RELATIONSHIP BETWEEN INFLATION AND MONEY SUPPLY IN NEPAL

A Thesis

Submitted to the

Central Department of Economics

Faculty of Humanities and Social Sciences, Tribhuvan University

In Partial Fulfillment of the Requirement for the Degree of

Master Degree of Arts

In

Economics

By

Sudip Khanal

Roll No.: 33/073

TU Regd. No.: 6-2-40-325-2013

Central Department of Economics

Kirtipur, Kathmandu, Nepal

Feburary 2021

DECLARATION

I, Sudip Khanal, declare that this is my original work. No part of it was earlier submitted by the candidate of research degree to any university.

………………………………………

Date: 2077/11/06   Sudip Khanal

ACKNOWLEDGEMENT

First of all, I would like to express my sincere gratitude to my thesis supervisor Prof. Ram Prasad Gyanwaly, Ph.D. Central Department of Economics, Tribhuvan University for his continuous guidance, enlightening ideas and invaluable suggestion in preparation of this thesis.

I am extremely grateful to Prof. Shiva Raj Adhikari, Ph.D. Head of Department, for encouraging me during this research work. Similarly, I am highly thankful to Assoc. Prof. Yogesh Ranjit, Ph.D, Acting Head of Department, for his suggestion and encouragement .I am equally grateful and gratitude to all my teachers of department. Without their support, encouragement and constructive suggestion from the beginning, it would not be possible to come up with this thesis in entirely accurate and clear form. I am also grateful to administration and all staff of department for kind co-operation, making healthy environment from very beginning to the end of the work.

I express my indebtness to my friend Mr. Nawaraj Bhatta for helping me tireless, kind co-operation and proof reading; Mr. Manab Prakash for encouraging me for continuity in study. Similarly, I am fully indebeted to grandfather Mr. Gangaram Khanal my parents Mr. Laxman Khanal, Mrs. Kalawati Khanal, Sisters Mrs.Deepa Khanal, Mrs. Sapana khanal and brother-in-laws MR.Arjun Dahal.for their blessing, inspiration and support to my study. I am grateful to my friends Mrs. Prasamsha Kattel, Mr. Tilak Kshtri, Mr. Bidur Poudel, Mrs. Suprabha Thapaliya, Mr. Nabin Neupane, Mrs. Sakila Gautam, Mrs. Melina Kharel, for their assistance in finding relevant material and engaging me in fruitful discussion.

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS

ADF Test	-	Augmented Dickey Fuller Test
BD	-	Budget Deficit
ECM	-	Error Correction model
EXC	-	Exchange rate
CPI	-	Consumer Price Index
CUSUM	-	Cumulative Sums
F.Y.	-	Fiscal Year
GDP	-	Gross Domestic Product
M2	-	Broad Money Supply
MoF	-	Ministry of Finance
NRB	-	Nepal Rastra Bank
OLS	-	Ordinary Least Square
GDP	-	Gross Domestic Product
SAP	-	Structural Adjustment Program
WB	-	World Bank
WTO	-	World Trade Organization

ABSTRACT

This study examines short term and long term effect of money supply on the inflation in Nepal during 1975-2019. The variables considered are consumer price index of Nepal, broad money supply, real GDP, nominal GDP, budget deficit, exchange rate and Indian consumer price index. The regression results from Engle-Granger Co-integration test and Error Correction model suggest that money supply has significant relation with inflation in both short and long run. However, money supply has higher impact in short run compare to long run. The result are consistent with classical Quantity theory of money and monetarist hypothesis on inflation.

_____

Keywords: Inflation, Money supply, Engle-Granger Co-integration, ECM,

TABLE OF CONTENT

CHAPTER I

INTRODUCTION

1.1 Background of the study

Inflation can be defined as a sustained increase in the general price level of goods and services in an economy over a period. It also reflects a reduction in the purchasing power per unit of money. A higher level of Inflation in any economy is considered an economic hazard because it affects the nation's economic stability. A mild inflation is considered to be desirable for economic growth and development. However, in general, high and variable inflation leads to uncertainties in income and expenditure decisions of the different groups of the society; distorts economic growth and development; lowers saving and investment; and makes high cost of capital. High inflation is more likely to raise unemployment than to lower it. It is universal fact that a higher rate of inflation brings about volatility and ultimately paves the way for distortion in optimum allocation of resources in the economy

Inflation can be divide into four categories by their speed. They are creeping, walking, galloping, and hyperinflation. Creeping or mild inflation is a situation when prices rise 3% per year or less. According to the Federal Reserve, when prices increase 2% or less, it benefits economic growth (Reserve, 2020). Inflation in between 3-10% a year is known as walking level of inflation. It has strong reaction to the economy. When inflation rises to 10% or more it is said to be galloping level of inflation. Hyperinflation aries when prices rise more than 50% a month. It is a very rare type of inflation. Examples of hyperinflation include Germany in the 1920s, Zimbabwe in the 2000s, and Venezuela in the 2010s (Louis, 2020) .

inflation can also be divide into two categories by their causes, they are demand-pull inflation and cost-push inflation or supply-side inflation. Demand-pull inflation can be defined as an increase in the general price level caused by an increase in demand at a time when an economy cannot increase production because it is at full employment or unable to increase production fast enough to keep pace with the increase in demand. When aggregate demand is higher than aggregate supply than demand-pull inflation condition arise.

Supply-side inflation or cost-push inflation is an increase in the general price level due to increased costs of production. The scarcity of resources increases the price of raw material, it decreases supply and increases the cost of production this creates the situation of inflation. Similarly, when there is a rise in wage rate without improving productivity because of higher bargain power of trade union or other factors that increases the cost of production. At that time production is constant this increase the price of good and services.

inflation simply can be define as a persistent and appreciable rise in the general price level (Shapiro, 2001). Inflation means an increase in the overall price of all commodities of an economy for some consistent period. Inflation can be defined as the persistent rise in the general price level across the economy over time (Nepal Rastra Bank, 2007). Inflation is the most serious and most concerned matter at present in economic debate. Capitalists or socialists economic theory concern inflation as a serious economic disturbance and they make suitable policies to tackle it. Inflation has a serious effect on the economy, it causes an increase in the price of the commodity, and price increase has a negative effect on employment, output, and income. So inflation in any economy is taken as a serious problem.

The money supply is the aggregate stock of currency and notes available in an economy at a point of time. Money supply represents the stock of money at a certain point of time. It is obtained by summing up financial assets that can perform functions of money such as the medium of exchange and store of value. The money supply process explains the creation of such a money stock in the economy (Shrestha, 2013). An increased volume of money has a positive impact on inflation. Economic theories found that when money supply is increased by central monetary authority then the volume of cash in hand of people increased this cause increase in the general price level. The money supply in Nepal is regulated by Nepal Rastra Bank. Generally, there are two types of money they are narrow money and broad money. Narrow money, which is denoted by M1 include cash hold by people in their hands and pockets and demand deposit in BFIs. Another type of money is broad money (denoted by M2) which includes M1 plus time deposit by people.

The classical economic perspective is not concerned with any economic disturbance like inflation because this theory is based on full employment and open market assumption. Two major pillars like 'Quantity theory of money' and 'Says law of market' strongly advocate that if market forces are operated without any intervention then there are no economic problems like over and under production, increase and decrease in price, etc. But classical economist believes if government intervene in the economy then there is some chance of economic disturbances but they do not indicate the disturbance is inflation.

After the great depression and arise of Keynesian economic thought, which is based on under full employment economy mainly focus on inflation as an endogenous variable of the economy. Keynesian economic thought defines inflation as a condition that arrives only after when the economy reaches full employment conditions and the price level is increased.Milton Friedman, father of monetarism view argue that inflation is fully and perfectly a monetarist phenomenon by providing theoretical and strong casual relation, monetarist provide that inflation can arise in the economy because it is caused by endogenous variable like money supply, interest rate, etc.

Historical evidence shows that a constant rise in money growth is directly proportional to the rise in prices. The world's major hyperinflation episodes such as Hungary (August 1945 – July 1946), Zimbabwe (March 2007 – November 2008), Yugoslavia (April 1992 – January 1994), Germany (August 1922 – December 1923), and Greece (May 1941 – December 1945) were primarily associated with an excessive supply of money by the government (Hanke & Krus, 2012). So, it can be concluded that money supply and price are related to each other.

1.2 Statement of the Problem

Money supply has an important and major effect on inflation. There is a strong correlation between money supply and price level. The direction of causality, however, has long been a matter of controversy. The quantity theory of money strongly advocates that there is a positive relationship between money supply and price level. monetarist believes that inflation is a monetary phenomenon and they advocates on the closed economic variable are a major determinant factor of inflation. When there is an increase in money supply by either increase in cash hold by people or cash deposit on the bank

and financial institution. Many studies find out the money supply as a major determinant of inflation in Nepal. Based on previous studies on inflation, this study believes that the money supply has an important effect on inflation. To acquire the knowledge of the relation between money supply and inflation in Nepal, the following research question is developed:

a) What is the trend and nature of inflation and money supply in Nepal ?

b) How money supply and inflation is related in Nepal ?

1.3 Objectives of the Study

The general objectives of the study is to analyze the relation between money supply and inflation. Where the specific objective of the study is given as below:

1. To analyse trend and nature of inflation and money supply in Nepal.

2. To examine the relationship between money supply and inflation in Nepal.

1.4 Hypothesis of the study

Based on the above objective of the study, and to answer the research question following hypothesis is tested:

1. H_0: There is no short-run relation between money supply and inflation.

   H_1: There is short-run relation between money supply and inflation.

2. H_0: There is no long-run relationship between money supply and inflation.

   H_1: There is long-run relation between money supply and inflation.

1.5 Significance of the Study

Inflation is a burning issue of economic science because it can cause a serious effect on the overall economy. Inflation is harmful for developing and developed economies. Many countries are affected, some are collapsed because of hyperinflation. Inflation distorts the smooth functioning of the economy. The monetarist economist believes that money supply has a more responsible factor for inflation. When monetary authority

increases the size of the money supply more then its target level then it's supposed to increase the inflation rate. This study tries to establish the relation between money supply and inflation in Nepal. By researching this matter this study helps make suitable policies for controlling inflation.

1.6 Limitations of the Study

Every study faces a different type of limitations. The study has some limitations on its scope and coverage. The study also limited by taking only few counter variables like gross domestic product, budget deficit, Indian inflation, exchange rate that affect inflation in Nepal. Another limitation of this study is, data is taken only from NRB and World bank data set . So, the variable definination might be different with other definition.

1.7 Organizations of the Study

This study has been carried out in five chapters. First chapter includes the introduction chapter. There are six sub-sections within first chapter as background of the study, statement of the problem, objectives of the study, significance of the study, limitations, and organization of the study. Second chapter includes the literature review and it consists of subsections as theoretical literature review, empirical literature review, and research gap, under the section of empirical review there are two subsection they are international context and Nepalese context.

Third chapter involves the research methodology and it consists of subsection as the selection of variables, sources of data, sample period covered, empirical linear model, econometric modeling, diagnostic tests and other criterion for applying model. Fourth chapter includes descriptive analysis of structure and fluctuation of money supply and inflation in Nepal. Fifth chapter include empirical analysis of relationship between money supply and inflation in Nepal. Summary, finding, conclusion and recommendations are well mentioned in the last chapter.

CHAPTER II

LITERATURE REVIEW

Literature review is the act of revising the previous literature which is related to the subject matter. Literature review helps to find out research gap hence to generate research questions. Literature review includes a review of different article, thesis, dissertation and different article, etc. This chapter includes theoretical review, empirical review where international context, as well as Nepalese context is included and research gap.

2.1 Theoretical literature

The relation between money supply and inflation has a strong theoretical base. From classical to current economic thought price and money supply relation is taken as a prior concern. Theoretical review on price and money supply is given as below.

2.1.1 Quantity theory of money

The classical quantity theory of money is developed by Iriving Fisher. The quantity theory of money is base on classical economic thought. According to this theory, other things remaining the same the increase in the volume of money supply increases the general price levels proportionately and thereby decreases the value of money. This theory is based on a full employment assumption. Classical and neoclassical economists believe that the only way to price rises and hence inflation is through the oversupply of the quantity of money in the economy (Nepal Rastra Bank, 2007). If the money supply increase by double then the general price level increase doubled and decrease the value of money. Where money plays as a means of transaction only. The well-known equation of quantity theory of money is given as

$$MV = PY \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \quad (1)$$

Where,

M = Money supply

V = Velocity of money, which represent that how many the money is used for transaction

6

$$P = \text{General price level}$$
$$Y = \text{Real Income}$$

P = General price level

Y = Real Income

The quantity theory of money assumes full employment in the economy. Velocity of money also remains stable at least in the short-run, Hence both Y and V do not change. (Nepal Rastra Bank, 2001). Now solving for P with assuming both Y and V as constant we get:

$$P = M\bar{V}/\bar{Y} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (1.\,a)$$

Where bar on the variable indicates as constant.

As V and Y assume to be constant we can write the equation 1.a as below:

$$P = f(M) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \quad (1.\,b)$$

So the quantity theory of money shows that price and money supply have propositional relations. Changes in money supply affects the general price level. The Classical Quantity theory of money is presented in the following figure:

Figure 2.1: The Classical Quantity theory of money

Figure Source: https://www.economicsdiscussion.net
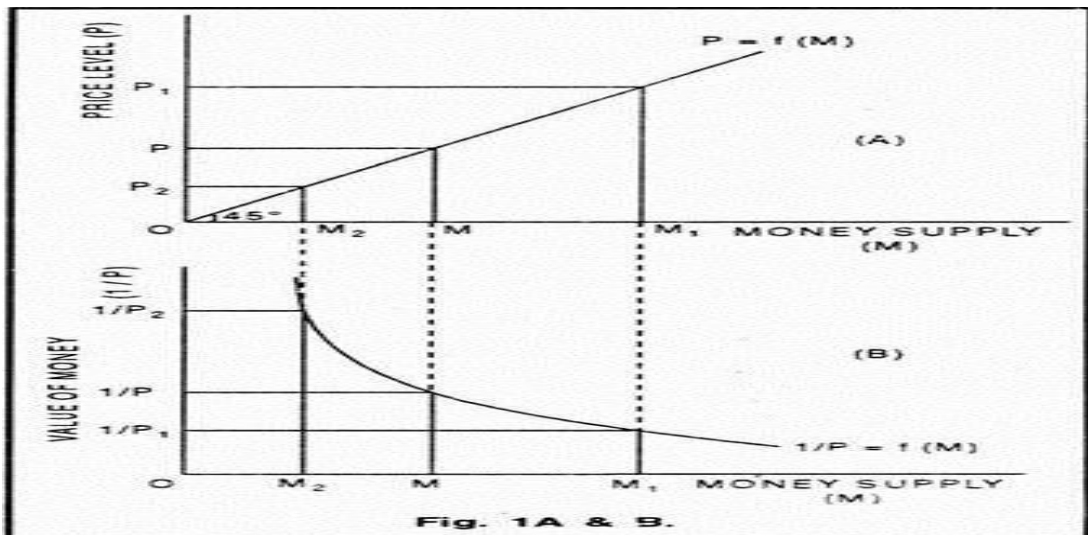
In figure 2.1, Fig 1A shows the relation between the price level and money supply which is directly proportional shows by 45-degree line. When money supply doubles from OM to OM1. The price level is also double from OP to OP1. In Fig 1B value of

money and money supply is presented. The rectangular hyperbola curve showing an inverse proportional relation between the money supply and the value of money. When the money supply increase from OM to OM1 the value of money is halved from O1/P to O1/P2.

So the classical quantity theory money state that money supply has direct proportional relation with the price and inverse relation with the value of money.

2.1.2 Keynesian view on money and price relationship

The classical Quantity theory of money is criticized over time. The speculative motive of money demand is ignored, investment good are ignored, the role of real factor and interest are ignored are some major criticism that classical Quantity theory of money faced. The classical quantity theory of money maintains that there is a direct and proportional relation between the quantity of money and price. But it does not give an explanation of the casual mechanism that defines the channel of this relation. Keynes criticized the classical theory and advocate the view that there is no direct, simple, and predictable relation between the quantity of money and its value or prices.

Keynesian version of quantity theory of money state that so long as there is unemployment in an economy there is a positive and proportional effect of the change in money supply to the change in output and employment with constant price level, but when there is full employment there is a positive and proportional effect of the change in money supply to the change in price level with constant output and employment. Hence in aggregate, there is an indirect and non-proportional effect of change in money supply to the change in the price level. Besides classicist, Keynes believes that money is used for both medium of exchange and store in value. Keynesian views on money and price relationships are encapsulated in the Philip curve. The Philip curve envisages that money has an effect both on price level and output. (Nepal Rastra Bank, 2001).

Keynesian model advocate that even before full employment situation price may rise due to inelasticity of factor of production and other bottlenecks in production like Shortage of raw materials, power shortage, lack of transport facilities, immobility of factors of production. But this inflation is only semi inflation, price rise only after full employment is called inflation. The theory says changes in the stock of money supply

affect income only directly (Shapiro, 2001). Keynesian view on money and price relation can be described by the following figure:

Figure 2.2: Keynesian version of Quantity theory of money

Money price relation in Keynes view

Source: https://www.economicsdiscussion.net
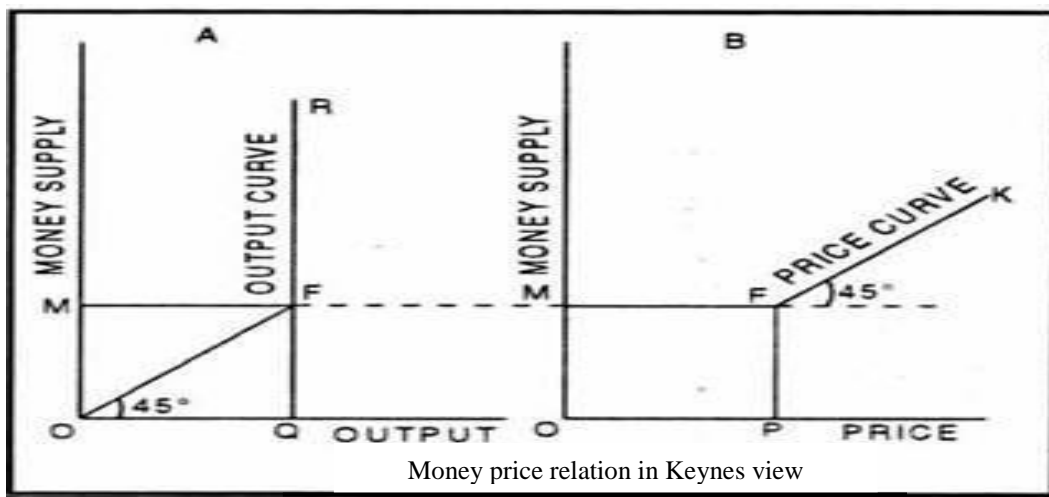
Figure 2.2 represents money and price relation in before and after full employment condition. In figure, both figure vertical axis represents money supply. For figure A horizontal axis represents output where it represents price in figure B. Where point F represent full employment condition. under full employment (Under point F) increase in money supply increase output and price remains constant but After full employment increase in price cause an increase in price remain output at constant. So Keynesian view in price and money can be concluded at price level is proportional to money supply after full employment condition in economy.

