

# CHAPTER - I

## INTRODUCTION

### 1.1 General Overview

Inflation, which today confronts with the economic policy makers throughout the world in the form of dominant economic problem, is not a new phenomenon because from the earliest days of recorded history, mankind has been puzzled and discomfited by the rising prices. Throughout the ancient period, the mediterian civilizations frequently experienced higher prices in terms of metallic currency due to the discovery of new mines and improved method of mining gold (Vaish, 2002). For layman, inflation means a substantial and rapid increase in the general price level which causes a decline in the purchasing power of money. There is no generally accepted definition of inflation and different economists define it differently in their own words. Broadly, the phenomenon of inflation has been understood in three ways: (a) Common view (b) Keynesian view and (c) Modern view.

**Common view:** Under common view, generally, inflation has been defined either (i) as a phenomenon of rising prices, or (ii) as a monetary phenomenon.

- (i) As a phenomenon of rising prices. Definitions given by the economists like Crowther, Gardner Ackley, H.G. Johnson regard inflation as a phenomenon of rising prices. According to Ackley, "a persistent and appreciable rise in the general price level or average prices." (Akley, 2007: 421)
- (ii) As a monetary phenomenon, Economists like Friedman, Coluborn, Hawtrey, Kemmerer define inflation as a monetary phenomena. Coulborn defines inflation as "too much money chasing too few goods." Hawtrey defines inflation as the "issue of too much currency". According to Kemmerer, "Inflation is too much money and deposit currency in relation to the physical volume of business being done."

**Keynesian View:** Keynes defined inflation as a phenomenon of full employment. Regarding the full employment, he distinguishes inflation into two viz. semi-inflation and real inflation. According to Keynes, inflation is the result of the excess of aggregate demand over the available aggregate supply. To him, general rise in price

below the full employment equilibrium is known as a semi-inflation. So long there is unemployment, employment will change in the same proportion as the quantity of money and when there is full employment, prices will change in the same proportion as the quantity of money. Keynes does not deny that prices may rise even before full employment, mainly due to existence of certain bottlenecks in the expansion of output. It is the true inflation (after full employment), which poses a real threat to the economy and is to be worried out.

**Modern View:** Modern economists, particularly the monetarists, analyze inflation in a comprehensive and unified manner. The modern view of inflation can be summarized in the following way.

- (i) Generally, two types of inflation are distinguished: demand pull inflation and cost push inflation. In the demand pull inflation, inflation and falling unemployment are supposed to go together, while in cost push inflation, inflation and rising unemployment are supposed to occur simultaneously.

Structuralist's model of inflation emphasizes supply side factors as the cause of inflation. In their model, inflation is driven by developmental efforts made by the government. When government increases its expenditure, people have more money. On the other hand, supply of output will not increase in desired growth rate due to structural bottlenecks in the economy and hence forces the price level up. So, structural bottlenecks are the main causes of inflation for them.

- (ii) During late 1950's A.W. Phillips empirically supported the idea that there existed a permanent long-run trade off between inflation and unemployment which implied that less inflation meant more unemployment and less unemployment would coexist with a higher rate of inflation.
- (iii) In the late 1960's the monetarists held the view that trade off between inflation and unemployment existed only in the short-run and not in the long-run. According to monetarist, money is the main determinant of inflation in an economy. An increase in money supply affects the output and employment in the short-run. In the long-run, it only affects the general price level. Monetarist view is mainly dependent upon Friedman's view " Inflation is always and everywhere monetary phenomenon" (Friedman, 1970: 24).

- (iv) The monetarist like Friedman, Phelps, and Leijonhufvud also combined demand-pull and cost-push inflation as one integrated whole. According to them, inflation is a unified phenomenon in which demand and cost elements appear as a part of one integrated cycle and in which expectation of future price level movements play a prominent role. Monetarists believe that expectation plays a key role in the explanation of inflationary process. Expectation of prices affects the employment of workers and supply of output. If expected price is below the actual price, economy will produce higher level of output. Thus, inflation will be smaller. Conversely, if expected price is above the actual price, supply of output declines in the economy and inflation will be higher. In the long-run, when anticipated inflation is equal to actual inflation, inflation and unemployment will simultaneously increase (Paul and Bhanumurthy, 2000).

