unit root test is also helpful in removing the effects of spurious regression. Spurious regression is a condition where higher R- square is obtained but the variables have no connection. It is a fallacy of ordinary regression analysis when simple regression is taken and significant result isobtaineddespite the variables are non- stationary. The regression equation of unit root test is:

$$\Delta LNGDP_t = \beta_1 + \beta_2 t + \delta LNGDP_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta LNGDP_{t-1} + \varepsilon_t \text{ ---------- (4)}$$

Where $\Delta LNGDP_{t-1} = LNGDP_{t-1} - LNGDP_{t-2}$ and t denotes for trend.

Johansen Co-Integration Test

After unit root test Johansen co-integration test is applied to find co-integration between the variables when all the variables are integrated in I(1) order. Co-integration is a statistical property of time series that it is applied to test long run relationship in the absence of Ordinary Least Square (OLS). When the variables are non- stationary at level but found stationary at first difference the co- integration test is applied. If different time series are stationary after differencing and two or more time series are integrated in order I(1) then Johansen co-integration is a way to find co-integration between the variables.The test is applied on the base of Schwartz Bayesian Criteria selecting minimum lag length and can be applied in the following model:

$$\Delta GDP_t = A_0 + \pi GDP_{t-1} + \pi_1 \Delta GDP_{t-1} + \varepsilon_t \text{ ---------- (5)}$$

Johansen test is a likelihood test and it is divided into two test i) Trace Test and ii) Maximum Eigenvalue test.

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{g} \ln(1 - \lambda_i) \text{ ---------- (6)}$$

$$\lambda_{max}(r) = -T \ln(1 - \lambda_{r+1}) \text{ ---------- (7)}$$

Vector Error Correction Model

A long run equilibrium can be obtained by using a given model, but there can be disequilibrium prevailed in the short run. VECM is the way to correct disequilibrium in the

short run that measures the speed of adjustment towards long run equilibrium. It is measured for short run and long run dynamics of the model.

$$\Delta LNGDP_t = \alpha_{01} + \sum_{i=1}^{j} bi\Delta LNGDP_{t-1} + \sum_{i=1}^{m} ci\Delta LNM2_{t-1} + \sum_{i=1}^{p} ei\Delta LNEXR_{t-1} \sum_{i=1}^{q} fi\Delta LNFER_{t-1} + \sum_{i=1}^{r} gi\Delta LNGCF_{t-1} + \lambda e_{t-1} + \varepsilon_t \quad \text{-------} \quad (8)$$

The error correction term is e_{t-1} and λ is the coefficient that shows the speed of adjustment in the short run towards long run equilibrium.

Granger Causality Test

Granger causality test is used to find out the direction of causality between money supply and economic growth in Nepal. It is important for policy makers to point out the source of causality or influence and the result of policy implementation. The granger causality model can be mentioned as:

$$LNGDP_t = \sum_{i=1}^{p} b1iLNGDP_{t-1} + \sum_{i=1}^{p} c1iLNM2_{t-1} + \sum_{i=1}^{p} d1iLNEXR_{t-1} + \sum_{i=1}^{p} e1iLNFER_{t-1} + \sum_{i=1}^{p} f1iLNGCF_{t-1} + \varepsilon_t \quad \text{---- } (9)$$

$$LNM2_t = \sum_{i=1}^{p} b1iLNGDP_{t-1} + \sum_{i=1}^{p} c1iLNM2_{t-1} + \sum_{i=1}^{p} d1iLNEXR_{t-1} + \sum_{i=1}^{p} e1iLNFER_{t-1} + \sum_{i=1}^{p} f1iLNGCF_{t-1} + \varepsilon_t \quad \text{----} (10)$$

Where, LN = natural log, p = maximum lag length and $\mathcal{E}_t$ = stochastic error term.

Empirical Results:

The empirical results are presented using time series data after various econometric tests. Augmented Dickey- Fuller test was used to find out the stationary situation of the series then Johansen co-integration test is run after confirming all variables are integrated in I (1) order. VECM model helps to find the short run and long run relationship in the model and Granger causality tests the causality between the variables.

Unit Root Test Results

Augmented Dickey- Fuller test was performed to find the stationary situation of the variables. It is implied for unit root test. The test indicates that all the variables in the model were found non stationary in level but they are stationary in first difference signifies integrated in order I (1). The result of unit root test is presented in table 1.