2.1.3 Reformulation of quantity theory of money

Keynes theory of money and price have been criticized by later economist major of them are Friedman, Patinkin. Excluding the real balance effect, restricting the role of money in economic activity, based on an unrealistic assumption are some notable criticism. Milton Friedman presented his most elegant and sophisticated version of the quantity theory of money in his paper, "The Quantity Theory of Money–A Restatement" published in 1956.

The monetarist view of economics led by Milton Friedman strongly believes that there is a relation between price and money. Inflation is exclusively a monetary phenomenon, according to monetarists (Stein, 1991). Monetarist doctrine of economics analysis focuses more on long-run compare to short-run. Milton Friedman argues that the Philip curve exists only in the short run but not in long run. So increase in money supply have a direct and proportional relationship with price only in long run. This doctrine advocate that Inflation was the product of greater velocity or supply of money than the rate of growth in the economy. In clear notation, the monetarist proposition suggests that there is unidirectional causality from money supply to income and unidirectional causality from money supply to the price level (Acharya, 2019)

Friedman leads the monetarist school which states that if there is less than full employment, an increase in money supply will lead to a rise in output and employment because of a rise in expenditure. But this will happen only in the short run; soon the economy will return to the less-than-full employment level caused by other real factors. The monetarists believe that changes in the money supply cannot affect real variables in the long run. At the full employment level, an increase in the money supply will raise prices.

2.1.4 Rational expectations theory of inflation

Rational expectation theory believes that people are rational. All economic agents are rational and they optimize their interest with forward-looking behavior. So current economic behavior of people is based on their rational expectation that depends upon past experiences, rational outlook availability of reliable and adequate quantitative and qualitative information of an economic issues.

According to this theory when money supply increases with expansionary monetary policy, the rational expectation of people is only to increase in price level and nominal income but not change in real wage rate, real income, output, and employment. Rational expectation theory state that real variables including output are determined independently of monetary factors. Hence money and price have a direct and proportional relationship

2.2 Empirical Review

2.2.1 International Context

Abdul (2006) Investigate the relation between money, inflation and growth in Pakistan and also try to test the validity of the monetarist stance that inflation is a monetary phenomenon. Data from F.Y.1960 to 2005 is used and different econometric tools like multiple regression model, unit root test for the stationary test, ARDL approach, AIC approach, t-test, F-test are used. This study found that there is a positive association between money growth and inflation in Pakistan. Based on the research question that to investigate the linkage between money supply, income and growth; the researcher used the linear form of the quantity theory of money. The study found that money growth this year affects the rate of inflation in the next year besides that study found money supply is the key factor that affects inflation. Money supply growth has 90 percent explanatory power. The research reveals that there is a proportional relationship between money supply over the output growth and velocity growth and hence the research also conform to that monetarist proposition that, the money supply is the main factor that contributes towards inflation in Pakistan.

Narayan, Kumar, & Prasad (2006) have explored the relationship between money supply budget deficit and inflation in the case of Fiji by using a multiple regression model. The study takes budget deficit, real money supply, RGDP, import price as regressors and consumer price index (CPI) as the dependent variable. Using annual time series data from 1970 to 2004 and testing different econometrics tools like Ordinary least square method (OLS), autoregressive distributed lag model (ARDL), dynamic ordinary least square method and Philip and Hansen fully modified ordinary (PHFM) ordinary least square model, researchers found out that there is a unidirectional causality running from money supply to inflation and bi-directional causality between money supply. They used two-equation where one equation used only money supply and budget deficit as regressors where other models includes the money supply, budget deficit and other control variables as an independent variables. Based on these two model researchers find out money supply has a significant role in causing inflation in the case of Fiji.

Odusanya & Atanda (2010) analyzed the interrelation between inflation and its determinant in Nigeria between 1970 and 2007. The long-run and short-run mechanism of interaction between inflation and its determinants were examined usig the Augmented Engle-Granger (AEG) cointegration test and Error Correction Mechanism (ECM) model respectively. The variable used in this study are inflation rate as dependent variable and growth rate of real output, money supply, real share of Fiscal deficit, real share of Import, Exchange rate, Interest rate are independent variable. The study reavelas that money supply has in-significant relation with money supply and inflation in Nigeria.

Chimobi (2010) find causality between money supply and inflation in Nigeria. The study focuses on investigating the long-run relationships and testing the direction of causality between money and inflation in the Nigerian Economy. It employs Johansen approach for co-integration and Granger-causality tests under block exogeneity approach. Results support the validity of a long term relationship between money supply and inflation in Nigeria. The Granger causality tests, on the other hand, reveal uni-directional causality that runs from money supply to inflation. The results suggest that monetary stability can contribute towards price stability since variation in the price level is also caused by money supply in the case of the Nigerian economy.

Mayandy & Amirthalingam (2012) Studies the nexus between money supply and inflation in Sri-Lankan economy. Annual time series data from 1978 to 2010 of inflation, money supply, budget deficit and exchange rate is used in the study. Vector error correction model is used for estimate short and long run relation between variable. The study find the result that the coefficient of the money supply variable is positive and inflation are positively correlated. An increase in broad money supply by one percent, Ceteris Paribus, will lead to 0.56 percent increase in price level. The study find out that in Sri Lanka. There is a unidirectional causal relationship exists between money supply and inflation.

Kiganda (2014) Check the relation between inflation and money supply in Kenya. The study's purpose was to the established a relationship between inflation and money supply in Kenya and also try to test the validity of the monetarist view of inflation in Kenya. Annual time-series data from 1984-2012 is used in this study. Based on the monetarist view, the model is developed where inflation is taken as a function of the

money supply. So there is only one independent variable. Unit root test is done for stationary test, Johanson co-integration test for co-integration test, Vector Error Correction Model (VECM) for finding long run and short-run relation between variable is used in this study, by doing so the researcher found out that inflation and money supply in Kenya have a positive correlation. The study verifies that there is an existence of monetarist theory in the case of Kenya.

Nguyen (2015) Examine the effect of fiscal deficit and broad money supply on inflation in Asian countries namely Bangladesh, Cambodia, Indonesia, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam in the period of 1985 to 2012. The study applied two different method of estimation, first is PMG estimation based error correction model and the differenced panel GMM Arellano-Bond estimation. The variable used in this study are ; inflation(percentage) as dependent variable and fiscal deficits (share of GDP), broad money M2 supply (share of GDP), RGDP per capita, government expenditure (share of GDP), interest rates, exchange rate (ratio of domestic currency and USD), exports (share of GDP) and imports (share of GDP) as independent variable . The estimated results show that broad money M2 supply has significantly positive impact on inflation only in the method of PMG estimation. In PMG estimation based ECM model, money supply impact on inflation in both short and long run.

Alam & Alam (2016) empirically examine the sources of inflation in india both in long-run and short-run .The study The study covers the data from 1989-90 to 2012-13. The study used augmented Dicky–Fuller (ADF) and Phillips–Perron (PP) test for stationarity test and bounds test technique, developed by Pesaran et al. (2000)to examine the existence of co-integration among the variables in the model. Wholsale price index is the dependent variable of the study and money supply, exchange rate of rupee, world oil price and RGDP as independent variable. The elasticity coefeiciennt of money supply is positive and significant in both long-run and short-run

Giannaros & Kolluri (1985) Examine the monetarist proposition regarding the effect of budget deficit on money growth and inflation for ten industrialized countries i.e. Belgium, Canada, France, West German, Italy, Japan, Netherland, Switzerland, U.K. and U.S. The study used narrow money supply, one year lag narrow money supply, nominal budget deficit and nominal GNP as variable. The study estimate two econometric model where one model is for testing monetarist proposition and another

is for comparison purpose the annual time series data are used. The study use Maximum Likelihood procedure, assuming first-order serial correlation in the disturbance term. The empirical result shows that budget deficit is insignificant as a determinant of money supply growth in examined counties excluding U.S. and results on monetarist proposition concerning the direct effect of the change in money supply on inflation are not conclusive across the countries examined. However, there is some evidence in favour of this proposition in Belgium, France, and Switzerland and strong evidence in the U.S. and Italy. So impact of money supply on inflation is have mixed result.

Ofori-Frimpon (2017) Examine the impact of money supply on inflation in Ghana and find that money supply has significant impact on inflation. The simple regression model is used with inflation as dependent variable and money supply as independent variable. Annual time series data from 1967 to 2015 is used in this study. Regression result shows that change in money supply by 1 percent because 0.71 percent change in inflation as other thing remaining the same.

By using co-integration test, and vector error correction model Sultana, Koli, & Firoj (2019) establish that the money supply does not affect the price level in the short run, but in the long run money supply stimulates inflation in Bangladesh. The study uses monthly data spanning from 2010-05 to 2017-12. By assuming consumer price index as a proxy for inflation which is the dependent variable for the study. The study takes two independent variables as broad money supply and narrow money supply. For long-run relation study use VECM model which result suggests the long-run causality from narrow money supply and broad money supply to CPI and also long-run causality from CPI to narrow money supply and broad money supply. To show the short-run causality under VECM, the study applied block Erogeneity Wald tests. The outcomes of Wald tests are show that inflation causes narrow money and broad money in the short run. Narrow and broad money doesn't cause inflation.

2.2.2 Nepalese Context

Neupane (1992) had made exploration of continue appropriate model for Nepal examining the both monetarist (closed economy and structuralists) approach by taking the data from the period of 1965 to 1988 by OLS technique. Author used the CPI as dependent variable and percentage change in current money supply lagged by one and

two years, percentage change in GDP, expected cost of holding money, percentage change in commodity, percentage change in import price index lagged by one year and percentage change in government budget deficit as explanatory variables. This concludes increase in money supply in line with the growth of per capita RGDP could help to control inflation showing the inflation growth nexus.

Nepal Rastra Bank (2001) Examined the relationship between money and price by using Distributed lag model. The sample size of this study is from third quarter of 1975 through the second quarter of 1999. The study used ADF test for unit root test, co-integration test Polynomial distributed lag and Granger causality test for fulfilled the research objective. The study found out money supply has impact on prices after some time lags if relationship is estimated of quarterly data. The study found that money supply generates impact on prices only after six months' time lag. In addition the result of this study shows that M1 has relatively stronger relationship that that of M2 with price in Nepal. The study suggest that because of weak relationship between money supply and inflation in Nepal it implies that measurement of core inflation is necessary to ascertain the actual degree of relation between price and money.

Shrestha & Bhatta (2018) Revisits money and price relationship in Nepal by applying step-wise econometric framework by employing monthly time series data spanning from January 2000M1 to 2017M12. Two separate regressions are run covering full data set and split data subset ranging from 2008M01 to 2017M12 to examine the relationship in more recent times. The study used ARDL method as new methodology to study the relation in addition all other diagnostic as well as unit root test, co-integration test are employed. The diagnostic test of whole data set ARDL Model shows serial correlation as well as homokedasticity so sub data set are used for rebust the model.

 The re-boost model Test results show that money supply significantly affects domestic price in Nepal. Increase in money supply by one percent increases the inflation by 0.27 percent and 0.11 percent in long run and short run respectively .Indian inflation is the major factor that has largest impact on the price situation in Nepal. However, exchange rate is not found to be associated with the changes in price level in Nepal. Test results also show that money-price relationship in Nepal has become much stronger in the recent times in terms of the magnitude of impact.

Pandey (2005) Use Engle-Granger co-integration following with Error Correction Model to determine the variable of inflation in Nepal. the study use annual time series data of narrow money supply, Indian price, government expenditure, RGDP and change in exchange rate with Indian currency as independent variable of consumer price index of Nepal which is proxy for inflation .The study has found long run relationship of inflation in Nepal with money supply (narrowly defined), Indian inflation and exchange rate with India (as explanatory variables) however the error-correction term was found not to be significant, suggesting that there is no short run adjustment with regard to inflation in Nepal.

Nepal Rastra Bank (2007) Estimated the impact of narrow money supply and Indian inflation (CPII) in Nepal's inflation by Applying integration and error correction model on annual data from 1978 to 2006. The result showed a significant short-run impact of M1 but did not find long-run impact on inflation. The estimates of integration equation showed that one percent increase in Indian price level changes Nepal's inflation by 1.09 percent. Likewise, narrow money supply increases inflation by 0.20 in the same year

Parajuli (2010) Use OLS method to find out determinant of inflation in Nepal. Time series data from 1977/78 to 2005/06 is used in the study. The variable used in the study are CPI as dependent variable and money supply, velocity, GDP, interest rate, wage rate and Indian inflation as independent variable. For fulfil the research objective study used eight different model, where impact of variables on CPI is major one by one. Empirical result shows that narrow money have negative impact on inflation while broad money have significant and positive relation. The study find major determinant of inflation are broad money, Indian inflation and interest rate in Nepal.

Paudyal (2014) Examine short term and long term effects of the macroeconomic variables on the inflation in Nepal during 1975-2011. The regressor are budget deficits, Indian prices, broad money supply, exchange rate and RGDP. The study used Wickens-Breusch Single Equation Error Correction model which suggest that all variables considered are significant in long run implying that these variables are the determinants of inflation in Nepal. The empirical result state that increase in money supply by 1 percent the inflation in change by 0.22 percent at other thing remaining the same at short run .In long run money supply coefficient value is decline as compare to short

run. However, only budget deficit, money supply and Indian prices cause inflation in the short run and in long run previous year CPI impact the CPI mostly in long run.

Gyanwaly (2012) examined the relationship between money,price and income in Asian Countries namely-Nepal, India, Sri Lanka, Myanmar, Korea using annual time series data of the period 1964-2011. The paper used the Unit Root Test as well as the Granger's cointegration and causality test in its methodology. The used narrow money supply, broad money supply inflation and RGDP as variable. The study find out the unidirectional causality from narrow money supply and broad money supply to inflation. The study reached to the conclusion that money supply is an endogenous variable in all the countries though the extent of endogeneity in term of price and income variables slightly differs from on to another.

Adhikari (2014) Studied whether inflation hampers economic growth in Nepal or not, with the help of Distributed Lag Models using the annual data of RGDP and Consumer Price Index (CPI) from 1975-2012. The nominal RGDP is converted into real terms and transformed into logarithmic form and the first difference of the RGDP in logarithmic form is taken as the proxy for economic growth. The CPI data is converted into logarithmic form and its first difference is taken as the proxy for inflation. While using the distributed lag models, the economic growth of Nepal at current time is adversely affected by inflation of the same time, whereas the current economic growth is favorably affected by the inflation of preceding time. The study confirms that Nepalese inflation has mixed impacts on economic growth.

Karna & Singh (2015) Analyse the inflation in Nepal by employing time series data from 1977/78 to 2005/06. The study use separately use nine equation which are simple linear regression and multiple linear regression and use into OLS. The variable used in this study are annual Consumer price index as dependent and real gross domestic product, nominal gross domestic product, narrow money, broad money, velocity of narrow money and velocity of broad money are independent variable . The empirical result shows that money supply has significant impact on inflation. From first and second model narrow money supply and broad money supply significantly account the inflation. One percent increase in narrow money supply and broad money supply increase the inflation by 0.55 and 0.45 percent respectively. If both narrow money supply and broad money supply is included, narrow money supply is not responsible

for increasing NCPI. The study ended with the conclusion that inflation in Nepal is mainly determined by Indian inflation with narrow money only having an effect in the short run (less than one year).

K.C. (2017) examined role of narrow money, broad money supply and remittances on consumer price index of Nepal. The study consists of time series data from 1990 to 2016 using OLS regression model with testing stationary time series data. The study found that data are non-stationary at level and stationary at first differences using ADF test. The study found that there is significant role of narrow and broad money supply and remittances on consumer price index and promotes inflation of Nepal. The study recommended that there are so many other variables which affect consumer price index. Hence, central bank should be analyzed other macroeconomic variables to formulate monetary policy and target inflation.

Chaudhary & Xiumin (2018) Uses ordinary least square multiple regression method for find out determinant of inflation in Nepal. The study consider price level in Nepal as dependent variable. Also, study consider money supply, RGDP of Nepal and consumer price index of India as independent variable. The study uses annual time series data from 1975 to 2016 and find out the conclusion that Money supply has significant impact on inflation however it has less impact compare to other variable i.e. Indian CPI and RGDP.

Pandey (2018) studied on microeconomic variables and inflation in Nepal. The study consists of time series data from 1975 to 2017 using OLS regression model. The study assumed that inflation is dependent variables and money supply, current expenditure, gross domestic product and interest rate are independent variables. The study found that money supply and current government expenditure promote inflation and gross domestic product decrease the inflation rate. The study recommended that increase in productivity especially in agriculture sector reduces inflation rates.

Acharya (2019) Examine that whether there is relation between money supply, income and price level in the case of Nepal. The study used ADF test for unit root test, bivariate Johanson co-integration tests followed by VECM for long run causality and VEC as well as VAR Granger Causality/Block erogeneity Wald tests for short run causality. This study used annual time series data from 1975 to July 2018. Based on the research

objective, this paper used five model where real and nominal GDP, money supply and CPI are used for regression. The study found that there is bidirectional long run causality between the real income and both type of money supply in real term but there is no short run causality between variables.in addition based on the result of test the study do not support the monetarist point of view which suggest that there is casual relationship runs from money supply to income and price in the long run. Study also found that there is no short - run causal relationship between NCPI and the nominal broad money supply.