Regarding the effect of inflation in different sectors of the economy, some members of society gain and others get hurt. In an economy, in which the prices of every thing changed proportionately, nothing would be lost or gained unless those changes affected the economy's output and the rate at which that output grew. However, in the real economy, all the prices do not change at the same rate, consequently, inflation does provide gains to some and losses to others.

Since there exists a long controversy as to whether inflation promotes or retards economic development, opinions regarding the effects of inflation are diverse. However, there is common belief that a mild dose of inflation can be vehicle for rapid growth of the economy as it leads to higher rate of profit to the producers which implies higher rate of capital formation and investment in the economy. In all the classical and neo-classical growth models, investment has been considered as a crucial factor for economic growth. However, when inflation goes beyond a certain limit, it creates problems for economic growth in the form of falling real per capital income thereby reducing the availability of funds. On the demand side, persistent and high rate of inflation leads to fall in demand which in turn reduces over all level of production in the economy. Therefore, it is essential to keep inflation under control to ensure rapid economic growth.

Thus, inflation has become an economic problem for both developed and developing countries. It has been a controversial phenomenon for economists and most challenging events for policy makers because economic development with price stability has been one of the main goals of macro economic thinkers and policy makers. Therefore, measure of inflation is important for (a) making policies (b) monitoring and accounting the policies (c) forecasting and estimating about economic activities. In case of developing economics, which are facing stagflation problems also, a rapid growth in output is the major blow on the inflation. Similarly, the restricted monetary and fiscal policies (or the surplus budget) are the easy way to control inflation but such policies may aggravate the problem of unemployment and contract the economy. However, in a country like Nepal, deficit financing is an inevitable way of government to carry out the recurrent expenditure and capital expenditure. So deficit finance, in a country like Nepal, is the main source of money creation, which ultimately pushes the price level up.

## **1.2 An Overview of Major Inflation in the World**

In the world, major inflationary shocks occurred in three periods of 20<sup>th</sup> century. They occurred, after World War I (1920-24); after world war II (1943-46); and after 1970s. After world war I, some countries observed hyperinflation. Albeit there is no universally accepted definition of hyperinflation, in common view, it is the inflation that is 'out of control'. It is very high inflation. Mainly, Germany (1920-23), Russia (1921-24) and Hungary (1922-24) were suffered from hyperinflation during the stated period. In the early 1920s, prices doubled in every 49 hours. In October 1923, average price level rose at the rate of 41 percent per day. After the end of world war II, some countries again realized hyperinflation. The most serve known as incident of inflation was in Hungary. Its prices doubled in every 15 hours during 1945-46. Another historic case of hyper inflation was of Greece during 1943-44. At that time, its prices doubled in every 28 hours (NRB, 2007).

Besides the historic hyperinflation, the moderate inflation occurred in latin American countries (1970-80), former USSR states and eastern European countries during the economic transit from controlled socialist economy to free market economy in the early 1990s. In case of Latin American countries; Argentina, Bolvia, Brazil, Chile, peru and Uruguay which together experienced an average annual inflation rate of 121

percent between 1970 and 1987. In Bolivia, prices rose by 12000 percent in 1985. Argentina, like wise, recorded an inflation of 3100 percent in 1989. Similarly, other countries were suffered from high rate of inflation. In case of former USSR states; Russia, Ukraine, Belarus, Georgia, Armenia, Azerbaijan, Estonia, Kazakhstan, Latvia, Slovenia etc. were suffered from high rate of inflation. Out of them, Belarus suffered from high inflation during 1992-95. It saw 920 percent in 1992, 966 percent in 1993, 2307 percent in 1994 (highest) and 1287 percent in 1995. Georgia went through the worst inflation in 1995 hitting 678 percent. Similarly Latvia recorded its high inflation of 900 percent and 527 percent during 1992 and 1993 respectively. In case of east European countries; Romania recorded its higher inflation of 216 percent in 1992, 243 percent in 1993, 167 percent in 1994 and 153 percent in 1997. Slovakia witnessed its highest inflation of 109 percent in 1991. Similarly, Croatia also observed its higher inflation situation during 1991-1994 hitting the highest of 1469 percent in 1993. These are same examples of major inflation in the world (NRB, 2007).