Table 3 *Unit Root Test*

Variables	At Level		At First Difference	
	t-Statistics	P-Value	t-Statistics	P-Value
LNGDP	0.486246	0.9848	-7.235130***	0.0000
LNM2	-0.580894	0.8661	-8.749989***	0.0000
LNEXR	-0.961357	0.7606	-5.463808***	0.0000
LNFER	-0.292178	0.9189	-5.722210***	0.0000
LNGCF	-1.796023	0.3787	-9.266812***	0.0000

*Note. ***, ** and * indicate significant at 1%, 5% and 10%*

Unit root test helps to find the situation of stationary of the data so Augmented Dickey- Fuller test is run to confirm unit root in the model. The test can help in avoiding

spurious regression effect and find co-integration between the variables. Result shows the null hypothesis is rejected and alternative hypothesis is accepted at 1% level of significance indicating all variables are non- stationary at level and stationary at first difference.

Johansen Co-Integration Test Result

Johansen co-integration test was used to find the co-integration that establishes the long run relationship between dependent and independent variables. It was applied after unit root test confirming all variables were integrated in order I (1). Augmented Dickey- Fuller test result shows the variables were non- stationary at level and found stationary in first difference so Johansen co-integration test is run.

Table 4 *Johansen Co-Integration Test*

Date: 06/09/22 Time: 13:30
Sample (adjusted): 1967 2020
Included observations: 54 after adjustments
Trend assumption: Linear deterministic trend
Series: LNGDP LNM2 EXR LNFER LNGCF
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.532234	86.84291	69.81889	0.0012
At most 1	0.348177	45.81436	47.85613	0.0768
At most 2	0.263036	22.70336	29.79707	0.2609
At most 3	0.092875	6.221691	15.49471	0.6693
At most 4	0.017585	0.958056	3.841466	0.3277

Trace test indicates 1 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.532234	41.02855	33.87687	0.0059
At most 1	0.348177	23.11100	27.58434	0.1688
At most 2	0.263036	16.48167	21.13162	0.1980
At most 3	0.092875	5.263635	14.26460	0.7083
At most 4	0.017585	0.958056	3.841466	0.3277

Max-eigenvalue test indicates 1 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Result of Johansen co-integration test confirms the variables are co-integrated in the model. Both Trace statistics and Max-Eigenvalue statistics are significant at 5% level that proves the co-integration of GDP growth with broad money, exchange rate, foreign exchange reserve and gross fixed capital formation. It signifies a stable long run relationship between GDP Growth and all independent variables so that VECM and Granger Causality tests can be implied for further tests.

Vector Error Correction Model (VECM)

Vector Error Correction Model was run after co-integration test. Result from Johansen co-integration test confirms the existence of co-integration between dependent and

independent variables. The variables were integrated in order I (1) supporting the long run relationship after that VECM model is performed for further test.

Table 5 *Vector Error Correction Model*

Vector Error Correction Estimates
Date: 06/09/22 Time: 13:19
Sample (adjusted): 1967 2020
Included observations: 54 after adjustments
Standard errors in ( ) & t-statistics in [ ]

CointegratingEq:	CointEq1
LNGDP(-1)	1.000000
LNM2(-1)	-1.602511 (0.39103) [-4.09817]
EXR(-1)	0.011216 (0.00239) [4.69731]
LNFER(-1)	-0.850176 (0.13331) [-6.37751]
LNGCF(-1)	0.649110 (0.26814) [2.42076]
C	-1.079702

Error Correction:	D(LNGDP)	D(LNM2)	D(EXR)	D(LNFER)	D(LNGCF)
CointEq1	-0.181244 (0.03376) [-5.36804]	0.110988 (0.04169) [2.66191]	3.500985 (3.74175) [0.93565]	0.279843 (0.07225) [3.87352]	-0.107037 (0.07408) [-1.44487]
D(LNGDP(-1))	-0.277079 (0.13680) [-2.02549]	-0.023638 (0.16893) [-0.13993]	29.73747 (15.1601) [1.96156]	-0.134847 (0.29271) [-0.46069]	-0.118056 (0.30014) [-0.39333]
D(LNM2(-1))	-0.293922 (0.14468) [-2.03151]	-0.046946 (0.17867) [-0.26276]	13.42456 (16.0339) [0.83726]	-0.024578 (0.30958) [-0.07939]	-0.235487 (0.31744) [-0.74182]
D(EXR(-1))	-0.004261 (0.00136) [-3.13743]	-0.001377 (0.00168) [-0.82119]	0.349572 (0.15050) [2.32274]	-0.000479 (0.00291) [-0.16491]	-0.002300 (0.00298) [-0.77205]
D(LNFER(-1))	0.020966 (0.05957) [0.35195]	0.070792 (0.07356) [0.96233]	0.904713 (6.60168) [0.13704]	0.521548 (0.12746) [4.09172]	-0.053860 (0.13070) [-0.41208]
D(LNGCF(-1))	0.108523 (0.06602) [1.64374]	0.005679 (0.08153) [0.06965]	-5.449671 (7.31671) [-0.74483]	0.009052 (0.14127) [0.06408]	-0.279055 (0.14486) [-1.92639]
C	0.048968 (0.00877)	0.022894 (0.01083)	0.245422 (0.97228)	0.029070 (0.01877)	0.033120 (0.01925)