Acharya (2019) Explored the relationship between money supply and inflation. The study used M1 M2 Gross domestic product, government expenditure Indian consumer price index and inflationary rate as an independent variable and CPI as dependent variable. Using multiple regression model, DW test the study found that money supply M2 has positive relation with inflation, where one percent increase in money supply will increase the inflation as 1.7% on an average at other things remaining the same. The study present the direct relation between money supply and inflation.

Byanjankar (2020) Examine the relationship between money supply and inflation by using time series data from 1975 to 2018. The study use CPI as dependent variable and money supply, Indian CPI, government deficit, crude oil price, RGDP and nominal effective exchange rate as independent variable. By using ARDL model study find out the insignificant relation between money supply and inflation in both short run and long run. The result shows that in long run Indian inflation rate, real income and exchange rate are major determinant of inflation in Nepal.

2.3 Research Gap

By reviewing all theoretical and empirical literature it can be said that money supply and inflation have relation. International context literature like Abdul (2006), Kiganda (2014) shows price and income relation. There are very few studies on national context like Acharya (2019), Nepal Rastra Bank (2001), Shrestha & Bhatta (2019) that specifically focus on money and price relation. More Previous study which are reviewed as literature in this study are focused on determinant of inflation. From the previous study it can be conclude that money and price have significant relation .So, the study has attempted to cover the gap of previous studies in terms of sample size and specification. Thus, the study is different from earlier studies of Nepalese context. The study can be helpful from its contribution to fill the gap between the previous studies and also the finding of this study can add value to the existing body of the literature.

CHAPTER - III

RESEARCH METHODOLOGY

Research is the systematic and analytic way of searching. Research is based on fact and try to understand the research problem properly. For full filling the research objective there is need of research design, variable, model and other required material. This chapter deals with the research methodology of this research which include research design, nature and sources of data, study period cover, tools and method of data collection. As well as it include organizing of data, model specification, and explanatory variable

3.1 Conceptual framework

Conceptual framework shows the relation among the dependent and independent variables. The study consists of inflation as dependent variable for that Consumer price index of Nepal is taken as proxy of inflation. Broad money supply, gross domestic product, exchange rate, budget deficit and Indian CPI are independent variables.
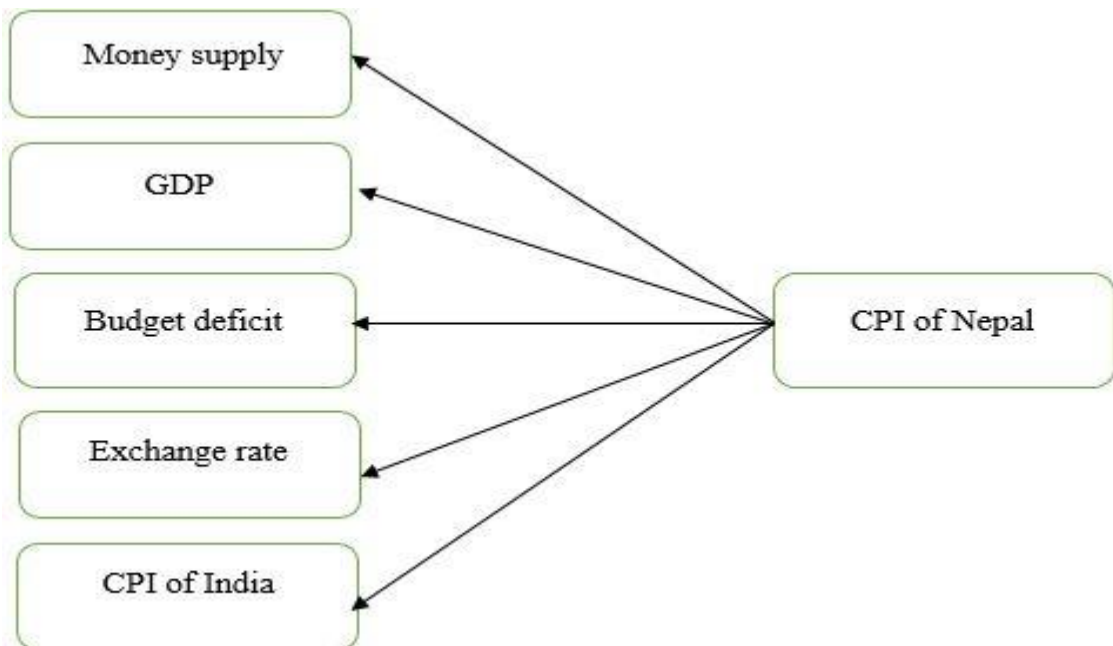
3.2 Research Design

The study is belonging to explanatory type using both of descriptive and analytical research, based on secondary sources of data. Deductive method has used. Descriptive analysis is carried out to analyse the trend and pattern of money and inflation in Nepal. Econometric tools and analytical method is used to find out relationship between money supply and inflation in long run and short run. For analytical research different econometrics tools has used. Sample period for study has been decided by help of literature review on similar subject. Econometrics method are used as per need of fulfilling the objective of this paper.

3.3 Nature and Sources of Data

This study is based on secondary data sources. Annual time series data from F.Y.1975 to 2019 are used for the study. The data which are used in this study is taken from Quarterly economic bulletin of Nepal and Current macroeconomics and financial situation which are published by Nepal Rastra Bank (NRB) and Data Set of world economy published by World Bank Group.

Table 3.1 Sources of Data and measurement

Variable Description	Unit	Sources
Consumer price index of Nepal	Index number	Current macroeconomics and financial situation, NRB
Nominal Broad Money supply	Million	Current macroeconomics and financial situation, NRB
Nominal Gross Domestic product	Million	Current macroeconomics and financial situation, NRB
Budget Deficit	Million	Current macroeconomics and financial situation, NRB
Exchange rate	Middle value	Quarterly economic bulletin, NRB
Consumer Price Index of India	Index number	World Bank Data set

3.4 Study Period Covered

The study covered 44 years of data from fiscal year 1974/75 to 2018/2019. The reason for selecting this period is for consistency check of the variables which are used in this study. For established the long run relation between variables and for applying many econometric tools this much of time series data is needed.

3.5 Tools and Method of Data Collection

This study has used secondary data. Data from F.Y. 1975 to 2019 is taken for examine long run relation between money supply and inflation. Unavailability of data before 1975 is the major reason for excluding data before 1975. For take 2019 as last observation is the reason that by the end of 2019 the world face the pandemic Covid-19. Covid-19 slow down the world economy through lockdown. Nepal also face Covid-19 effect on economy so the economy is not like before so for excluding externality, data till 2019 is used.

3.6 Data Organization and Processing

After collecting raw data from different secondary sources researcher arrange raw data in table by using Microsoft excel. Data of Consumer Price Index of Nepal and India is available in 2010 base year, for the consistency in data set researcher change the base year for the data into 2001 by using excel. After that data are arranged in chronological order. Data are arranged in one table for applying different mathematical test and method. Recheck of data entry is done twice for avoiding typing error. By using excel, all data are converted in to natural logarithm form. This prepared table of data is saved for further process.

For analysis of the first objective i.e. the trend and nature of inflation and money supply in Nepal, simply the figures are drawn in terms rupees and percentage. The Microsoft Excel and EViews.10 software is used for drawn the figures for trend and nature of inflation and money supply. But the study of second objective is based on econometric analysis which required the data (time series) must be stationary hence the data are converted into logarithm form. The Augmented Dickey Fuller (ADF) Unit Root Test is

done for checking the stationary of time series data. After checking for stationary long run and short run relation between money supply and inflation is tested from Engle-Granger co-integration test and Error Correction model (ECM) is performed respectively. At last different residual and fitness of model is checked as per needed.

3.7 Model Specification

Monetarist state that inflation is a monetary phenomenon. Based on this assumption the model used in this study is given as below :

$$\text{CPIN}_t = f(\text{M2}_t, \varepsilon) \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots . \ldots \ldots . \qquad (2)[1]$$

Where,

CPIN_t	=	Consumer price index of Nepal
M2_t	=	Money supply
ε	=	Error term

Monetarist believe that there is positive relation between money supply and inflation so sign of coefficient of money supply is taken as positive. Now presenting equation 2 in to liner form;

$$\text{CPIN}_t = \alpha + \beta_1 \text{M2}_t, +\varepsilon \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \quad (2.\,a)$$

Model was further transformed by obtaining the natural logarithms and represented as

$$\text{LnCPIN}_t = \alpha + \text{Ln}\beta_1 \text{M2}_t, +\varepsilon \ \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \quad (2.\,b)$$

Macroeconomic theory shows Gross domestic product has effect on inflation so, GDP is taken as one factor of inflation in Nepal. Many study shows budget deficit has impact on inflation. Deficit financing cause increase in price. Nepal face this situation in past time and in study period Nepal face budget deficit so budget deficit is taken as an independent variable of inflation.

---

[1] This model is used by Evans Ovamba Kiganda for studying relation between inflation and money supply In case of Kenya.

Operating in open economy and facing negative BoP is complex situation for any economy, Nepal face this problem as well. Fluctuation in exchange rate impact on price. For minimize the risk, Nepal pegged its exchange rate with its biggest trading partner i.e. India. For other currency it is determine by forex market. Exchange rate play important role in determination of the inflation. So, Exchange rate is taken as another determining variable of inflation.

Nepal is landlocked country and its border is covered by India and China. Nepal border is covered by 3 geographic area of India. Nepal's more than 90 of trade is related with India. So Indian inflation rate is also the possible factor for affecting Nepal inflation. So Indian consumer price index is taken as another regressors.The study used three model , First model include RGDP as dependent variable, Second model use nominal GDP as independent variable and third model exclude both GDP From model. Now adding all this variable in model the equation and taking natural log on both side three model is given as.

First model is :

$$LnCPIN_t = \alpha + \beta_1 LnM2_t, +\beta_2 LnRGDP_t + \beta_3 LnBD_t + \beta_4 LnEXC_t + \beta_5 LnCPII_t + \varepsilon_t \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (2.c.1)$$

Second model is :

$$LnCPIN_t = \alpha + \beta_1 LnM2_t, +\beta_2 LnNGDP_t + \beta_3 LnBD_t + \beta_4 LnEXC_t + \beta_5 LnCPII_t + \varepsilon_t \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (2.c.2)$$

Third model is :

$$LnCPIN_t = \alpha + \beta_1 LnM2_t, +\beta_2 LnBD_t + \beta_3 LnEXC_t + \beta_4 LnCpII_t + +\varepsilon_t \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (2.c.3)$$

Where

$CPIN_t$	=	Consumer price index of Nepal
$M2_t$	=	Broad Money supply
RGDP	=	Real Gross Domestic product
NGDP	=	Nominal Gross Domestic product
BD	=	Budget deficit

$$
\begin{aligned}
\text{EXC} \quad &= \quad \text{Exchange rate} \\
\text{CPII}_t \quad &= \quad \text{Indian Consumer price index} \\
\varepsilon_t \quad &= \quad \text{Error term}
\end{aligned}
$$

3.8 Specification of Variables

The study attempts to analyse the factors determinations of inflation in Nepal by using various econometric and statistical tools in which the following variables are used:

A) Consumer price index (CPIN):- CPIN is taken as dependent variable. CPIN is used as proxy of inflation. CPIN used on this study is calculated by Nepal Rastra bank. According to the World Bank, the consumer price index reflects changes in the cost of the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals. CPI captures the average household consumption basket. The basket is determine by national level Household budgetary survey. CPI is used in log form. The raw data on CPI has base year of 2014. This study CPI is converted into Base year 2001 by using following formula:

$$
\text{CPI at base year price} \ = \ \frac{\text{Consumer price index at current price}}{\text{Base year consumer price}} \times 100
$$

B) Money supply (M2):- Money supply is the aggregate stock of currency and notes available in an economy at a point of time. Two type of money supply are popular they are narrow money supply and broad money supply. Narrow money supply include cash held by people in their hand and pockets and demand deposit which is generally denoted as M1 where broad money supply include M1 and time deposit. For the purpose of this study log transformation of Broad money supply M2 is taken. Money supply value is in million rupee. It is the core independent variable of the model.

C. Gross Domestic Product (GDP):- The gross domestic product is the money value of all final goods and services which are produced within in the country during a year. It is expressed in base-year prices, and is often referred to as 'constant price'. Here, the GDP of Nepal is expressed as independent variable in the regression model.Nominal and Real Both type of GDP is used in this study . The GDP at producer prices are collected from different publication of 'Economic Survey' of Nepal. Base year for GDP is 2001.

D) Budget Deficit (BD):- Budget deficit is another variable used as independent variable in this study. Budget deficit is simply the difference between government revenue minus government expenditure. Budget deficit represent the condition when government spend more than it earns. First of all budget deficit data is collected in million amount. Absolute term of budget deficit is taken. Log transformation value of Budget deficit is used in regression.

E) Exchange Rate (EXC): Exchange rate compare the national currency with other currency. Exchange rate data is available in NRB economic bulletin as average annual and period end. Also this two section are divided into 3 sub section as buying, selling and middle. For the consistency in data the study used annual average middle exchange rate as exchange rate data. For regression model log value of data is used.

G) Indian Consumer Price Index (CPII): Indian consumer price index measures change in the prices of the market basket of goods and services of the consumer in India. CPII is counter variable of this regression model. Many research on determination of inflation in Nepal find impact on CPI of Nepal by Indian CPI. Indian CPI in presented in log transformation and taking base year as 2001

3.9 Specification of Tools and Method of Data Analysis

To analyse the trend and nature of inflation and money supply in Nepal, descriptive method is used For this purpose table, graph, histogram are create, which is drawn by using Microsoft excel and EViews.10. The study used different statistical test such as mean, median, standard deviation etc. To analyse the descriptive statistic of the variable. To find the causal relationship between inflation and money supply in Nepal different econometrics tools are used with the help of EViews.10.

3.10 Hypothesis Testing

Hypothesis testing is a way to test the results of a survey or study to see if it has meaningful results. In general, hypothesis is defined as an assumption or statement made about the population parameter. Since these assumptions may or may not be valid, the hypothesis testing is done to confirm it. There are two types of hypothesis, namely, null hypothesis and alternative hypothesis. The null hypothesis is the hypothesis to be

tested and it is referred as hypothesis of no difference. There are several techniques of hypothesis testing. The study used following test for full filled the study objective:

A) Unit root test:

The study is based on time series data so it is important to test stationary of data. A stochastic process is said to be stationary if its mean and variance are constant over time and the covariance between the two periods depends only on the lag between the two time periods and not the actual time at which the covariance is computed. A test of stationary (or non-stationary) that has become widely popular over the past several year is the unit root test (Gujarati, Porter, & Gunasekar , 2012).

The study involved estimating following equation to ascertain the existence of unit root.

$$Y_t = \rho Y_{t-1} + u_t \qquad\qquad -1 \leq \rho \leq 1 \qquad \dots\dots\dots\dots\dots\dots (5)$$

Where,

$$u_t = \text{noise error term}$$

The test is based on following hypothesis

$$H_0 = \rho = 0 \text{ that is , unit root exists}$$

$$H_1 = \rho < 0 \text{ that is , unit root not exists}$$

By doing so we can check any existence of stationary in time series data or not. now by taking regression of Y_t on Y_{t-1} and see if the estimated slope coefficient in the regression is zero or not we can find the unit root exists or not .

(A.1) Augmented Dickey-Fuller Test

The question raised on unit root test is that which test is used to find if the estimated coefficient of Y_{t-1} is zero or not. The t value of the estimated coefficient of Y_{t-1} does not follow the t distribution even in the large samples; that is it does not have an asymptotic normal distribution. For correcting this problem the ADF test involved testing the following three model for allow various possibilities (Gujarati, Porter, & Gunasekar , 2012).

The equation for no intercept and no trend is

$$\Delta Y_t = \delta Y_{t-1} + \sum_{i=1}^{m} \beta_1 \Delta Y_{t-1} + u_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (5.a)$$

The equation for only intercept and no trend is

$$\Delta Y_t = \beta_0 + \delta Y_{t-1} + \sum_{i=1}^{m} \beta_1 \Delta Y_{t-1} + u_t \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (5.b)$$

the equation for both intercept and trend is

$$\Delta Y_t = \beta_0 + \beta_1 t + \delta Y_{t-1} + \sum_{i=1}^{m} \beta_1 \Delta Y_{t-1} + u_t \dots\dots\dots\dots\dots\dots\dots\dots (5.c)$$

Where,

u_t = pure white noise error term

m = lag length

The following hypothesis is tested for ADF test

$H_0 = \rho = 0$ that is , unit root exists

$H_1 = \rho < 0$ that is , unit root not exists

B) Co-integration test

Economically speaking two variable will be co integrated if they have a long term or equilibrium relationship between them. (Gujarati, Porter, & Gunasekar, 2012). Co-integration test helps to identify to the linkage between two variable. Co-integration refers to the existence of a long run equilibrium relationship between the variable in which an economy system coverage over time (Bhusal, 2016). Co-integration only tells about long run relationship between the series but it does not fix the direction of such relation (Luo, 2013)

(B.1) Engle - Granger Co-integration Test

Regression of inflation and money supply equation (2.c) takes place even in the presence of unit root test when relevant variables are checked for stationary using the unit root test. It stills provides the combined effect of two non- stationary variables. But, in this situation, spurious regression is estimated. So, unit root test on the residuals (ε_t) is applied to check the stationary. For the estimation of the error terms, Engle and Granger (1987) calculated critical values are used to estimate the stationary of the error terms Engle-Granger co-integration test. (Engle & Granger, 1987) Suggested this test consist of estimating the co-integration regression by OLS, obtaining the residual ε_t and applying the unit root test for $\boldsymbol{\varepsilon_t}$ According to this test, following hypothesis is tested:

Null Hypothesis (H_0): ε_t has unit root at level i.e. ε_t is non-stationary at level

Alternative Hypothesis (H_1): ε_t has no unit root at level i.e. ε_t is stationary at level

If the Augmented Dickey - Fuller test statistic is greater than Engle-Granger critical value then the null hypothesis is rejected that means $\boldsymbol{\varepsilon_t}$ is stationary at level. If $\boldsymbol{\varepsilon_t}$ is stationary at level that state the variable are co-integrated and exist a long run relationship between them .Similarly this also assure the correct forecasting of the model when $\boldsymbol{\varepsilon_t}$ is stationary at level .