Misallocation of resources, food insecurity, non-renewable sources of petroleum products, unequal distribution of income, higher level of unemployment etc. were the main problems of these high rate of inflation in the world.

### **1.3 Historic Overview of Inflation in Nepal**

The price level and its growth, inflation, is an important economic indicator. There are various indices which measure the price level, such as; consumer price index (CPI); wholesale price index (IWPI); sensitive price index (SPI) gross domestic product (GDP) deflator and so on. In Nepal, there are three main price indices, namely: the CPI; the IWPI; and the salary and Wage Rate Index (SWRI). The main focus for measuring the cost of living is placed on CPI. This is because CPI measures inflation impact which is the final measure of prices on household. Measurement of prices in Nepal began from 1973 using the expenditure weightage of the goods and services of the people obtained from HBS. Prior to that, equal weight were assigned for each and every commodity of the basket.

Historically, Nepal has not suffered from a very high rate of inflation, although it reached a record level of 19 percent in 1991/92. The average annual rate of inflation has remained about 8 percent during the period for 1979/80 to 2006/07 (Appendix E).

Major inflation shocks occurred in 1985/86 and 1991/92 and it remained above the average rate in these two time periods. It was found at the minimum rate of 2 percent for the period 2000/01 and below than 6 percent for the time periods 1984/85 and for 1999/2000 to 2004/05 (Appendix C).

Albeit some economists argue that a mild dose of inflation is an engine to economic growth, it distorts the smooth working of the economy. Although some member of the society gain from inflation, other get hurt; the popular view is that the middle and especially the lower income groups lose and that upper income groups gain, more loosely expressed "the rich get richer and the poor get poorer" (Shapiro, 2004: 478).

Nepal is one of the least developed countries in the world which exhibits many characteristics of deprivation and underdevelopment. Most of the Nepalese people are poor. It is estimated that 30.8 percent of population is still below the poverty line (CBS, 2004). A high rate of inflation reduces the real income of the people that can be spent on food and non-food commodities. Therefore, in underdeveloping countries like Nepal, inflation raises the problem of food insecurity that will decline the social welfare of the people. However, higher social welfare is the most important economic goal of any economy. Gini coefficient, a tool of measuring income inequality, was 0.34 in 1995/96 and reached at 0.41 in 2003/04 i.e. income inequality has been increased in Nepalese economy (MOF, 2005).

It can be concluded that the gap between rich and poor people has been intensified during the study time period. Eventhough Nepal Rastra Bank as the monetary authority of Nepal has been committed for long to achieve a low and stable inflation, the dynamics of price and inflation in Nepal is somewhat complex mainly because of the large trade dependence with India, along with sharing the open border. At the sometime, the level of financial development is still at the nascent stage in Nepal. In this case, high rate of inflation has affected in production, investment and other fields of the economy. Thus, measure of inflation and policies of controlling inflation have been crucial for the smooth functioning of Nepalese economy.

#### **1.4 Statement of the Problem**

There are many reasons that are responsible for inflation. In Nepal, households at the bottom quintile of the income distribution spend more than 80 percent of their

income on food. At the same time, population is increasingly annually with higher rate but the output is increasing at a rate lower than population growth rate. A high rate of inflation reduces the real money balances and the income that can be spent on food and non-food commodities again leading to food insecurity. Nepalese money market has not been well developed. People hold money under the mattress to purchase the capital goods. It takes long period of time to be sufficient for purchasing the capital goods due to high rate of inflation. The inequality gap has been increased in Nepalese economy since the past several years. Nepal has not achieved significant improvement in economic development. It signifies that inflation has adversely affected on poverty reduction, distribution of income, production, saving, investment, social welfare etc. This also leads misallocation of resources and shows stagnation of the economy. Nepal is an open economy with virtually no restrictions on the movements of most of the goods across the border. Nepal needs to meet a larger percent of demand from imports. While importing goods from abroad, she also imports the inflation of others country. Thus, inflation decreased the real income of the people and finally their standard of living has gone down.