	[5.58151]	[2.11310]	[0.25242]	[1.54855]	[1.72055]
R-squared	0.504523	0.174000	0.154579	0.367448	0.126860
Adj. R-squared	0.441271	0.068553	0.046652	0.286697	0.015395
Sum sq. resids	0.038367	0.058510	471.2133	0.175665	0.184704
S.E. equation	0.028571	0.035283	3.166357	0.061136	0.062689
F-statistic	7.976356	1.650122	1.432263	4.550374	1.138113
Log likelihood	119.1146	107.7209	-135.1135	78.03762	76.68295
Akaike AIC	-4.152394	-3.730404	5.263463	-2.631023	-2.580850
Schwarz SC	-3.894563	-3.472573	5.521294	-2.373192	-2.323019
Mean dependent	0.029066	0.021527	2.050517	0.044563	0.014241
S.D. dependent	0.038224	0.036558	3.242905	0.072386	0.063177

Determinant resid covariance (dof adj.)	7.74E-11
Determinant resid covariance	3.86E-11
Log likelihood	264.2560
Akaike information criterion	-8.305779
Schwarz criterion	-6.832457
Number of coefficients	40

The result of vector error correction model explains the positive impact of exogenous variables where R- square represents the explanatory power of the model. The value of R-square is 0.5045 in which the independent variables explains this model by 50.45%. The coefficient of VECM was negative and significant at 5% level. The coefficient 0.1812 is the speed of adjustment indicates the model was changing towards long run equilibrium by 18.12%. It shows the evidence of the long run relationship between money supply and economic growth of the country.

Serial Correlation Test

For serial correlation test Breusch- Godfrey LM test was conducted in the model. It can predict whether the residuals are auto-correlated or not. The result of the test is presented in the table below.

Table 6 *Serial Correlation LM Test*

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.266637	Prob. F(1,46)	0.0772
Obs*R-squared	3.580484	Prob. Chi-Square(1)	0.0585

The result of Breusch- Godfrey Serial correlation LM Test is presented in table 4 that explains the model has autocorrelation or not. Test shows F- statistics and Obs R- squared is greater than 5% rejecting null hypothesis signifies the model is free from serial correlation.

Heteroskedasticity Test

The model assumes constant variance. If the model has no feature of homoscedasticity, the model has no longer BLUE properties. The result of Breusch- Pagan-Godfrey test is given the table below. It helps to find the presence of heteroskedasticity in the model.

Table 7 *Heteroskedasticity Test*

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.749033	Prob. F(10,43)	0.1004
Obs*R-squared	15.61370	Prob. Chi-Square(10)	0.1112
Scaled explained SS	12.07452	Prob. Chi-Square(10)	0.2801

In the result of the test the probability of Chi- Square value is greater than 5%.The null hypothesis that there ishomoskedacity is not rejected at 5% level of significance that means there is no presence of heteroskedacity.