To test the Engle - Granger co integration from equation 2.c.1 Error Correction term is calculated as given below:

$$ECT_t = \varepsilon_t = LnCPIN_t - (\alpha + \beta_1 LnM2_t, + \beta_2 LnRGDP_t + \beta_3 LnBD_t + \beta_4 LnEXC_t + \beta_5 LnCPII_t +) \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (6)$$

After calculating the value of ECT for different period then the study check the stationary of ECT. If the error correlation term is stationary at level then the variable in equation 2.c are co-integrated i.e. there exist a long run relationship among them. The stationary test of ECT is also used to test whether the long run model is spurious or not. If R- squared value is greater than Durbin-Watson statistics, this is the symptoms of spurious regression. But the model is not spurious when the residual is stationary at level even R-squared is greater than Durbin- Watson statistics.

C) Error Correction Model (ECM)

Error Correction Model is used to find out short run dynamics of the model if the variable are I(1) and there exists a co-integration relationship. This model is used for estimate the speed of adjustment short-run disequilibrium to long- run equilibrium. The co-integration test show static equilibrium by long run equilibrium. In short run institutional and structural changes may occurs which create difficulties to explain long run dynamics. Therefore, it must be checked the short run relationship and short run dynamics. According to "Granger Representation Theorem" if two time series variables are co-integrated then relationship between two variables can be examined as an Error Correction Model(ECM). The ECM model is given below

$$D(LnCPIN_t) = \alpha + \beta_1 D(LnM2_t) + \beta_2 D(LnRGDP_t) + \beta_3 D(LnBD_t) + \beta_4 D(LnEXC_t +$$
$$\beta_5 D(LnCPII_t) + \beta_6^* ECT_{t-1} + V \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(7)$$

Where,

$D(LnCPIN_t)$	=	first difference natural log of Consumer price index
$D(LnM2_t)$	=	first difference natural log of Broad Money supply
$D(LnRGDP_t)$	=	first difference natural log of Real Gross Domestic product
$D(LnBD_t)$	=	first difference natural log of Budget deficit
$D(LnEXC_t)$	=	first difference natural log of Exchange rate
$D(LnCPII_t)$	=	first difference natural log of Indian Consumer price index
ε	=	Error term
α	=	constant
V	=	white noise error term

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5,$ and β_6^* are the short run coefficients.

ECT_{t-1} is one period lag residual of equation 2.c . The coefficient of ECT_{t-1} provides the speed of adjustment which should be negative and significant.

(D) Diagnostic Test

(D.1) Serial correlation test

Autocorrelation or serial correlation refers to the case in which the error term in one time period is correlated with the error term in any other time period. Classical linear regression assumes that such correlation does not exist. As a result of a crucial limitation of Durbin-Watson (DW) statistic, that it becomes invalid when applied to a regression equation which includes a lagged dependent variable among its regressors and cannot test for higher order autocorrelation, the Breusch-Godfrey (LM) test was employed.

(D.2) Heteroscedasticity Test

Heteroscedasticity occurs when the variance of the error term is not constant. The study employed Breusch-Pagan-Godfrey Test . From this test F-Squared and R-Squared value probability is higher then 5% level of significance then the null hypothesis is accepted that is there is no heteroscedasticity in the model.

CHAPTER - IV

STRUCTURE AND FLUCTUATION IN INFLATION AND MONEY SUPPLY

This chapter deal with the presentation and analysis of data which show structure and fluctuation in money supply and inflation in Nepal from study period. This chapter is descriptive in nature. The chapter is divided into two section which is decided through objective of the study. First section show nature and trend of inflation based on study period data. Where nature and trend of overall inflation, sectorial inflation, food and non-food inflation are presented in table, bar diagram, histograms as needed by study after then second section shows nature and trend of money supply based on study period data.

4.1 Nature and Trend of Inflation in Nepal

4.1.1 National Consumer Price Index calculation in Nepal

Consumer price index measure weighted average price basket of consumer goods and services. The basket is determine through household survey. The first household budget survey is conducted in 1972/73 . After then the measurement of inflation in Nepal is started. CPI only measure the movement of price of good and services. Calculation of CPI include four stages they are determining the basket of goods and services, selection of price collection centers , selecting the outlets and price collection methods and last selecting the method of averaging the price indices .

The basket of goods and services is determine with the help of household survey. Determining basket of goods and services has two criteria i.e. expenditure share and frequency purchase of good and services. In case of Nepal the CPI basket consist of 496 goods which is selected on the basis of the expenditure weight obtained from the fifth household budget survey (2014/15). On 496 items 402 is goods and remain 94 item are services.

The second step is to selection of price collection centers . By calculating expenditure share of center the price collection center is decided. In Nepal altogether 60 price

collection center have been selecting. On 60 center 29 center from rural and 31 center is from urban area. After selecting price collection center the next step is to selecting the outlets and price collection method. In this stage more then one outlet in on center is decided. In Nepal price of good is collected from three different outlets in a price collection center on a weekly monthly and quarterly bases.

Last step is to averaging the price indices. This is the most important part of CPI. Generally this procedure can be divided in two step they are calculation of elementary indices and upper level aggregation. In Nepal Javons index has been used for elementary level aggregation and laspeyres geometric index has been used for higher level aggregation of the indices.

4.1.2 Year-wise National Consumer Price Index in Nepal

The trend of NCPI inflation in Nepalese economy from the time period 1975/76 to 2018/19 is shown in Figure 4.1. And data are shown in the Appendix - I.

Figure 4.1: Trend of NCPI
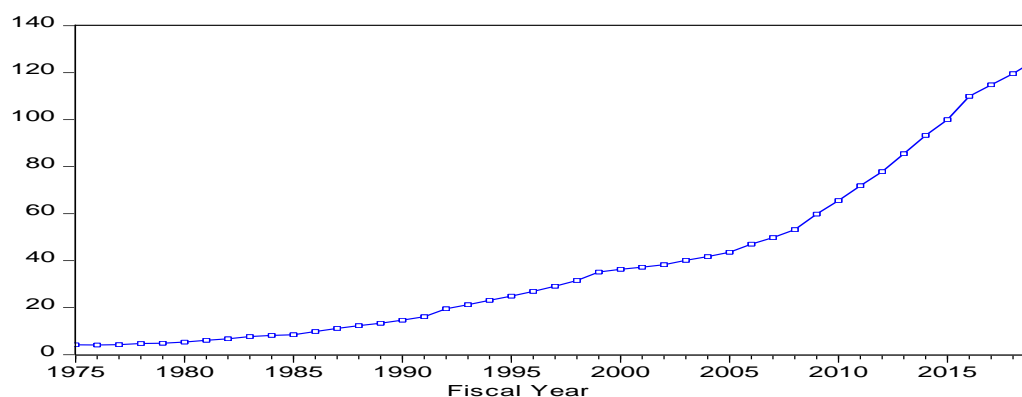
Source: Appendix – I.

Figure 4.1 shows the upward increasing trend of consumer price index in Nepal from 1975/76 to 2018/19. Graph of CPI show higher in 2018/19 and lower in 1975/76. Which also present that CPI of Nepal is on increasing trend this means from 1974/75 to 2018/19 weighted average of price of a basket of consumer goods and services is increased at the time passes. After 2000 A.D. the CPI rate is increase more rapidly compare to previous year.

4.1.3 Inflation Rate of Nepal

Inflation rate is recorded to be 4.64 in the year 2018/19. which is 4.15 in previous year. This shows that the inflation is in increasing trend as previous fiscal year

Figure 4.2: Trend of Inflation
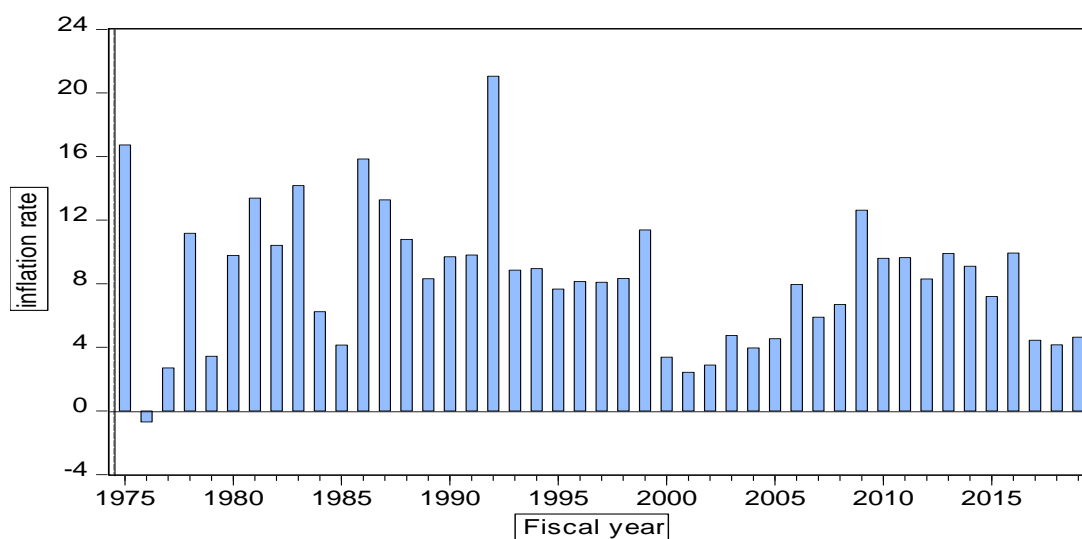
Source: Appendix – III.

Figure 4.2 shows the trend of inflation in Nepal from 1975/76 to 2018/19. The histogram have more ups and down as inflation is in negative rate where some time it is up to 21 percent. In fiscal year 1976 the inflation rate has negative but in 1975 inflation has more then 16 percent of inflation. The sharp decline in inflation rate was mainly due to declaration of emergency in India. A good harvest as well as the price control measure taken in India following the declaration of emergency in conjunction with the increase in the production of food grain together with monetary tightening back at home had eased the pressure on the price front ultimately leading to the negative growth of 0.6 percent in the inflation rate in FY 1975/76 (Pandey, 2005).

In 1992 Nepal face higher inflation as never seen in Nepalese history. Inflation rate is 21.07 and Food and beverage inflation is 24.49 percent at that time. Empirical studies show that higher causes of inflation includes the budget deficit, exchange rate, import and expected inflation (Neupane, 1992). The devaluation of Nepalese rupees vis-à-vis US dollar and other convertible currencies by 20.9 percent on July 1, 1991 was also responsible for exceptional rise in the rate of inflation during that fiscal year. (Nepal Rastra Bank, 2007).

Inflation rate is double digit in 1977/78 after then the inflation rate throughout the decade is fluctuate. Along with this 1980, 1981,1983,1986,1988 the inflation rate is double digit. The inflation rate of Nepal is single digit excluding 1988 and 2008 after 1990. Before 1990 inflation rate show more fluctuation.

In F.Y. 2002 Nepal faces economic slowdown the inflation rate was declined rapidly. The reason behind that was continuity of insurgence, lower production and negative RGDP growth rate. A series of domestic and external shocks, especially the continued escalation of the insurgency, irregular monsoon, and weak external demand, have exacerbated the economic downturn that began in mid-2001. Agricultural output slipped to 2.2% in 2002 due to the irregular monsoon. (ADB, 2003). The average inflation rate has been recorded at 8.11 percent during the period of 46 years .The inflation rate data is shown in appendix 2

4.1.4 Decade-wise Average NCPI and Inflation

It is believe that Major political and economic incident of country impact inflation and price of economy. This type of impact can be analyse by decade wise data. So, the average decade wise average NCPI and inflation is given to the table below

Table 4.1: Decade-wise Average NCPI and Inflation

Fiscal Years	National Consumer Price Index (average)	Inflation (average)
1975/76-1985/86	9.6	8.2
1986/87-1996/97	28.6	10.4
1997/98-2007/08	60.5	5.7
2008/09-2018/19	131.18	8.1
Overall Average	57.47	8.1

Source: Author's Calculation from Appendix – I &III.

Table 4.1 shows the decade wise average national consumer price index and inflation. NCPI in first decade i.e. 1975/76-1985/86 is lower compare to past decade. In the period of 1976 - 1980, the inflation observed lower average trend by 5.22 percent with comparison to that of the remaining periods except for 2000 - 2005. Low level of inflation is attributed to tight monetary policy and better food harvest in Nepal and price

control measures in India as well (Nepal Rastra Bank 2007). In every next decade NCPI is increased as compare to the before decade. Beside that inflation rate is higher in second decade and lower in third decade ie. 1997/98-2007/08. National consumer price index is 57.47 in overall average and inflation is 8.1 percent in overall average.

Figure 4.3.: Decade-wise Average NCPI
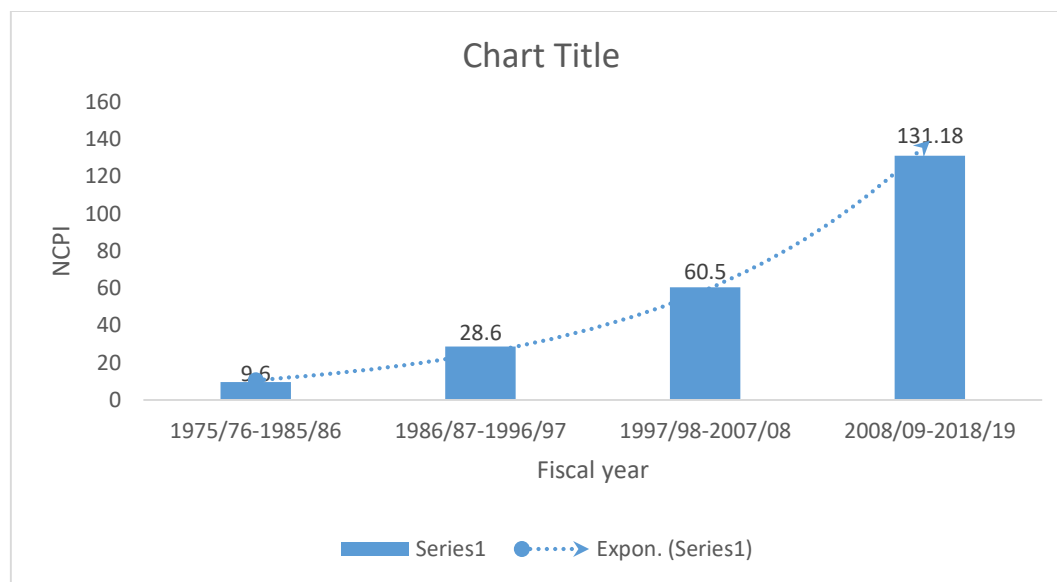
Source: Based on Table 4.1

Figure 4.3 shows decade wise average of NCPI which is in the increasing trend and the overall average of NCPI is 57.4. Highest average is recorded in the Last decade whereas lowest average NCPI is recorded in first decade. Nepal NCPI is in increasing trend . The base year for NCPI is 2001. The last decade has higher average NCPI.

Figure 4.4: Decade - wise Average Inflation
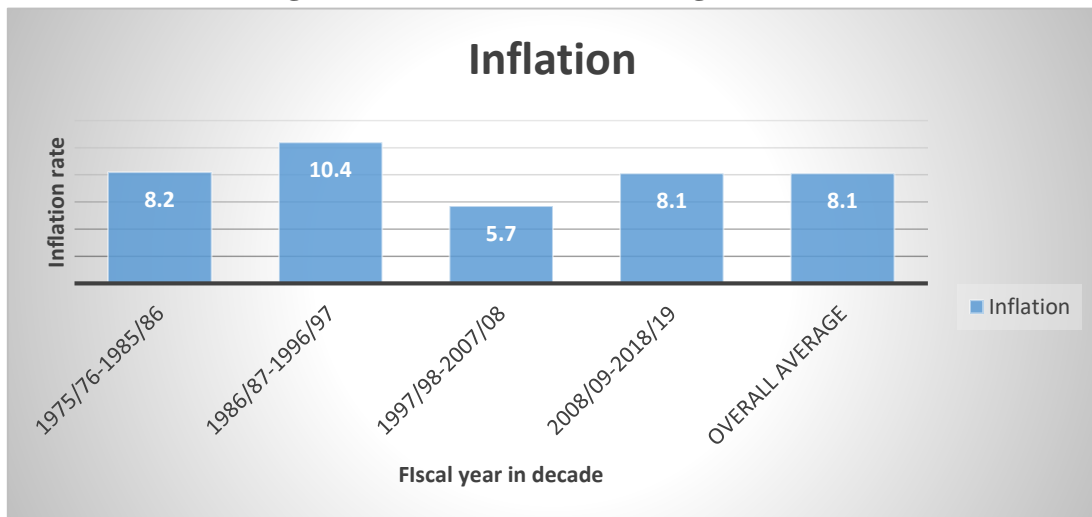
Source: Based on Table 4.1.

The figure 4.4 shows the decade wise average of Inflation, which shows that second decade has higher inflation average compare to all decade. The lower average of inflation is recorded as third decade. The overall average of inflation is 8.1 and first and fourth decade has comparably similar inflation as average. The reason behind the higher inflation rate in second decade is the paradigm shift of Nepalese economy from closed to open economy, increase in electricity tariff and fertilizer, the impact of the gulf war and higher price in India. For control this higher inflation government Structural Adjustment program during the 1988-1990 period to reduce structural constraints to growth and maintain desirable level of inflation as well as strengthen the external position of the country (Nepal Rastra Bank, 2007).

Implementation of SAP, favourable fiscal policy and control monetary policy help to reduce the inflation. So the next decade the inflation rate was decline. Civil war, financial sector reform, liberal industrial policies are another contributor for the lowest average inflation in third decade.