In conclusion, inflation disrupts economic stability. Therefore, it is essential to keep inflation under control to ensure a higher social benefit as a whole. Understanding the causes of inflation is thus important for price stability and designing policies that can improve food security, capital formation, redistribution of income, allocation of resources, employment opportunities and so on. Some studies argues that monetary factors are alone responsible to rise price and some blame to the structural factors as well. It does not seem wrong; to say that inflation has become a serious problem of the country.

### **1.5 Significance of the Study**

Inflation is now regarded as a major economic problem of both developed as well as developing countries. The problem is chronic in developing countries like Nepal. The general view on inflation in Nepal is considered to be caused by many factors such as disequilibrium in demand and supply forces, need to review fiscal and monetary policies as well as other structural factors. Monetarists generally consider money supply as the sole cause of inflation. On the other side, imported inflation mainly from India due to unrestricted long open, border and free trade plays the dominant role in

raising price level in Nepal. Structuralists are of the view that the fragmentation between the supply and demand in and between different sectors of the economy is the root cause of inflation in developing countries.

Whatever may be the causes of inflation, the higher rate of inflation causes instability in the economy and hence, there will be an utmost need for analyzing the causes of inflation and finding the possible remedies to curb it.

## 1.6 Objectives of the Study

The general objective of the study is to analyze the factors responsible for inflation in Nepal. However, the specific objectives derived from the general objective are as follows:

- (a) To determine the magnitude and direction of the impact of identified independent variables i.e. narrow money supply, broad money supply, Indian wholesale price index, fiscal deficit, real gross domestic product, expected cost of holding money and foreign exchange reserve.
- (b) To analyze the impact of the determining variables on Nepalese inflation.

## 1.7 Hypotheses of the Study

To identify whether the relationship of inflation rate is significant with money supply, gross domestic product (taken as proxy for real income), expected cost of holding money, Indian inflation, fiscal deficit and foreign exchange reserves, the following statistical hypotheses will be tested in this study.

- |                                     |                                 |
|-------------------------------------|---------------------------------|
| 1. $H_0: \delta P/\delta M = 0;$    | $H_a: \delta P/\delta M > 0$    |
| 2. $H_0: \delta P/\delta Y = 0;$    | $H_a: \delta P/\delta Y < 0$    |
| 3. $H_0: \delta P/\delta EH = 0;$   | $H_a: \delta P/\delta EH > 0$   |
| 4. $H_0: \delta P/\delta IWPI = 0;$ | $H_a: \delta P/\delta IWPI > 0$ |
| 5. $H_0: \delta P/\delta FD = 0;$   | $H_a: \delta P/\delta FD > 0$   |
| 6. $H_0: \delta P/\delta FER = 0;$  | $H_a: \delta P/\delta FER > 0$  |

Where,

$H_0$  = Null hypothesis

$H_a$  = Alternative hypothesis

P = General price level



M = Money supply  
Y = Real income  
EH = Expected cost of holding money  
IWPI = Whole Price Index of India  
DEF = Deficit financing  
PER = Foreign exchange reserves.

The notation  $\delta$  implies the rates of change in respective variables i.e. the variables are in the growth rate form. All the variables have hypothetically expected positive relationship with rate of inflation except GDP (taken as real income), which is hypothesized to have negative relationship with the rate of inflation.

### **1.8 Limitations of the Study**

Most of the economic analysis have limitations, which are unavailability of the required data, unreliability of the data and shortage of essential material for the study. This study analyses the empirical findings under following limitations.

- a. The study is based on secondary data.
- b. National urban consumer price index may not comprise the price index of the whole kingdom of Nepal.
- c. Wholesale price index of India is considered as the representative of the general price level of India which is collected from "International financial statistics" based upon the fiscal year from January to December. This study uses average value of wholesale price index of India (IWPI) between two time periods in order to adjust it with the Nepalese fiscal year.
- d. Real gross domestic product has been used as a representative of production of goods and services of Nepal. It does not represent whole production of the economy.
- e. Expected cost of holding money is calculated by subtracting the previous year rate of inflation from current one, which may not represent correctly the variable.

## **1.9 Organization of the Study**

The present study is divided into five chapters viz. Introduction, Review of Literature, Research Methodology, Empirical Analysis and Summary, Conclusions and Recommendations.