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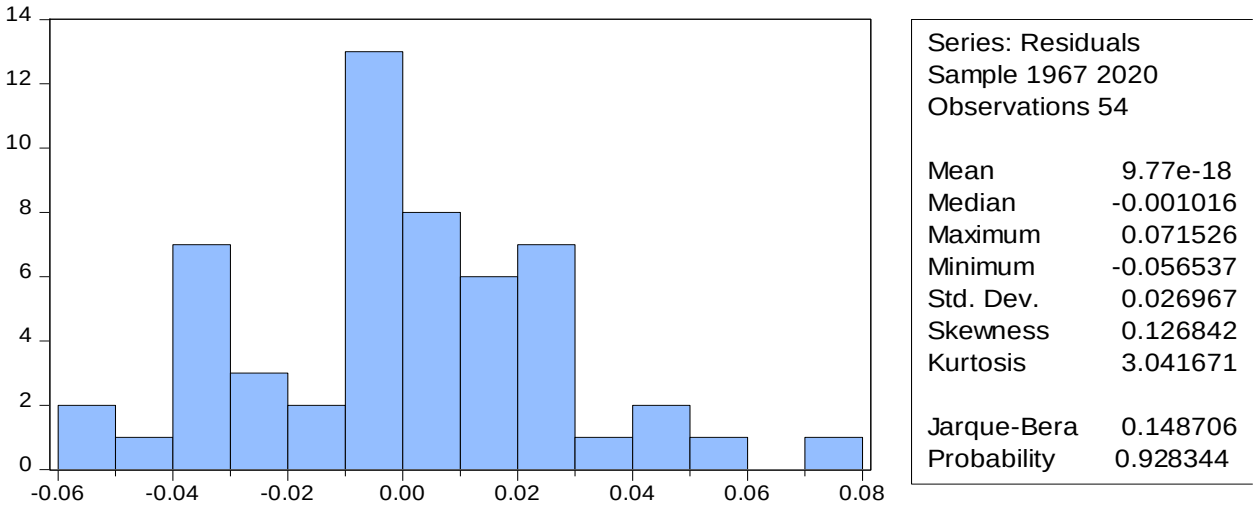
Normality Test

Histogram normality test shows the residuals were normally distributed. For normality test Jarque- Bera statistics was observed that conform the normality conditions of error terms. If the value of this test is greater than 5% we accept the null hypothesis that signifies the residuals are normally distributed.

Figure 1: *Jarque- Bera Normality Test*



In the table 6 Jarque- Bera statistics is 0.148706 with p-value 0.928344 which is greater than 5% level of significance. It indicates that the null hypothesis is accepted that the residuals are normally distributed.

Granger Causality Test

Granger causality test is the way to find one way or two-way causation exists in the regression model. It helps to obtain the source of influence of the variables. Pairwise Granger Causality test of GDP growth with all independent variables are performed and presented in the table below.

Table 8 *Granger Causality Test*

Pairwise Granger Causality Tests
Date: 06/09/22 Time: 13:22
Sample: 1965 2020
Lags: 1

Null Hypothesis:	Obs	F-Statistic	Prob.
LNM2 does not Granger Cause LNGDP	55	7.97058	0.0067
LNGDP does not Granger Cause LNM2		5.87040	0.0189

Table 7 presents the result of pairwise Granger Causality test that expresses the direction of causation in the regression. There wasa two- way causality obtained between money supplyand foreign exchange reserve withGDP growth. One-way causality existed from exchange rate to GDP growth and no causality was found between gross fixed capital formation and GDP growth. All independent variables except gross fixed capital formation granger caused GDP growth in this model.

4. Conclusion

The objective of this study is to investigate the impact of monetary policy on economic growth of Nepal. For this purpose, GDP growth is taken as dependent variable and money supply, exchange rate, foreign exchange reserve and gross capital formation are taken

as independent variables to show the long run and short run relationship. The study applies Johansen co-integration test to find long run relationship between the variables. It is used after Augmented Dickey- Fuller unit root test to remove the effect of spurious regression in the model. All variables are found non- stationary at level and found stationary at first difference so that Johansen co-integration test is implied to test the co-integration. After conforming all variables are integrated in I (1) order then vector error correction model is used to find the speed of adjustment in the short run towards long run equilibrium. The coefficient of VECM is negative (-0.181244) and significant at 5% significance level that shows the model is adjusting by 18.12% towards long run equilibrium. It is the evidence of long run relationship between monetary policy and economic growth of the country. The results of granger causality show the direction of causality between the variables. Money supply and foreign exchange reserve have two-way causality with GDPgrowth and one-way causality exist from exchange rate to GDP growth but no causality is obtained between gross capital formation and GDP.It is found that all variables granger cause GDP but gross capital formation does not show the direction of causation with GDP growth. The result of various test proves the short run and long run relationship between monetary policy and economic growth that shows monetary authorities and policy makers should focus on these variables for the sound economic growth of the country. Central bank should focus on short run and long run monetary policy for economic growth(Mahara, 2020). Increase in broad money supply in a certain threshold level is healthier for economic growth of the country (Joshi, 2021).Policy makers should emphasize on economic growth through long run policies and monetary policy mechanism.

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