4.1.5 Food, non-food and overall inflation in Nepal

Figure 4.5: Food, non-food and overall inflation in Nepal
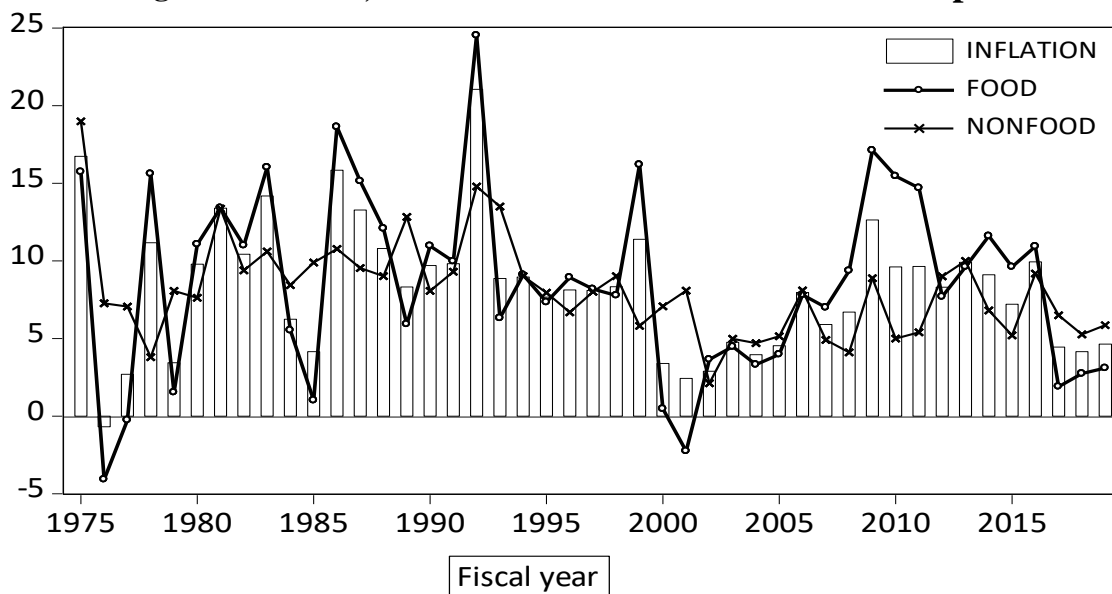
Source: Appendix-IV

The above figure shows the food, non - food and overall inflation from the period of 1975 to 2019. From the figure it shows that food inflation is more fluctuate compare to non-food inflation. Food inflation has higher in fiscal year 1991 and reached to the negative in fiscal year 2000 and 1976. Higher rate food inflation in 1991 may due to structural change of Nepalese economy from closed economy to open economy. From the figure inflation is mostly affected by food inflation. In 1996 food inflation is get negative which cause the overall inflation to be negative.

 In 2001 food inflation is again became negative one of the reason behind that is higher demand on arms weapons due to massive civil war. Nepal food production is largely depend on agricultural productivity which is depend on monsoon. Favourable monsoon raise the food production and vice versa. So, that fluctuation in food inflation can be interpreted by production level of food and determined by monsoon. Non-food inflation get higher in study period at 1995 and lower at 2002. It has lower fluctuation compare to food inflation.

4.1.6 Distribution of inflation in Nepal

Change in CPI is generally known as inflation. In Nepal CPI is estimated on three geographical area they are Ktm valley, hill and terai. Where Kathmandu valley include three district namely Kathmandu, Bhaktapur and Lalitpur. Mountain area CPI is started to estimate only after fiscal year 2014/15. CPI of every region include food and beverage and non-food services CPI following graph shows the structure of CPI of terai, hill and Ktm valley area on the data of study period .

Figure 4.6: Distribution of inflation in Nepal
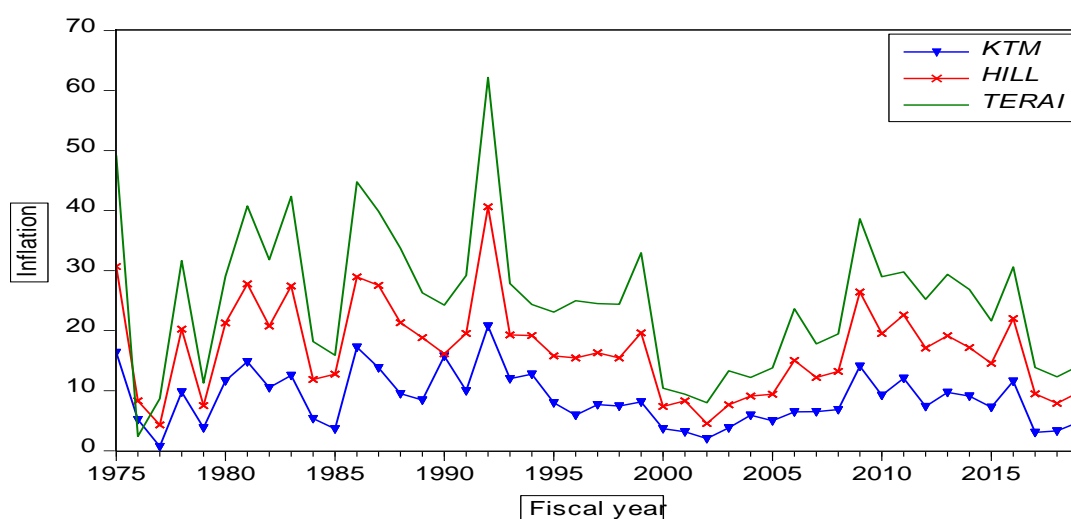
Source: Appendix V

figure 4.6 shows inflation distribution has been shown. In the graph X-axis shows fiscal year and Y-axis shows inflation. From above figure inflation distribution is highly associated with Kathmandu valley then compare to other two region i.e. terai and hill. The reason behind that is Kathmandu valley has higher population and high density. Higher population create higher demand. Approximately half of the population is lived in terai region. So inflation in terai region is also higher. After 2000 A.D it is seems that inflation in all three region are not too much different compare to previous years. More fluctuation in inflation is in hill region may be due to agricultural production. The more production in the year in hill region the less inflation may have and vice versa.

4.2 Nature and trend of Money supply in Nepal

Money supply is the aggregate stock of currency and notes available in an economy at a point of time. It is the measurement of stock of currency, notes, and other material which can be used as like money. Money supply is broad concept it not only measure the volume but also the availability of money in an economy at a point of time. There are different type of money supply in economy they are. Narrow money (M1), broad money (M2) , M3 and M4. Narrow money include currency in circulation in public and demand deposit. When we add time deposit in narrow money its sum became broad money.

Money supply has direct impact on price. So money supply is in the control of central monetary authority of the nation. Understanding of money supply process is necessary for effective conduct of monetary policy to attain its prescribed goals. An analysis of money supply will give us a clear picture of money generating process, particularly the degree of control by the central bank, which is important for monetary management. (Shrestha, 2013)

Classical and neoclassical economists argue that over-supply of money leads to an increase in price level. Conversely, under-supply of money can lead to economic contraction. Hence, central banks need to keep money supply at an optimal level. (Shrestha & Bhatta, 2019) . So that money supply and price relation should be in equilibrium form so the monetary policy is in this direction.

In Nepal, money supply is under the control of Nepal Rastra Bank which is the central bank of Nepal. It is established in B.S. 2013. Before 2013 different institution like Sadar Muluki Khana, Nepal Bank Limited practice to control money supply over economy. But Nepal Rastra bank Act 2013 declared NRB as central bank of Nepal and clearly define money supply control is under the act of NRB. In Nepal narrow money (M1) and broad money (M2) is measured. This study take M2 as money supply because M2 also add M1. The trend of money supply in Nepal from 1975/76 to 2018/19 is shown in following figure and the time series data of M2 is given in appendix I

Figure 4.7: Trend of Money Supply
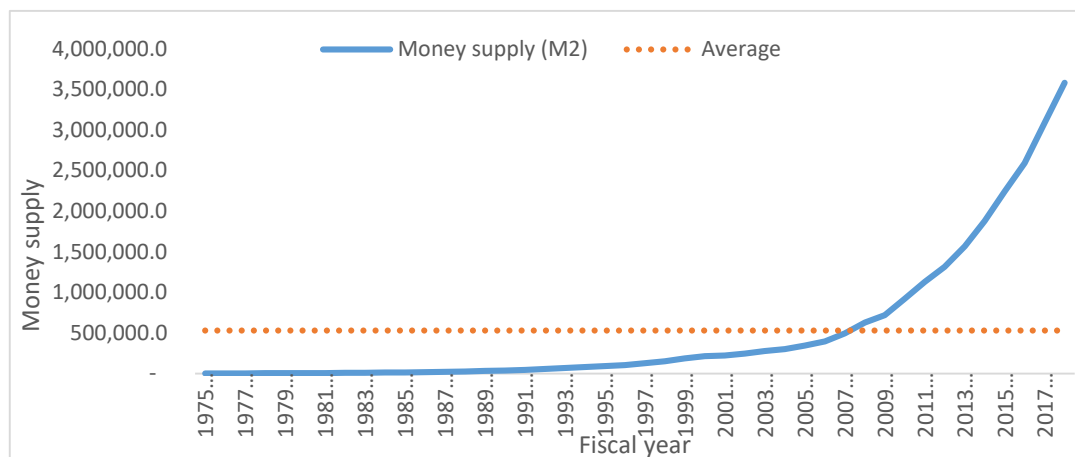
Figure 4.7 show trend of money supply from 1975/76 to 2018/19. Money supply amount is present in million form. The figure shows that money supply of Nepal is increasing rate. Every year the money supply is increased. The average money supply over the study period is 529661.1 million. The Figure shows that after 2000 A.D. the rate of money supply is increased fast and it increased faster as compare to previous year.

4.2.1 Money supply growth Rate of Nepal

The growth measures the percentage change in current period from previous period. Here the growth rate in Money supply is calculated by deducting the value of Money supply in previous fiscal year from the value of money supply in this fiscal year and dividing that differentiated value by the value of Money supply in previous fiscal year for all respective fiscal year.

The trend of money supply is normally increasing over the period. However, in order to study the trend of its growth following Figure 4.8 is drawing. The trend of money supply growth looks fluctuating over the period. In FY 2001/02 its growth rate is low. The trend of money supply is shown in following Figure 4.8.

Figure 4.8: Trend of Money supply growth rate (in percent)

M2 Growth rate
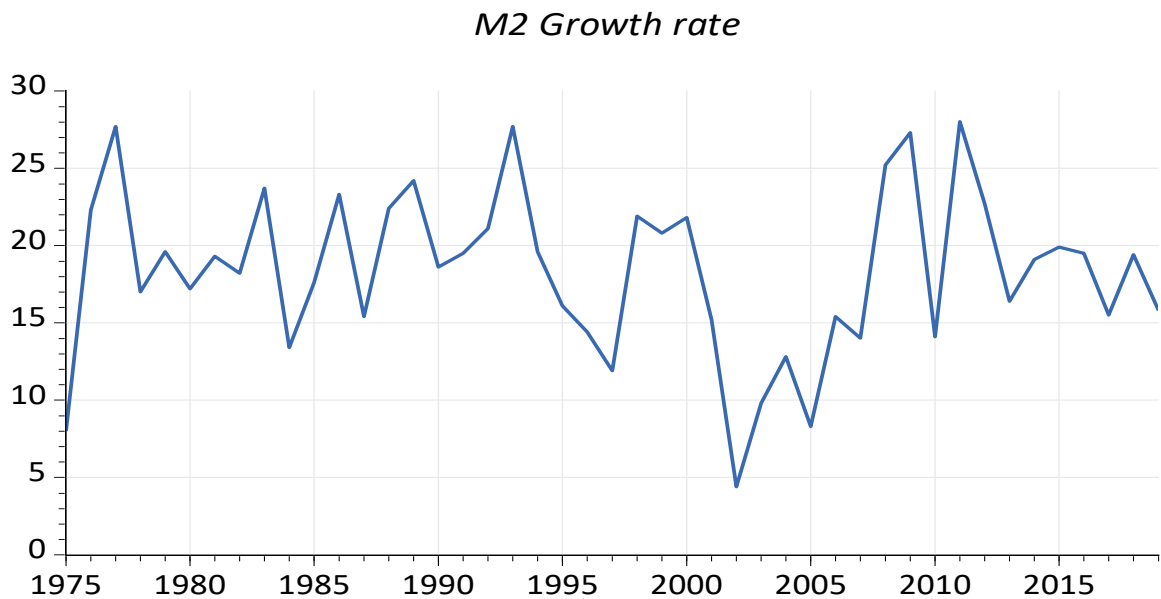
Source: Appendix-III.

Figure 4.8 shows the trend money supply growth in Nepal since the fiscal year 1974/75 to 2018/19. In above figure X-axis measure the fiscal year and in Y-axis measure rate of Money supply. The figure value of Money supply growth is in percentage form. The overall trend of money supply growth is fluctuating over the period. In FY 2010/11 the highest growth rate is recorded the growth rate is 28.0 percent. Also in FY 1992/93 the growth rate is high. But in FY 2001/02 the growth rate is too low. Because of the Maoist insurgency in the country in that period other macroeconomic variable like RGDP rate inflation rate is so much contracted. After that the money supply growth rate is also fluctuate but not as before.

4.3 Inflation and money supply in Nepal

Classical and neo classical strongly advocate that there is positive relation between inflation and money supply. Quantity theory of money also suggest this idea. Figure 4.9 try to show this through graph of inflation and money supply trend from study time data.

Figure 4.9: Trend of inflation and money supply (in percent)
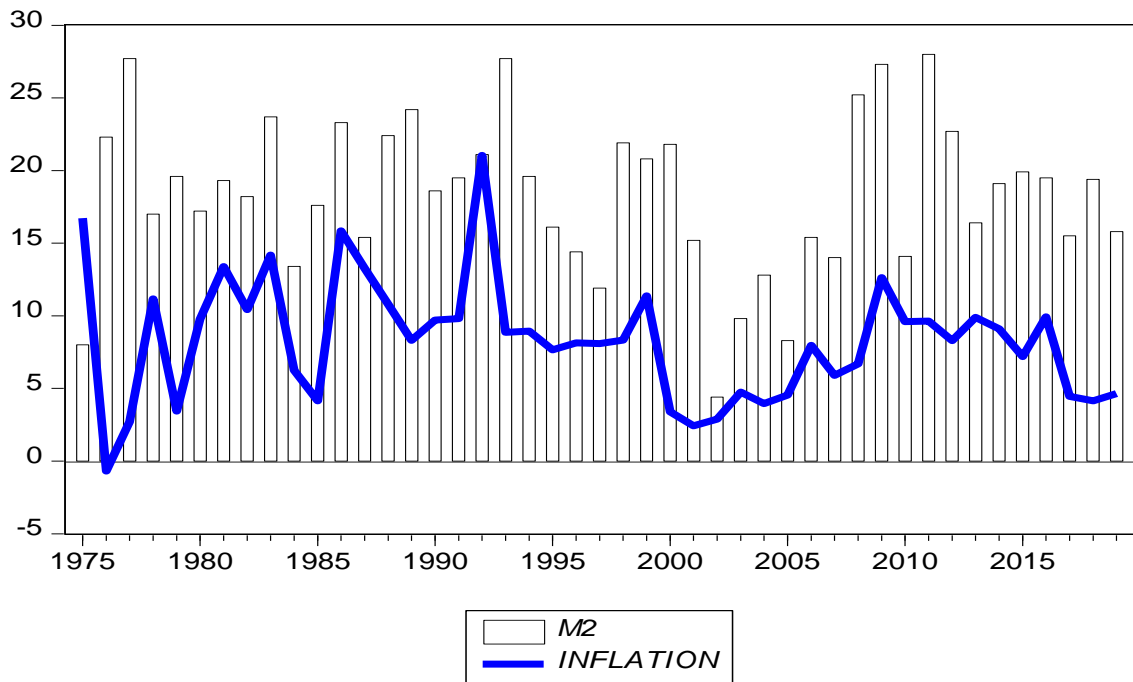
In Figure 4.9 X-axis measure fiscal year and Y-axis measure change percentage of money supply and inflation. In above figure line represent inflation rate and bar is for change in money supply. This both line and bar have quite similar trend. When money supply increased then inflation is also increases but the percentage is not same. This graph also represent relation between money supply and inflation .Inflation and money supply have fluctuation throughout the study period. From figure sometimes rather then money supply other factor affect the inflation. In F.Y.1976 money supply growth is positive and inflation is negative. This shows along with money supply other factor affect the inflation in Nepal.

CHAPTER - V

RELATIONSHIP BETWEEN INFLATION AND MONEY SUPPLY IN NEPAL

5.1 Descriptive Statistics of the variables

The descriptive statistics of consumer price index of Nepal (CPIN), money supply (M2), real gross domestic product (RGDP), nominal gross domestic product (NGDP) budget deficit (BD), exchange rate (EXC), and consumer price index of India (CPII), include mean, median, maximum value, minimum value, standard deviation, skewness etc. are presented in following table.

Table 5.1 Descriptive Statistics of the variables

	CPIN	M2	RGDP	NGDP	BD	EXC	CPII
Mean	105.3751	517937.2	411135.3	669168.4	-46582.00	53.22378	104.2916
Median	78.26000	103720.6	366224.7	280513.0	-20350.40	57.02000	78.17000
Maximum	336.2800	3582138	949885.8	3458793	-506.8000	112.8800	319.9700
Minimum	11.14000	2064.400	143079.6	16601.00	-360562.3	10.55000	13.14000
Standard Deviation	95.30098	876486.2	228022.4	889055.7	73489.02	32.29987	90.20113
Skewness	1.031158	2.097582	0.659096	1.629933	-2.742233	0.095763	0.957197
Kurtosis	2.968182	6.547130	2.368299	4.729584	10.66222	1.741178	2.740737
Jarque-Bera	7.976550	56.59037	4.006272	25.53410	166.4792	3.039964	6.997729
Probability	0.018532	0.000000	0.134912	0.000003	0.000000	0.218716	0.030232
Sum	4741.880	2330717	1850108	30112573	-2096190.	2395.070	4693.120
Observations	45	45	45	45	45	45	45

Table 5.1 shows the description of statistics of the variable. The sample mean of CPIN is 105.3751 and its middle value (median) is 78.2600. CPIN has maximum value of 336.2800 and minimum value at 11.14000 in this observation. Standard deviation of

CPIN is 95.30098 which shows the deviation from its sample mean. CPIN has positive skewness (higher value then sample mean) and platykurtic which is represent by value 1.031158 and 2.968182 respectively. Jarque- Bera probability value is less than 5 percent which show the non-normality of variable.

The sample mean of M2 is 517937.2 and median is 103720.6. M2 standard deviation is 876486.2 which show the deviation from sample mean. The maximum and minimum value of M2 is 3582138 and 2064.400 respectively M2 has positive skewness and leptokurtic kurtosis. Jarque-Bera probality tells that the variable has not have normal distribution.