Chapter one explains the general overview of inflation, overview of major inflation in the world, historic overview of inflation in Nepal, statement of problem, significance, objectives, assumptions, limitations and organization of the study.

Chapter two concerning the review of literature is presented in four sections. Some approaches of inflation are reviewed at first. General empirical studies on inflation are reviewed secondly. Similarly, some empirical studies on inflation in Nepal are reviewed in third section. Conclusion of literature review is finally presented.

Chapter three explaining the research methodology contains general design, sources of data, data processing technique, hypothesis, model, specification for the inclusion of the variables, method of estimation, some statistical tests of significance are presented.

Chapter four is related to the empirical study of the dependent variable i.e. inflation on other explanatory variables. In this chapter, the effect of determining variables on Nepalese inflation has been presented using simple and multiple regression models.

Summary, conclusions and recommendations of the study are presented in chapter five.

Finally, bibliography and appendices are given at the end of the study.

## **CHAPTER- II**

### **REVIEW OF LITERATURE**

#### **2.1 Conceptual Framework**

The traditional literature on inflation accounts for two types of inflation demand pull and cost push. The post Keynesian literature distinguishes three approaches namely monetarist view, Phillips curve and structuralist view. The Phillips curve explains an inverse relationship between inflation rate and unemployment rate. The actual inflation rate in developed countries was satisfactorily explained by Phillips curve during 1960's. After 1960's. Phillips curve lost its significance due to the development of monetary mechanism in explaining the inflation. During rate 70's the structuralist contended that inflation is not only due to the structuralist factors such as growth process of an economy. Review of literature, in this chapter, is divided into three categories. They are as follows:

- a. Approaches of Inflation
- b. General Empirical Estimates
- c. Empirical estimates in Nepal

#### **2.2 Approaches of Inflation**

Under this section, the theoretical review of some theories about the inflation and its causes is studied. General conceptual approaches are classical, Keynesian, monetarists, structuralist approaches on inflation. These are briefly discussed one by one in this section.

##### **2.2.1 Classical Approach**

The main economists of this view are Ricardo, J.S. Mill, Marshall, David Hume & J.B. say. Their explanation is based on the quantity theory of money. The main theme of this approach is that an increase in the quantity of money directly and proportionally increase the price level i.e. inflation. Says' law of market and the quantity theory of money are two basic pillars of the classical economics. Here we explained two approaches

- a. Fisherian Approach
- b. Cambridge Approach

**Fisherian Approach :**

The most definitive, highly influential, widely famous of most carefully qualified version of the quantity theory was given by Irving Fisher in 1911. He postulates the relationship between change in the quantity of money and change in the general price level. According to Fisher, other things remaining unchanged, as the quantity of money in circulation increases, the price level also increases, the price level also increases in direct proportion and the value of money decreases and vice versa. It can be expressed as follows:

$$MV = PT$$

Where, M = stock of money in circulation.

V = transaction velocity of money

P = general price level

T = Total transaction of goods & services

On the assumptions that, in the long run, under the condition of full employment, total output (T) does not change and the transaction velocity of money (V) is stable. Thus, Fisherian equation of exchange can be written as

$$P = \frac{MV}{T}$$

$$P = f(M)$$

(b) Cambridge Approach

All the classical economists did not agree to what Fisher had said. Cambridge economists developed a theory of money and price level, known as Cambridge Cash Balance Approach.

Alfred Marshall was the originator of this approach. The Cambridge economists directed their attention mainly towards the store of value function of money in place of its medium of exchange function. Although Alfred Marshall did not express his theory in the form of an equation, his followers like Pigou, Keynes, Robertson formulate the familiar equation as follows:

$$M = KPY$$

Where, K = Reciprocal of velocity of money

Y = Total output

As K and Y being constant, P varies directly and in the same proportion as M varies i.e.  $P = f(M)$ .

The results of both of these approaches are the same that inflation is caused by the increase in the quantity of money. The concluding remark of these approaches is other things remaining unchanged, as the quantity of money in circulation increases / decreases the price level also increase/decreases in the same proportion and vice versa. The only difference between the approaches is that in the Fisherian case, money is used for medium of exchange purpose only, where as the Cash balance approach is based on the store of value function of money also.