From the table all variable except BD are positive skewness which state that there are more higher value then its sample mean and its distribution is long right tail. BD is negative skewness represent the long right tail of distribution. M2 and BD are leptokurtic kurtosis represent peaked curve of the distribution series and other variable are platokurtic kurtosis which represent flat curve of the distribution. From Jarque-Bera probability value only RGDP and EXC data are normally distributed.

Descriptive statistic of variable shows that some variable data are normally distributed and some are not. So, using this data in regression can falsified the result. For solving this problem natural log of the data are used in this study.

5.2 Stationary Test

Before run the Engle-Granger co-integration model in order to check the co-integration between money supply on inflation, it requires checking whether the used data for regression analysis are stationary or not. If the data are not stationary, then first of all it is necessary to convert into stationary. The stationary of time series data means that the mean, variance, and auto covariance (at various lag) remain the same at each point of time (i.e.they are time invariant).

Augmented Dickey Fuller (ADF) test is run for check Stationary test in this study. The detail model for unit root test is explained in methodology chapter. Each variable is tested in both form intercept and intercept with trend which are presented in Table 4.3.The test is done simply by using econometric software EViews.10.

Table 5.2 Augmented Dickey Fuller Tests for Unit Root

Variables	Level Form		First Difference (Δ in log)		Remarks
	Intercept	Trend and Intercept	Intercept	Trend and Intercept	
LnCPIN	-1.6615 (0.44)	-1.2867 (0.87)	-4.9117 (0.00)*	-5.1340 (0.00)*	I (1)
LnM2	-0.7568 (0.82)	-2.1054 (0.52)	-4.6933 (0.00)*	-4.7054 (0.00)*	I (1)
LnRGDP	0.9636 (0.99)	-3.1825 (0.14)	-7.4697 (0.00)*	-7.6005 (0.00)*	I (1)
LnNGDP	0.164485 (0.96)	-2.187053 (0.48)	-7.32282 (0.00)*	-7.239424 (0.00)*	I (1)
LnBD	-1.3845 (0.58)	-3.0233 (0.13)	-6.3922 (0.00)*	-6.3439 (0.00)*	I (1)
LnEXC	-1.5126 (0.51)	-0.6606 (0.96)	-5.1350 (0.00)*	-5.1414 (0.00)*	I (1)
LnCPII	-1.8789 (0.33)	-1.5265 (0.80)	-6.4988 (0.00)*	-6.7181 (0.00)*	I (1)

Source: Author's Calculation through EViews.10 .

Note: *shows 1% level of significance; ** shows 5% level of significance and numeric value in the parenthesis expresses p-values. The p-values are based on MacKinnon (1996) one-sided p-values.

Table shows the result of the ADF test statistics of concerned variable used in the study. All the variables are non-stationary at the level but stationary at first difference. The Augmented Dickey Fuller tests shows all the variables are stationary at the 1% level of significance at first difference. Thus, it is concluded that all variables are integrated of order 1, i.e. I(1). .Since all variable are stationary at first difference so this study apply Engle Granger approach to test the long run co-integration of the variable.

5.3 Engle-Granger Cointegration Test and Error Correction Model

According to Engle-Granger co-integration test, the long run co-integration of the variables can be tested by testing the stationary of the residual term error correlation term in the long run model. The study tries to find relation between money supply and inflation by using three different model. First model used RGDP as independent variable, second model used nominal GDP as independent variable and last model is without GDP. The long run models has derived by using OLS method as below.

Table 5.3 Long run model result by using OLS Method (First model)

Dependent Variable: LNCPIN				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LnM2	0.098713**	0.047132	2.094379	0.0428
LnGDP	-0.217028***	0.117006	-1.854840	0.0712
LnBD	0.048122*	0.013821	3.481719	0.0012
LnEXC	0.151915*	0.021399	7.099174	0.0000
LnCPII	0.785736*	0.081880	9.596194	0.0000
C	1.473380	1.159280	1.270944	0.2113
R-squared	= 0.999577	F-statistic	=	18417.51
Adjusted R-squared	= 0.999522	Prob(F-statistic)	=	0.000000
Sum squared residual	= 0.020993	Durbin-Watson stat	=	1.570807

Source : Authors own calculation through EViews.10

Note: */**/*** denotes statistically significant at 1 percent, 5 percent, 10 percent

Table 5.3 show the long run model and the coefficient are called long run coefficient. To test the long run coefficient among the variable it is necessary to stationary of residual term. For that we have to check stationary of residual term. If the residual of the long run model is stationary at level then the variable are co-integrated and exist long run relationship. So the model is not a spurious model. The stationary test of residual is checked by ADF. The ADF test result of residual term is given as below in table 5.4.

Table 5.4 ADF test result of residual of first model

Null Hypothesis: ECT has a unit root		t-Statistic	Prob.*
Exogenous: None			
Lag Length: 0 (Fixed)			
		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.407393	0.0000
Test critical value	1% level	-2.618579	
	5% level	-1.948495	
	10% level	-1.612135	
*MacKinnon (1996) one-sided p-values.			

Source: Authors calculation through EViews-10.

Table 5.4 show that the result of ADF test of residual. From the table value of Augmented Dickey-Fuller test statistics 5.381876 is greater than critical value of Engle-Granger cointegration value 4.700 at 5% percent level of significance (See Appendix VII). So the null hypothesis that the ECT has unit root is rejected i.e. ECT is stationarity at level. Thus the residual term is stationary at level form it is conclude that there exist the co-integration among the variable and the long run model will not be spurious

Table 5.3 shows the long run model and the coefficient gives the long run coefficient. The result of long run model shows that LnCPII, LnEXC, LnM2 and LnBD have significant positive role in increasing Consumer price index of Nepal and LnRGDP has significant negative effect on CPIN. Consumer price index in Nepal is highly effected by Indian CPI and exchange rate, money supply and budget deficit respectively in long run.

The long run model suggest that money supply has positive significant relation with CPIN. The coefficient is statistically significant at 5% level of significance. The result shows that one percent unit increase in money supply increases the CPIN by 0.09 percent at other thing remaining the same. So, in long run money supply impact on inflation is lower compare to other variable.

The long run coefficient of LnRGDP is -0.217028 and it is statistically significant at 10% level of significance. It indicate that increase in one percent unit of RGDP

decreases NCPI by 0.21 percent. At other thing remaining the same, Increase in RGDP increases the production and decline inflation.

Similarly, coefficient of LnBD is 0.048122 and significant at one percent level of significance. Data on budget deficit is taken in absolute term in this regression so. The result implied that decrease in budget deficit by 1 percent unit increases the NCPI by 0.04 percent unit, ceterus peribus.

The elasticity Coefficient value of LnEXC is significant at one percent level of significance. The result shows that increase in exchange rate by 1 percent unit increases the NCPI by 0.15 percent at other thing remaining the same.

Next variable is CPII. Its coefficient is the highest compare to all variables which is 0.785736. The coefficient is statistically significant at one percent level of significance. An increase in CPII by 1 percent unit increases the NCPI by 0.78 percent unit at other thing remaining the same.

The value of R-squared is 0.9995. Which indicate that 99.95 percent of total variation in NCPI is explained by explanatory variables and 0.05 percent is due to error. Similarly, the probability value of F-statistics is less than 1 percent which shows that there is overall significant of long run model.

The Durbin-Watson test statistics is 1.570807. By using this value it is difficult to conclude about the autocorrelation. So this study used Breusch- Godfrey Serial Correlation LM test to test the serial correlation. The result of serial correlation shows that the observed R-squared is 2.069460 with probability Chi-squared 0.3553 This probability is more than five percent so the null hypothesis that there is no serial correlation cannot be rejected. Hence the long run OLS model is free from autocorrelation. The CUSUM test and CUSUM squared test also shows that the model is between 5 percent level of significance (Appendix-VIII).

The second model result is shown in appendix ix. The residual unit root test shows non stationarity of residual term. The Augumented Dickey-Fuller test statistics 5.135045 is greater then Engle-Granger cointegration test value 4.700 at 5 % level of significance. This model shows the insignificant relationship between money supply and inflation in long run. The result shows that in long run inflation is affected mainly by indian CPI,

exchange rate and budget deficit. The diagonistic test shows model is free from serial correlation and heteroskedasticity. (see Appendix VI)

The third model result is shown in appendix ix . The residual unit root test shows non stationarity of residual term. The Augumented Dickey-Fuller test statistics 4.959821 is greater then Engle-Granger cointegration test value 4.700 at 5 % level of significance. This model also shows the insignificant relationship between money supply and inflation in long run. The result shows that, in long run inflation is affected mainly by indian CPI, exchange rate and budget deficit. The diagonistic test shows model is free from serial correlation and heteroskedasticity. (see Appendix VI)

Table 5.3 and other model result shows the long run relation between variable. To test the short run relationship between money supply and inflation and other variable relation with inflation the study used Error Correction Model. The result of Error Correction Model of first model is presented in table 5.5

Table 5.5 Regression Result of Short-run Error Correction Model (using RGDP)

Dependent Variable: D(LNCPIN)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.012239	0.016107	-0.759871	0.4521
D(LnM2)	0.190713**	0.087293	2.184749	0.0353
D(LnGDP)	-0.023877	0.149736	-0.159457	0.8742
D(LnBD)	0.037287***	0.019058	1.956450	0.0580
D(LnEXC)	0.139715*	0.049299	2.834024	0.0074
D(LnCPII)	0.644109*	0.099079	6.500954	0.0000
ECT(-1)	-0.835288*	0.175864	-4.749639	0.0000
R-squared	= 0.705758	F-statistic	=	14.79113
Adjusted R-squared	= 0.658043	Prob(F-statistic)	=	0.000000
Sum squared resid	= 0.017635	Durbin-Watson stat	=	1.750893

Source: Authors calculation through EViews-10

*Note: */**/*** denotes statistically significant at 1percent, 5 percent, 10 percent*

Table 5.5 is the short run error correction model and the coefficient of the short run model shows the short run elasticity of the variables with respect to CPIN. In short run except RGDP all variable impact on consumer price of Nepal with significant positive relation. RGDP coefficient is not statistically significant. Major impact on inflation in short run is caused by Indian consumer price index. Money supply also impact inflation in short run.

The coefficient of short run variable of money supply is 0.190713 which is significant at 5 percent level. This result indicate that one percent increase in money supply increases inflation by 0.19 percent and vice versa at other thing remaining the same. This result is similar with the proposition of classical quantity theory of money.

Similarly, the next variable is RGDP. The coefficient of RGDP is not statistically significant. The coefficient is in negative form. Keynesian and other theory define that the relation between RGDP and inflation. So this result also define the theory in same way Coefficient of budget deficit is 0.037287 which is significant at 10 percent level.. Budget deficit is taken in this study at absolute term. So increase in budget deficit by one percent decreses the inflation by 0.03 percent in short-run.

Exchange rate impact the inflation also in short run. Coefficient of D(LnEXC) is 0.139715 and it is significant at 1 percent level . This implies that increase in exchange rate by one percent increases the inflation by 0.13 percent vice versa, at other things remaining the same.

Major impact on inflation in short run is by Indian CPI. D(LnCPII) has coefficient of 0.644109 which is significant at one percent level . From the result it can be state that increase in Indian CPI by one percent increases the inflation by 0.64 percent and vice versa.

The ECT(-1) coefficient is -0.835288 and it is statistically significant at one percent level . The coefficient of ECT(-1) shows the speed of adjustment to the equilibrium and the rule of thumb is that coefficient of it should be negative. The coefficient implies that 83.52 percent of the error being corrected every year. This result also implies that NCPI and other explanatory variable are converging in the long run.

R-squared value of the model is 0.705758 which indicate that in short run explanatory variable only explain 70.57 percent of the total variation in NCPI and remaining 29.43 percent is due to error. Likewise, the probability value of F- statistics is less then one percent that shows that there is overall significant of short run model.

The Durbin-Watson statistics value is 1.750893 which state that there is no problem of serial correlation problem with this model also. So, ECM model is free from autocorrelation.

The second model result is shown in Appendix VI. This model shows the insignificant relationship between money supply and inflation in short run also. The result shows that in short run inflation is affected mainly by indian CPI, exchange rate and budget deficit. ECT(-1) value has negative sign and significant at one percent level. The Durbin-Watson statistics value is 1.870726 which state that there is no problem of serial correlation problem with this model also. So, ECM model is free from autocorrelation.

The third model result is shown in Appendix VI. This model shows the insignificant relation ship between money supply and inflation in short run also. The result shows that in short run inflation is affected mainly by indian CPI, exchange rate and budget deficit. ECT(-1) value has negative sign and significant at one percent level. The Durbin-Watson statistics value is 1.850135 which state that there is no problem of serial correlation problem with this model also. So, ECM model is free from autocorrelation.

5.4 Residual Diagnostic Test

a.Heteroskedasticity Test: Breusch-Pagan-Godfrey test is used to test the heteroskedasticity by setting the following null hypothesis. The Breusch-Pagan-Godfrey test regressed the square residuals on the original regressors.

Table:5.6 Heteroskedasticity Test result of First model

Breusch-Pagan-Godfrey Test			
Null hypothesis: Residuals are not heteroskedasticity.			
F-statistic	1.199993	Prob. F(5,39)	0.3272
Obs R-squared	5.999968	Prob. Chi-Square(6)	0.3062

Source: Authors own calculation through EViews-10

Table 5.6 and from Appendix VII the probability value of F-statistic, and Observed R-squared is more than 5 percent. It means that the null hypothesis is not rejected. Thus, it can be concluded that the all three models equation is free from heteroscedasticity.

b. Serial CorrelationTest: Breusch-Godfrey Serial Correlation LM test has been applied to test serial correlation by using the following null hypothesis.

Table 5.7 Serial Correlation Test of first model

Breusch-Godfrey Serial Correlation LM Test			
Null hypothesis: There is no serial correlation			
F-statistic	0.891789	Prob. F(2,37)	0.4185
Obs*R-squared	2.069460	Prob. Chi-Square(2)	0.3553

Source: Authors own calculation through EViews-10

Table 5.7 and Appendix VII the p-value of both F-statistic and Observed R-squared with degree of freedom two is higher than 5 percent level of significance . Then, it can be concluded that all three model is free from serial correlation problem .

CHAPTER - VI
SUMMARY, FINDING, CONCLUSION AND RECOMMENDATION

6.1 Summary

The main objective of monetary policy is to control inflation for sustain the economic stability. Classical quantity theory of money and other theory define money supply as major determinant of inflation. On this base, the study define its objective as analyse the trend of inflation and money supply in Nepal, examine the relation between money supply and inflation in Nepal and analyse the long and short run relation between those variable. Hypothesis are created on the basis of objective of the study.

Literature review of different theory international literature and national literature shows the sign of relation between money supply and inflation. This study try to fill the gap between previous study recommendations. Data from FY 1975 to FY 2019 is collected from secondary source manely from NRB, World Bank data set and MoF publication. Graphical representation of money supply and inflation point out the relation between variables. For finding the relation between money supply and inflation ordinary least square multiple regression model is used. Consumer price index on Nepal is taken as dependent variable and money supply as core independent variable. For true estimation of inflation other control variable are included into the model.

ADF test shows the stationrity of the data at their first difference and Engle -Granger Co-integration give the long run relation between money supply and inflation. The residual term has also stationary and different residual test verify the long run model. In long run money supply has impact on inflation, but its impact amount is less then other variable. Open economy and trade dependent with India may be reason for that. This statement also get support from that Indian inflation has major impact on inflation in long run.

For short run analysis Error Correction Model is used. The model result suggest that inflation in short run has major impact on inflation. From doing so it can be said that money supply play important role in determine inflation in long and short run. This

statement prove the classical quantity theory of money. It is also shows that impact of money supply on inflation is higher in short run compare long run.

Indian inflation is the major variable that affect the inflation in Nepal in both short and long run. And money supply, exchange rate and inflation rate of Indian inflation are the major determinant of inflation in both short run and long run.

6.2 Finding

The major finding of the study are listed as given below:

1. The trend analysis of inflation shows that inflation is highly fluctuated during the study period. The maximum level of inflation is 21.1 percent in FY 1991/92 and its minimum value is -0.69 in 1975/76. Overall average inflation of study period is 8.1 percent. The study also find that inflation in Nepal is majorly caused by inflation in food and beverage compare to non-food inflation. The distribution of inflation in Nepal shows that inflation is highly associated with Ktm valley inflation compare to other two region i.e. Terai and Hill. Terai and hill inflation is more fluctuating throughout the study period. After employ new constitution the inflation was really in under control.

2. The trend analysis of money supply specifically Broad money is highly fluctuated during the study period. The maximum growth rate of money supply is 28.0 percent in FY 2010/11 and lowest in FY 2001/02 which is 4.4. The trend analysis of inflation and money supply shows that money supply and inflation has similar like trend and it also define the relation between this two variable.

3. The ADF test shows that all variable are stationary only after the first difference i.e. all variable used in this study are I(1).

4. The Engle-Granger co-integration indicate that variable used in this study are cointegrated and long run OLS model is free from spurious regression.

5. First model of the study only shows the significant relation between money supply and inflation in long run and short run. The long run model shows that money supply has positive significant effect in inflation in long run. One percent unit increase in money supply lead to 0.09 percent increases in inflation at other

thing remaining the same. The impact on inflation by money supply is seem to less compare to other variable. The major variable that effect the inflation positively inflation in long run are Indian inflation, exchange rate and budget deficit. However RGDP is significantly negative impact on inflation.

6. In long run both nominal and real GDP has insignificant relation with inflation. The result of second and third model shows insignificant relation between money supply and inflation in both long-run and short-run.

7. The result of ECM model of first model indicate that in short run, money supply has significant positive relation with inflation in short run. One percent unit increase in money supply increases the inflation by 0.16 percent at other thing remaining the same. Like money supply Indian inflation and exchange rate and budget deficit effect the inflation significantly positively. The coefficient value of Indian CPI, exchange rate and budget deficit is 0.6441, 0.1397 and 0.0372 respectively. So in short run inflation is affected by money supply but majorly by Indian CPI

8. The coefficient of ECT (-1) is negative and significant at 1 percent level indicate that the money supply and other explanatory variable are converging into long-run equilibrium.

9. Effect of money supply in inflation is higher in short-run compare to long-run. In long-run the coefficient of money supply is 0.098713 on the other side in short run the coefficient is 0.190713.

10. From the empirical study all three hypothesis of the study, null hypohtsis is rejected. So there is relation between money supply and inflation in shor-run as well as long-run.

11. Result of CUSUM test and CUSUM of squares also indicate the model is in the boundary line of 5 percent level significance.

6.3 Conclusion

One of the major objective of the monetary policy is to balance money demand and money supply for maintain inflation. Balancing inflation is major and difficult work because estimation of inflation is quite difficult task. From Fisher to monetarist all of them are agree on one statement that there is relation between money and price but the type of relation is debatable till now. They have their own different description for relation with this variable.

Several internal and external factors affect price level in an economy. Money supply is the major internal factor affecting price level as over-supply of money can lead to an increase in price level. Information on the pattern of money-price relationship is crucial to maintain the money supply at an optimal level. In this regard, examine the relation between money supply and inflation in Nepal is very necessary. SO the central focus of this study is to examine the inflation-money supply relationship.

The OLS long run model and Engle-Granger co-integration test show that there is significant relationship between money and price in Nepal as one percent change in money supply induce a change of 0.09 percent in the consumer price index. The short run error correction model test show that there is significant relation between money and price as one percent change in money supply induce a change of 0.19 percent in the consumer price index. Indian price index has the largest impact on Nepal's price level on long run as well as short run.

6.4 Recommendation

From the above finding and conclusion of the study, this study recommended the following points:

1. Since broad money stimulate inflation in Nepal, it should be managed at optimum level. It can be recommended that monetary policy should encourage investment demand in the economy to expand loan from bank and financial institutions in productive sectors rather than in unproductive sectors or consumption purpose.

2. Major impact on inflation in Nepal caused by Indian price level,it is external factor. Government of Nepal should focus on increasing internal production and making self-sufficient economy.

3. New area of government internal revenue should investigate. Which help to decrease the size of budget deficit and help to maintain price stability.

REFERENCES

Abdul, Q. (2006). Money, inflation and growth in Pakistan. *The Pakistan Development Review*, 45(2), 203-212.

Acharya, R. C. (2019, June). Relationship between money supply, income and price level in Nepal. *NRB Working paper No.46*.

Adhikari, R. (2014). Whether inflation hampers economic growth in Nepal. *Journal of Economics and Finance, 5*, 52-56.

Alam, M. Q., & Alam, M. S. (2016). The determinants of inflation in India: The bounds test analysis. *International Journal of Economics and Financial Issues*, 6(2), 544-550.

ADB (2003). *Country Economic* Review : *Nepal.* Asain Developement Bank.

Bhusal, T. P. (2016). *Basic Econometrics.* Kathmandu, Nepal: Dreamland Publication Ltd.

Byanjankar, R.(2020). Determinants of inflation in Nepal: An application of ARDL bounds testing approach to cointegration. *NRB Working Paper No.48*.

Chaudhary, S. K., & Xiumin, L. (2018). Analysis of the determinants of inflation in Nepal. *American Journal of Economics*, 8(5), 209-212.

Chimobi, O. P. (2010). Causality between money and inflation in Nigerian economy. *International Journal of Economic Perspectives, 4*, 363-370.

Engle, R. F., & Granger, C. (1987). Co-integration and error correction : representation, estimation, and testing. *Econometrica, 55*, 251-276.

Giannaros, D. S., & Kolluri, B. R. (1985). Deficit spending, money, and inflation: some international empirical evidence. *Journal of Macroeconomics, 7(3), 401-407*

Gujarati , D. N., & Gunasekar , S. (2007). *Basic econometrics (fourth ed.).* New delhi: McGraw-Hill companies.

Gujarati, D. N., Porter, D. C., & Gunasekar , S. (2012). *Basic Econometrices (fifth edition).* Chennai, India: McGraw hill education (india) private limited.

Gyanwaly, R. P. (2012). Casual relationship between money,price and income in Asian countries (1964-2011) *The Economic Journal of Nepal, 35,* 12-32.

Hanke , S., & Krus, N. (2012, August 15). World hyperinflations. *CATO Working Paper No. 8.* Retrieved from http://www.jstor.org/stable/41261104

K.C., R. (2017). Trend of money supply and inflation in Nepal. An unpublished thesis Tribhuvan University, Kirtipur, Nepal.

Karna, S. K., & Singh, S. (2015). Analysis of inflation of NEPAL. *New Man International Jouranal of Multidisciplinary Studies, 2(5), 4-21*

Kiganda, E. O. (2014). Relatioship between inflation and money supply in kenya. *Journal of social economics, 2*, 63-83.

Louis, F. R. (2020, August). *Fedral reserve bank of st Louis.* Retrieved from https://www.stlouisfed.org/on-the-economy/2018/january/venezuela-address-hyperinflation

Luo, P. (2013). *Money supply behaviour in 'BRICS' economics*. A bachelore thesis. *Jonkoping University*. Sweden

Mayandy, K., & Amirthalingam, K. (2012, june). The Nexus between Money Supply and Inflation in Sri Lanka. Retrieved from Researchgate: https://www.researchgate.net/publication/343079927

Narayan, S., Kumar, N. P., & Prasad, A. D. (2006). Modelling the relationship between budget deficits, money Supply and inflation in Fiji. *Pacific Economic Bulletin, 21*

Acharya, M. B. (2019). Effects of money supply to the inflation in Nepal. An unpublished thesis. Tribhuvan university, Nepal

NRB (2001). Money and price relationship in Nepal : A revisit. *Economic Review 13*, 50-63, Research Department, Nepal Rastra Bank

NRB.(2007). Inflation in Nepal. Nepal Rastra Bank, Research Department, Kathmandu.

NRB (2020). Current macroeconomics and financial situation. Nepal Rastra Bank,

Neupane, G. (1992). Causes of inflation in nepal: A quantitative analysis. *Economic Review Occasional Paper 6, nepal rastra bank*.

Nguyen, V. B. (2015). Effects of fiscal deficit and money M2 supply on inflation: Evidence from selected economies of Asia. *Journal of Economics, Finance and Administrative Science, 20*, 49–53.

Odusanya, I. A., & Atanda, A. A. (2010). Analysis of inflation and its determinants in Nigeria. *Pakistan Journal of Social Sciences, 7,* 97-100.

Ofori-Frimpon, K. (2017). The impact of money supply on inflation, a case of Ghana. *Imperial Journal of Interdisciplinary Research 3, 2312-2318*

Pandey, G. (2018). Macroeconomic variables and inflation in Nepal. An unpublished thesis, Tribhuvan university, Kirtipur, Kathmandu .

Pandey, R. (2005). Inflation. *Nepal Rastra Bank Golden Jublee Publicataion*, 326-344.

Parajuli, R. B. (2010). Determinants of Inflation in Nepal. *PYC Nepal Journal of Management, 3, 172-180*

Paudyal, B. S. (2014). Determinants of Inflation in Nepal: An empirical assessment. *NRB Economic review. 26(20), 61-82*

Reserve, B. O. (2020, August). *Federal Reserve System.* Retrieved from https://www.federalreserve.gov/faqs/economy_14400.htm

Shapiro, E. (2001). *Macroeconomics analysis(fifth edition).* New Delhi: Galgotia Publications Pvt.Ltd.

Shrestha, M. B., & Bhatta, G. R. (2018.). Selecting appropriate methodological
    framework for time series data analysis. *NRB Working Paper no.36*

Shrestha, P. K. (2013). An empirical analysis of money supply process in Nepal. *NRB
    Economic Review*. 25(2), 17-42

Stein, J. L. (1991). *Monetarism (Vol. 1).* (J. L. Stein, Ed.) New York Amererdam:
    North-Holland Publishing company.

Sultana, N., Koli, R., & Firoj, M. (2019 January). Casual relationship of money
    supply and inflation: A study of Bangladesh. *Asian Economic and Financial
    Review*. 9, 42-51

Appendix I

Raw Data

Fiscal year	NCPI Base year 2000/01	M2 (Rs in Million)	RGDP (Rs in Million) Base year 2000/01	NGDP (Rs in Million) Base year 2000/01	BD (Rs in Million)	EXC (Rs in Million)	CPII Base year 2000/01
1974/75	11.21	2064.40	143,079.6	16,601.0	-506.8	10.55	14.23
1975/76	11.14	2524.00	148,042.0	17,394.0	-801.4	12.18	13.14
1976/77	11.44	3223.00	149,537.7	17,280.0	-998.9	12.50	14.23
1977/78	12.72	3772.10	154,214.8	19,727.0	-1,121.5	12.33	14.59
1978/79	13.15	4511.40	157,500.0	26,128.0	-1,222.6	12.00	15.51
1979/80	14.44	5285.30	155,131.2	23,351.0	-1,613.6	12.00	17.27
1980/81	16.37	6307.70	170,692.7	27,307.0	-1,691.9	12.00	19.53
1981/82	18.08	7458.00	178,222.7	30,988.0	-2,685.3	13.00	21.07
1982/83	20.64	9222.40	178,948.9	33,821.0	-4,143.9	13.88	23.57
1983/84	21.93	10455.20	194,692.0	39,290.0	-4,031.0	15.50	25.53
1984/85	22.83	12296.60	205,170.1	46,587.0	-4,478.2	17.93	26.95
1985/86	26.45	15159.00	214,537.7	55,734.0	-5,152.6	19.95	29.31
1986/87	29.96	17498.20	218,184.3	63,864.0	-5,538.1	21.69	31.89
1987/88	33.20	21422.60	234,977.2	76,906.0	-6,814.6	22.21	34.88
1988/89	35.96	26605.10	245,146.3	89,270.0	-10,228.4	25.63	37.35
1989/90	39.44	31552.40	256,508.9	103,416.0	-10,381.4	28.64	40.70
1990/91	43.32	37712.50	272,839.4	120,370.0	-12,819.4	31.95	46.34
1991/92	52.43	45670.50	284,047.8	149,487.0	-12,905.5	42.69	51.80
1992/93	57.08	58322.50	294,974.4	171,474.0	-15,749.3	45.65	55.08
1993/94	62.19	69777.10	319,219.1	199,272.0	-14,016.7	49.25	60.72
1994/95	66.95	80984.70	330,291.0	219,175.0	-14,484.8	49.94	66.93
1995/96	72.40	92652.20	347,920.7	248,913.0	-18,649.3	55.21	72.94
1996/97	78.26	103720.60	366,224.7	280,513.0	-20,350.4	57.02	78.17
1997/98	84.77	126462.60	376,999.3	300,845.0	-23,180.4	61.95	88.51

1998/99	94.42	152800.20	393,902.9	342,036.0	-22,328.0	67.95	92.64
1999/00	97.62	186120.80	417,992.1	379,488.0	-23,382.9	69.07	96.36
2000/01	100.00	214454.20	441,518.5	441,519.0	-30,941.5	73.83	100.00
2001/02	102.89	223988.30	442,049.0	459,442.6	-29,626.6	76.88	104.30
2002/03	107.78	245911.20	459,488.3	492,230.8	-27,776.4	77.79	108.27
2003/04	112.05	277306.10	481,004.3	536,749.1	-27,111.6	73.79	112.35
2004/05	117.13	300440.00	497,739.0	589,411.7	-32,436.4	72.06	117.12
2005/06	126.46	346824.10	514,485.6	654,084.1	-38,607.1	72.32	123.90
2006/07	133.92	395518.22	532,038.2	727,827.0	-45,892.5	70.49	131.80
2007/08	142.90	495377.10	564,516.9	815,658.2	-53,727.2	65.02	142.81
2008/09	160.88	630521.17	590,107.2	988,271.5	-76,187.5	76.88	158.35
2009/10	176.29	719599.12	618,529.1	1,192,773.6	-79,743.3	74.54	177.33
2010/11	193.14	921320.14	639,694.1	1,366,954.1	-95,544.5	72.27	193.04
2011/12	209.20	1130302.29	670,279.4	1,527,343.6	-94,606.4	81.02	211.02
2012/13	229.78	1315376.28	697,954.2	1,695,011.1	-61,861.5	87.96	234.03
2013/14	250.64	1565967.16	739,754.4	1,964,539.6	-71,558.8	98.25	248.90
2014/15	268.73	1877801.53	764,335.7	2,130,149.6	-119,491.7	99.49	263.52
2015/16	295.43	2244578.57	768,835.2	2,253,163.1	-115,792.8	106.35	276.54
2016/17	308.58	2591701.99	832,060.3	2,674,492.8	-224,649.6	106.21	283.43
2017/18	321.40	3094466.61	887,816.7	3,044,927.1	-360,562.3	104.37	297.20
2018/19	336.28	3582137.65	949,885.8	3,458,792.9	-270,795.2	112.88	319.97

Appendix II

Data in Nominal Form

Year	LnCPIN	LnM2	LnRGDP	LnNGDP	LnBD	LnEXC	LnCPII
1975	2.4	7.6	11.9	9.7	6.2	2.4	2.7
1976	2.4	7.8	11.9	9.8	6.7	2.5	2.6
1977	2.4	8.1	11.9	9.8	6.9	2.5	2.7
1978	2.5	8.2	11.9	9.9	7.0	2.5	2.7
1979	2.6	8.4	12.0	10.2	7.1	2.5	2.7
1980	2.7	8.6	12.0	10.1	7.4	2.5	2.8
1981	2.8	8.7	12.0	10.2	7.4	2.5	3.0
1982	2.9	8.9	12.1	10.3	7.9	2.6	3.0
1983	3.0	9.1	12.1	10.4	8.3	2.6	3.2
1984	3.1	9.3	12.2	10.6	8.3	2.7	3.2
1985	3.1	9.4	12.2	10.7	8.4	2.9	3.3
1986	3.3	9.6	12.3	10.9	8.5	3.0	3.4
1987	3.4	9.8	12.3	11.1	8.6	3.1	3.5
1988	3.5	10.0	12.4	11.3	8.8	3.1	3.6
1989	3.6	10.2	12.4	11.4	9.2	3.2	3.6
1990	3.7	10.4	12.5	11.5	9.2	3.4	3.7
1991	3.8	10.5	12.5	11.7	9.5	3.5	3.8
1992	4.0	10.7	12.6	11.9	9.5	3.8	3.9
1993	4.0	11.0	12.6	12.1	9.7	3.8	4.0
1994	4.1	11.2	12.7	12.2	9.5	3.9	4.1
1995	4.2	11.3	12.7	12.3	9.6	3.9	4.2
1996	4.3	11.4	12.8	12.4	9.8	4.0	4.3
1997	4.4	11.5	12.8	12.5	9.9	4.0	4.4
1998	4.4	11.7	12.8	12.6	10.1	4.1	4.5
1999	4.5	11.9	12.9	12.7	10.0	4.2	4.5
2000	4.6	12.1	12.9	12.8	10.1	4.2	4.6
2001	4.6	12.3	13.0	13.0	10.3	4.3	4.6
2002	4.6	12.3	13.0	13.0	10.3	4.3	4.6
2003	4.7	12.4	13.0	13.1	10.2	4.4	4.7
2004	4.7	12.5	13.1	13.2	10.2	4.3	4.7
2005	4.8	12.6	13.1	13.3	10.4	4.3	4.8
2006	4.8	12.8	13.2	13.4	10.6	4.3	4.8
2007	4.9	12.9	13.2	13.5	10.7	4.3	4.9
2008	5.0	13.1	13.2	13.6	10.9	4.2	5.0
2009	5.1	13.4	13.3	13.8	11.2	4.3	5.1
2010	5.2	13.5	13.3	14.0	11.3	4.3	5.2
2011	5.3	13.7	13.4	14.1	11.5	4.3	5.3
2012	5.3	13.9	13.4	14.2	11.5	4.4	5.4
2013	5.4	14.1	13.5	14.3	11.0	4.5	5.5
2014	5.5	14.3	13.5	14.5	11.2	4.6	5.5
2015	5.6	14.4	13.5	14.6	11.7	4.6	5.6
2016	5.7	14.6	13.6	14.6	11.7	4.7	5.6
2017	5.7	14.8	13.6	14.8	12.3	4.7	5.6
2018	5.8	14.9	13.7	14.9	12.8	4.6	5.7
2019	5.8	15.1	13.8	15.1	12.5	4.7	5.8

Appendix-III

Inflation and Money Supply Growth Data

Fiscal year	Inflation (in %)	money supply in % change	Fiscal year	Inflation (in %)	money supply in % change
1975	16.73	8.0	1998	8.33	21.9
1976	-0.69	22.3	1999	11.38	20.8
1977	2.70	27.7	2000	3.39	21.8
1978	11.17	17.0	2001	2.43	15.2
1979	3.44	19.6	2002	2.89	4.4
1980	9.78	17.2	2003	4.75	9.8
1981	13.39	19.3	2004	3.96	12.8
1982	10.42	18.2	2005	4.54	8.3
1983	14.17	23.7	2006	7.96	15.4
1984	6.24	13.4	2007	5.90	14.0
1985	4.14	17.6	2008	6.70	25.2
1986	15.84	23.3	2009	12.63	27.3
1987	13.27	15.4	2010	9.60	14.1
1988	10.79	22.4	2011	9.64	28.0
1989	8.31	24.2	2012	8.30	22.7
1990	9.70	18.6	2013	9.90	16.4
1991	9.81	19.5	2014	9.10	19.1
1992	21.05	21.1	2015	7.20	19.9
1993	8.86	27.7	2016	9.93	19.5
1994	8.95	19.6	2017	4.45	15.5
1995	7.66	16.1	2018	4.15	19.4
1996	8.13	14.4	2019	4.64	15.8
1997	8.09	11.9			

Appendix-IV

Food, Non-Food Inflation Data

Fiscal year	Food inflation (in %)	non Food inflation in % change	Fiscal year	Food inflation (in %)	non Food inflation in % change
1975	15.74	18.99	1998	7.77	9.02
1976	-4.09	7.27	1999	16.20	5.81
1977	-0.26	7.06	2000	0.46	7.07
1978	15.60	3.79	2001	-2.27	8.08
1979	1.52	8.06	2002	3.64	2.12
1980	11.06	7.62	2003	4.47	4.98
1981	13.41	13.36	2004	3.32	4.69
1982	10.98	9.39	2005	3.97	5.14
1983	16.01	10.60	2006	7.81	8.10
1984	5.53	8.44	2007	7.00	4.90
1985	1.02	9.89	2008	9.35	4.10
1986	18.63	10.76	2009	17.12	8.88
1987	15.13	9.53	2010	15.45	5.00
1988	12.08	9.01	2011	14.70	5.40
1989	5.91	12.83	2012	7.70	9.00
1990	10.96	8.06	2013	9.60	10.00
1991	9.97	9.30	2014	11.60	6.80
1992	24.52	14.79	2015	9.60	5.20
1993	6.31	13.50	2016	10.93	9.17
1994	9.10	9.02	2017	1.89	6.49
1995	7.34	7.94	2018	2.74	5.26
1996	8.93	6.68	2019	3.09	5.86
1997	8.18	8.01			