In Nepal, the supply of money is increasing in trend. The average growth rate of narrow money supply ( $M_1$ ) is about 15 percent and the average growth rate of broad money supply is about 17 percent during the time periods from 1980/81 to 2006/07. On the other hand, average growth rate of gross domestic product is about 4 percent for the same time periods. So, average growth of money supply is higher than average growth of gross domestic product. Thus, money supply may be one of the causes of inflation in Nepal under classical theory.

### **2.2.2 Keynesian Approach**

The Keynesian theory of money and prices is considered as superior to the traditional quantity theory of money. Keynes discarded the old view that the relationship between quantity of money and prices is direct and proportional. Instead, he established an indirect and non-proportional relationship between quantity of money and prices. The traditional quantity theory is based on the unrealistic assumption of full employment of resources. Keynes believes that full employment is an exception. Therefore, so long as there is unemployment, output and employment will change in the same proportion as the quantity of money but there will be no change in the prices, and when there is full employment, prices will change in the same proportion as the quantity of money (J.M. Keynes, Theory of Money and Prices). Keynes

developed the concept of 'inflationary gap' - larger the gap - faster will be the inflation and vice-versa. Inflationary gap exists when the aggregate expenditure exceeds the maximum attainable level of output, which results that there is upward pressure in prices.

In Keynesian theory, the key concepts in analyzing output, inflation, growth and the role of policy are aggregate demand and supply. Aggregate demand signifies the relationship between spending on goods and services and level of price whereas aggregate supply is the relationship between the total supply of goods and services and the level of price. The equilibrium level of output and price are determined by the intersection between aggregate demand and supply. Thus, any change in the position of aggregate demand or supply curve affects the price level and output. In this way, Keynesian view on inflation can be explained in demand pull and cost push inflation.

### **2.2.3 Demand Pull Inflation**

Excess demand inflation is a situation often described as "too much money chasing too few goods". According to the demand pull theory, inflation or price rise takes place due to the demand for goods and services exceeding their total supply available at the current prices. There are two explanations for the existence of the excess demand. The first explanation regards the quantity of money as the sole determinant of the demand function. According to the quantity theory of money analysis to the inflation, the price level depends directly and proportionately on the quantity of money. Consequently inflation occurs when the money supply increases. Thus, to stop inflation, the supply of money must be stabilized. The second explanation recognizes that the demand function is determined by a wide range of variables and consequently denies any direct and simple relationship between the money supply and the aggregate demand function postulated by the naive quantity theory of money.

We often see demand pull inflation at work when nations rely on money to finance their spending. Rapid money supply growth increases aggregate demand, which in turn increases the price level. It proceeds from the money supply through aggregate demand to inflation. Thus, when the German Central Bank printed billion and billions

of paper marks in 1922 - 1923 and they came into the market place in search of bread and or hanging, it was no wonder that the German price level rose a billion fold, making the currency worthless. This was demand pull inflation with a vengeance (Samuelson and Nordhaus, 1989).

Keynesian demand pull inflation suggests that not only money supply but also fiscal factors (Consumption expenditure, investment expenditure, taxes and government expenditure) may be responsible for the change in general price level in any economy. Inflation in our economy may also be influenced by these factors and thus, the theory helps to choose the fiscal variables in our research.

#### **2.2.4 Cost Push Inflation**

Besides the demand pull inflation, there is another cause of inflation know as cost push inflation on the supply side or supply side inflation. According to Flemming, At microeconomic level one might reject the walrasian hypothesis that prices respond to excess demand while at the macroeconomic level, one might believe that as a matter of fact autonomous disturbances to aggregate supply were more important than disruption of aggregate demand whether by the authorities or in other ways. There are two principal causes of cost-push inflation discussed by Shapiro (2004) in his book:

1. Higher money wage secured by labor unions call the wage - push inflation. If the increase in the wage rate is faster than the increase in productivity of the labor, there will be an increase in the price level. If firms find the labor cost per unit of output rising, they higher cost. A series of increase in wage rates thus leads to a series of increase in prices, which is ultimately the inflation.
2. Higher prices secured by monopolistic firms or industries to make the greater profit push inflation. An alogous to the wage push inflation, the monopolist and oligopolist's power to drive the price upward more than the cost of production is called the profit push inflation. The existence of imperfectly competitive market for goods and services is the root cause for profit push inflation.

This theory shows that the factors which affect the cost of production may influence the price level in the economy. The significance of this theory is that the general price

level may also be influenced by the cost of raw materials, interest rate, exchange rate, prices of capital inputs. Nepal, being the developing country in the world, it imports the capital goods and many raw material from abroad. Thus, increase in price level on those goods and services, change in interest rate and exchange rate may also create a situation of supply irresponsive to the market demand, pushing the price level up.

### **2.2.5 Phillips Curve Theory**

The original Phillips curve model introduced the inverse relationship between the unemployment and rate of change of money wage. Furthermore, the original Phillips curve version between the unemployment and rate of change of money wage was actually transformed into a relationship between the rate of change in price (inflation) and unemployment considering that prices would change whenever wage rose more rapidly than labor productivity. Thus, new version of Phillips were shows the trade off between inflation and unemployment. It means that inflation and unemployment can coexist in an economy and they are inversely associated to each other. In one hand, Phillips curve denies a unique definition for the full employment. On the other hand, it also signifies that unemployment can be reduced by creating inflation. Therefore, policy makers for the purpose of reducing unemployment create inflation. In other words, unemployment is one of the macro economic variables that can give rise to inflation.,

However, the modern view regards that the Phillips curve relationship between inflation and unemployment would remain no longer in the long-run i.e. there would be no trade-of between inflation and unemployment in the long-run.

The review of Phillips curve theory signifies that any efforts to reduce the unemployment rate will raise the price level in the economy. Therefore, Phillips curve theory implicitly shows that the factors which affect the unemployment may also influence the price level in the economy.

### **2.2.6 Monetarist Approach**

Monetarists recommended growth of money supply as the most important factor in explaining inflation in developing countries. In the case of LDCs, it can also be shown



with the help of transmission process, the monetarists view that increase in money supply puts direct pressure over the price level, which is as follows:

$$\Delta \text{Money supply} \Rightarrow \Delta \text{Rate of return} \Rightarrow \Delta \text{Aggregate demand} \Rightarrow \Delta \text{GNP}$$

A change in money supply affects the rate of return of various assets, which will, in turn, affect spending and GNP changes. Friedman has explained that the nominal stock of money is the most effective factor determining permanently higher prices. In Friedman's demand for money function, rate of inflation enters as a cost of holding real balances, which ultimately affects the quantity of real balances held. Given this function, the rate of increase in the nominal stock of money determines the rate of inflation, the public eventually expects that the rate of inflation adjusts its ratio of real balances to real income (Johnson, 1979). Thus, inflation in an economy is viewed as a tax on holding of real balances and the rate of inflation is determined by the rate of increase in money supply significantly owing to the reduction in the demand for real balances.

Monetarists regard that expansionary monetary policy can only temporarily keep the unemployment rate below the natural rate. In this regard, Friedman's theory of natural rate of unemployment and output is the theoretical function for the monetarists' belief that in the long-run the influence of money supply is primarily on the price level and other nominal variables. The unemployment rate will gradually return to the natural rate and the final effect of the expansionary monetary policy will be a higher inflation. So, there is direct relationship between the change in money stock and the general price level in the long-run.

According to famous Friedman, Inflation is always and everywhere a monetary phenomenon. Thus, the key cause of inflation in the monetarists' view is money supply.

The monetarists' explanation of inflation has a long history and is derived from the quantity theory of money which relates the general price level to the given stock of money. This theory can be stated that the demand for money highly relies on the level of income and in equilibrium situation that supply of money is equal to the demand for money. Since demand for money depends upon the income elasticity of money demand and level of income, a higher growth rate of money supply than the income

growth creates the situation of excess money supply in the economy and hence creates the inflationary problem in closed economy.