Appendix-V

Distribution of Inflation In Nepal

Fiscal year	KTM	Hill	Terai	Fiscal year	Ktm	hill	Terai
1975	16.4	14.2	-5.9	1998	7.4	8.0	9.0
1976	5.2	3.1	4.4	1999	8.1	11.5	13.3
1977	0.7	3.6	11.4	2000	3.7	3.7	3.1
1978	9.8	10.5	3.8	2001	3.2	5.2	1.1
1979	3.8	3.7	7.8	2002	2.0	2.5	3.4
1980	11.7	9.6	13.0	2003	3.8	3.8	5.7
1981	14.8	13.0	11.1	2004	5.9	3.2	3.1
1982	10.5	10.2	14.9	2005	5.0	4.4	4.4
1983	12.6	14.9	6.3	2006	6.5	8.6	8.6
1984	5.4	6.5	3.1	2007	6.5	5.7	5.6
1985	3.6	9.1	15.8	2008	6.9	6.3	6.3
1986	17.3	11.7	12.3	2009	14.1	12.4	12.2
1987	13.8	13.7	12.4	2010	9.2	10.3	9.5
1988	9.5	11.8	7.5	2011	12.1	10.6	7.2
1989	8.4	10.4	8.1	2012	7.4	9.7	8.1
1990	15.8	0.4	9.7	2013	9.7	9.4	10.2
1991	10.0	9.6	21.5	2014	9.1	8.1	9.7
1992	20.8	19.9	8.6	2015	7.2	7.3	7.1
1993	12.0	7.3	5.2	2016	11.6	10.4	8.6
1994	12.8	6.4	7.3	2017	3.0	6.4	4.4
1995	8.0	7.8	9.5	2018	3.3	4.6	4.4
1996	5.9	9.5	8.2	2019	4.8	5.0	4.4
1997	7.7	8.6	-5.9				

Appendix-VI

Engle-Granger Co-integration Test And ECM Test Results

First Model Co integration test result

Dependent Variable: LNCPIN
Method: Least Squares
Date: 02/19/21   Time: 12:30
Sample: 1975 2019
Included observations: 45

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNM2	0.098713	0.047132	2.094379	0.0428
LNRGDP	-0.217028	0.117006	-1.854840	0.0712
LNBD	0.048122	0.013821	3.481719	0.0012
LNEX	0.151915	0.021399	7.099174	0.0000
LNCPII	0.785736	0.081880	9.596194	0.0000
C	1.473380	1.159280	1.270944	0.2113

R-squared	0.999577	Mean dependent var	4.183684
Adjusted R-squared	0.999522	S.D. dependent var	1.061623
S.E. of regression	0.023201	Akaike info criterion	-4.565689
Sum squared resid	0.020993	Schwarz criterion	-4.324801
Log likelihood	108.7280	Hannan-Quinn criter.	-4.475888
F-statistic	18417.51	Durbin-Watson stat	1.570807
Prob(F-statistic)	0.000000		

ECM result of First Model

Dependent Variable: D(LNCPIN)
Method: Least Squares
Date: 02/19/21   Time: 12:31
Sample (adjusted): 1976 2019
Included observations: 44 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.012239	0.016107	-0.759871	0.4521
D(LNM2)	0.190713	0.087293	2.184749	0.0353
D(LNRGDP)	-0.023877	0.149736	-0.159457	0.8742
D(LNBD)	0.037287	0.019058	1.956450	0.0580
D(LNEX)	0.139715	0.049299	2.834024	0.0074
D(LNCPII)	0.644109	0.099079	6.500954	0.0000
ECT(-1)	-0.835288	0.175864	-4.749639	0.0000

R-squared	0.705758	Mean dependent var	0.077289
Adjusted R-squared	0.658043	S.D. dependent var	0.037334
S.E. of regression	0.021832	Akaike info criterion	-4.665988
Sum squared resid	0.017635	Schwarz criterion	-4.382140
Log likelihood	109.6517	Hannan-Quinn criter.	-4.560724
F-statistic	14.79113	Durbin-Watson stat	1.750893
Prob(F-statistic)	0.000000		

Second Model Co integration test result

Dependent Variable: LNCPIN
Method: Least Squares
Date: 02/19/21   Time: 16:45
Sample: 1975 2019
Included observations: 45

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNM2	0.005969	0.048536	0.122983	0.9028
LNNGDP	0.055139	0.049260	1.119347	0.2698
LNBD	0.061959	0.013327	4.648960	0.0000
LNEX	0.141871	0.023299	6.089180	0.0000
LNCPII	0.758028	0.084260	8.996311	0.0000
C	-0.897186	0.214850	-4.175867	0.0002

R-squared	0.999554	Mean dependent var	4.183684
Adjusted R-squared	0.999496	S.D. dependent var	1.061623
S.E. of regression	0.023273	Akaike info criterion	-4.512771
Sum squared resid	0.022134	Schwarz criterion	-4.271882
Log likelihood	107.5373	Hannan-Quinn criter.	-4.422970
F-statistic	17467.82	Durbin-Watson stat	1.556587
Prob(F-statistic)	0.000000		

ECM result of Second Model

Dependent Variable: D(LNCPIN)
Method: Least Squares
Date: 02/19/21   Time: 16:46
Sample (adjusted): 1976 2019
Included observations: 44 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.009467	0.016110	-0.587652	0.5603
D(LNM2)	0.106537	0.090627	1.175560	0.2473
D(LNNGDP)	0.065263	0.052623	1.240190	0.2227
D(LNBD)	0.039921	0.020838	1.915784	0.0631
D(LNEX)	0.141511	0.053364	2.651812	0.0117
D(LNCPII)	0.675527	0.106921	6.317993	0.0000
ECT2(-1)	-0.738243	0.184617	-3.998786	0.0003

R-squared	0.665641	Mean dependent var	0.077289
Adjusted R-squared	0.611420	S.D. dependent var	0.037334
S.E. of regression	0.023273	Akaike info criterion	-4.538176
Sum squared resid	0.020040	Schwarz criterion	-4.254327
Log likelihood	106.8399	Hannan-Quinn criter.	-4.432911
F-statistic	12.27657	Durbin-Watson stat	1.870726
Prob(F-statistic)	0.000000		

Third Model Co integration test result

Dependent Variable: LNCPIN
Method: Least Squares
Date: 02/19/21   Time: 16:48
Sample: 1975 2019
Included observations: 45

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNM2	0.041599	0.036756	1.131760	0.2645
LNBD	0.058528	0.013011	4.498289	0.0001
LNEX	0.150583	0.022030	6.835478	0.0000
LNCPII	0.769740	0.083872	9.177596	0.0000
C	-0.672454	0.076739	-8.762914	0.0000

R-squared	0.999539	Mean dependent var	4.183684
Adjusted R-squared	0.999493	S.D. dependent var	1.061623
S.E. of regression	0.023898	Akaike info criterion	-4.525594
Sum squared resid	0.022845	Schwarz criterion	-4.324853
Log likelihood	106.8259	Hannan-Quinn criter.	-4.450760
F-statistic	21697.27	Durbin-Watson stat	1.481395
Prob(F-statistic)	0.000000		

ECM result of Third Model

Dependent Variable: D(LNCPIN)
Method: Least Squares
Date: 02/19/21   Time: 16:49
Sample (adjusted): 1976 2019
Included observations: 44 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.007093	0.015249	-0.465124	0.6445
D(LNM2)	0.140493	0.090421	1.553761	0.1285
D(LNBD)	0.036547	0.020315	1.799035	0.0800
D(LNEX)	0.149553	0.051883	2.882475	0.0065
D(LNCPII)	0.673232	0.105722	6.367936	0.0000
ECT3(-1)	-0.702849	0.175264	-4.010242	0.0003

R-squared	0.662799	Mean dependent var	0.077289
Adjusted R-squared	0.618430	S.D. dependent var	0.037334
S.E. of regression	0.023062	Akaike info criterion	-4.575167
Sum squared resid	0.020210	Schwarz criterion	-4.331868
Log likelihood	106.6537	Hannan-Quinn criter.	-4.484940
F-statistic	14.93849	Durbin-Watson stat	1.850135
Prob(F-statistic)	0.000000		

Appendix-VII

Diagonistic Test Results

First Model Serial Correlation test result

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.891789	Prob. F(2,37)	0.4185
Obs*R-squared	2.069460	Prob. Chi-Square(2)	0.3553

First Model hetroskedasticity test result

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	1.199993	Prob. F(5,39)	0.3272
Obs*R-squared	5.999968	Prob. Chi-Square(5)	0.3062
Scaled explained SS	4.161874	Prob. Chi-Square(5)	0.5264

Second Model Serial Correlation test result

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.124110	Prob. F(2,37)	0.3358
Obs*R-squared	2.577694	Prob. Chi-Square(2)	0.2756

Second Model hetroskedasticity test result

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.920914	Prob. F(5,39)	0.4778
Obs*R-squared	4.751925	Prob. Chi-Square(5)	0.4469
Scaled explained SS	3.147628	Prob. Chi-Square(5)	0.6772

Third Model Serial Correlation test result

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.501061	Prob. F(2,38)	0.2358
Obs*R-squared	3.294841	Prob. Chi-Square(2)	0.1925

Third Model hetroskedasticity test result

Heteroskedasticity Test: Breusch-Pagan-Godfrey

F-statistic	0.964118	Prob. F(4,40)	0.4378
Obs*R-squared	3.957026	Prob. Chi-Square(4)	0.4119
Scaled explained SS	3.110409	Prob. Chi-Square(4)	0.5395

Appendix-VIII

CUSUM And CUSUM Squared Test Result
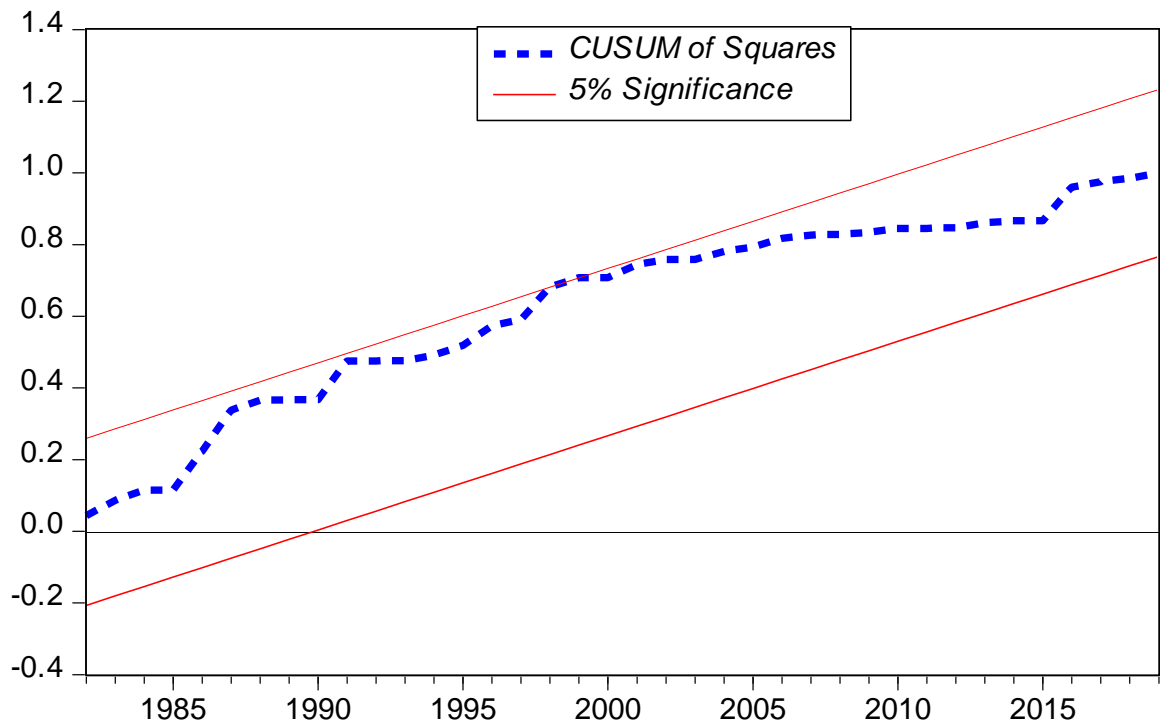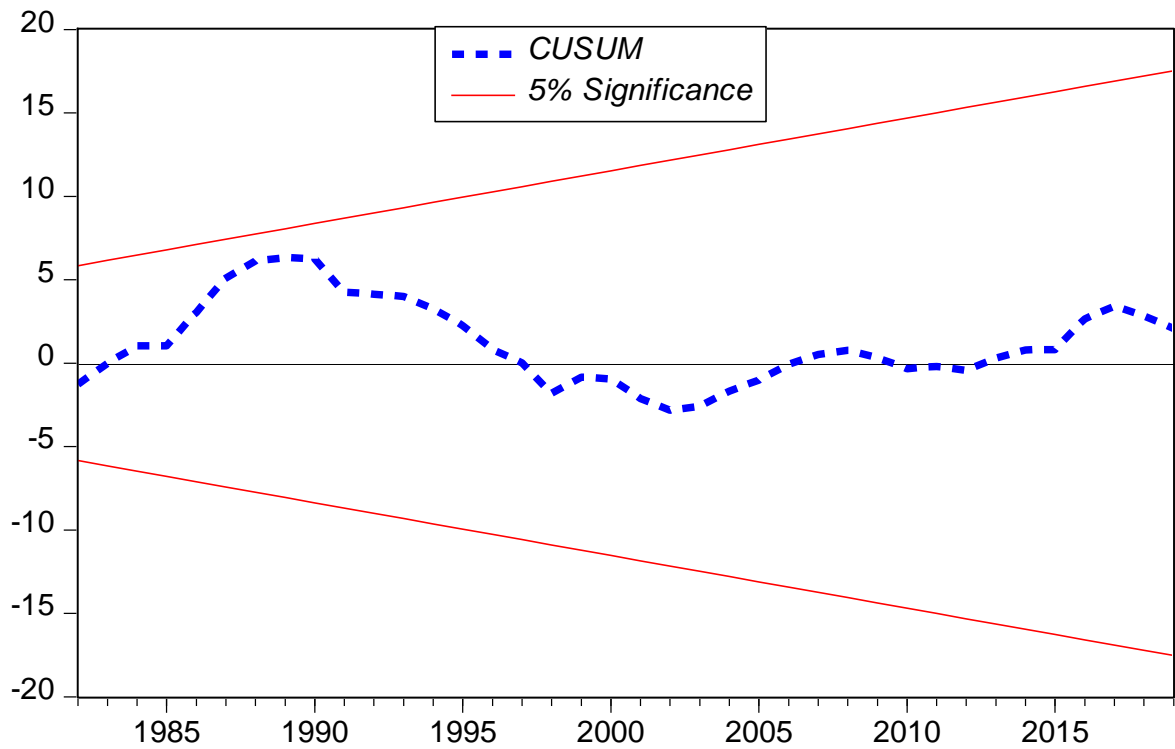
Appendix-IX

Critical Values for the Engle–Granger Cointegration Test

T	1%	5%	10%	1%	5%	10%
	Two Variables			**Three Variables**		
50	−4.123	−3.461	−3.130	−4.592	−3.915	−3.578
100	−4.008	−3.398	−3.087	−4.441	−3.828	−3.514
200	−3.954	−3.368	−3.067	−4.368	−3.785	−3.483
500	−3.921	−3.350	−3.054	−4.326	−3.760	−3.464
	Four Variables			**Five Variables**		
50	−5.017	−4.324	−3.979	−5.416	−4.700	−4.348
100	−4.827	−4.210	−3.895	−5.184	−4.557	−4.240
200	−4.737	−4.154	−3.853	−5.070	−4.487	−4.186
500	−4.684	−4.122	−3.828	−5.003	−4.446	−4.154

The critical values are for cointegrating relations (with a constant in the cointegrating vector) estimated using the Engle–Granger methodology.

Source: Critical values are interpolated using the response surface in MacKinnon (1991).

Tribhuvan University
Faculty of Humanities and Social Sciences
University Campus
CENTRAL DEPARTMENT OF ECONOMICS
Office of the Head of the Department
Kirtipur, Kathmandu, Nepal

LETTER OF RECOMMENDATION

This thesis entitled ***Relationship between Inflation and Money Supply in Nepal*** has been prepared by **Mr. Sudip Khanal** under my guidance and supervision. I hereby recommend this thesis for examination by the thesis Committee as a partial fulfillment of the requirements for the **Degree of Master** of **Arts in Economics**.

…………………………………………

Prof. Ram Prasad Gyanwaly, Ph.D.

(Thesis Supervisor)

Date: 2077/11/06 B.S.

(Feburary 18, 2021)

ii

Tribhuvan University
Faculty of Humanities and Social Sciences
University Campus
CENTRAL DEPARTMENT OF ECONOMICS
Office of the Head of the Department
Kirtipur, Kathmandu, Nepal

Ref. No.:

APPROVAL LETTER

We clarify that this thesis entitled *Relationship between Inflation and Money Supply in Nepal* submitted by **Mr. Sudip Khanal** to the Central Department of Economics, Faculty of Humanities and Social Sciences, Tribhuvan University, in partial fulfillment of the requirements for the degree of **Master of Arts in Economics** have found satisfactory in scope and quality. Therefore, we accept this thesis as a part of the Degree.

Thesis Committee:

……………………………………

Assoc. Prof. Yogesh Ranjit, Ph.D.
 (Acting Head of the Department)

……………………………………

Prof. Ramji Gautam, Ph.D.
 (External Supervisor)

………………………………….

Prof. Ram Prasad Gyanwaly, Ph.D.
 (Thesis Supervisor)

Date: 2077/11/23 B.S.
(07 March 2021 A.D.)

iii