Monetarists believe on the natural rate of inflation. Any attempts to reduce the unemployment rate below the natural rate of unemployment create inflation in the economy. They regard that unemployment rate can be reduced below the natural rate only in the short. But in the long-run, it will be at the natural rate of unemployment because supply of money in the long-run increases the price level only. Therefore, inflation occurs in Cycles. When aggregate demand increases in the economy, in the short-run, economy supplies more output along the initial supply curve so that level of unemployment decreases and price level increases. The trade off between inflation and unemployment can be explained with the help of Phillips curve. Workers, in the long-run, expect the price level equal to the actual price and hence level of unemployment would be at the initial natural rate. In this case, supply curve shifts leftward and price level again increases. Thus, inflation takes place in cycles.

Monetarists also introduced the role of adaptive expectations on inflation. To them, if expected price is below the actual price, degree of inflation will be low because output can be increased than before. Conversely, if expected, price is above the actual price, inflation rate will be high because it declines the level of output than before.

The review of monetarist views on inflation suggests that level of unemployment can not be reduced below the natural rate just by managing the aggregate demand. However, it can be kept low by reducing the friction in labor market.

In Nepal, average growth rate of money supply is higher than average growth rate of income (which has already been mentioned in classical review). Therefore, according to monetarists' view, there would be excess money supply at each period. So, inflation may be an continuous problem of Nepalese economy. On the other hand, this theory has explained the role of expected price on inflation. Thus, growth rate of money supply and expected price may also be found as the key causes of inflation in Nepal.

### **2.2.7 Structuralists Approach**

This theory explains the inflationary behaviour in developing countries. It was developed in the 1950s when the monetarists' model could not explain the rapidly

growing inflation in Latin American countries. The basic argument of the structuralists approach is that inflationary process in LDCs can not be explained with reference to the level of aggregate demand. They argued that fragmentation between supply and demand in and between different sectors of the economy was the root cause of inflation in developing countries.

Structuralists approach on inflation emphasizes supply side factors as the cause of inflation. In their model, inflation is driven by development efforts, made by the government. When government increases its expenditure, money supply increases in the economy. But supply of output will not increase in desired growth rate due to the structural bottlenecks in the economy and hence price level rises. Therefore, structural bottlenecks, in the view of structuralists, are the main causes of inflation, i.e. food prices, administrative prices, wages and import prices etc. are considered as the source of inflation under the structuralists view on inflation. Such factors have to be accommodated by monetary policy makers under structuralists model because they are determined outside the monetary sphere. Money supply has been given little significance as independent cause of inflation by structuralists.

Structuralist views on inflation has been used to explain the inflation in Latin America, Asian and African countries and in general underdeveloped economics like, Nepal because there are many structural issues and rigidities in the economy such as monsoon based agricultural production, lack of transportation, black marketing, existence of saving investment gap, lack of capital and human capital resources, a low level of economic freedom etc. As a result, there is continuous rise in the price level in the economy.

This theory signifies that inflation can not adequately be determined just by considering the variables as suggested by Keynesian, Fisherians and neo-fisherians in developing economics. Therefore, structural bottlenecks existing in the economy are mainly responsible for inflation. So, this theory suggests that such types of characteristics should be included for determining the inflation in developing countries like Nepal.

### **2.3 General Empirical Estimates**

Since inflation is not socially desirable, controlling inflation is one of the goals of monetary policy of any economy. As inflation is, in fact, a common problem of any of the economy, several studies about inflation have been conducted in the world even. In this section, the study is concerned about empirical studies made on inflation outside Nepal.

Harberger has developed an econometric model for the causes of inflation in Chile. In the main objective of the study was to identify the factors that cause the inflation in Chile and also to find out the process by which money supply affects the rate of inflation. The rate of inflation is considered as the dependent variable and percentage change in money supply at current and previous period, percentage change in real income and past change in the rate of inflation are considered as the independent variables. This study covered the time period from 1939 to 1958 and used the ordinary least square techniques to estimate the general price level. He also included both percentage change in current money supply and percentage change in one year lagged money supply in his model. According to his study, the effect of increase in money supply upon the price level does not occur instantaneously. And one way of capturing the lagged effect of money supply on inflation is to introduce the lagged money supply as explanatory variable in the model (Harberger, 1963).

Vogel, in his study has tried to analyze the determinants of inflation in Latin America using Harberger's model. He has extended Harberger's model to sixteen Latin American countries covering a period of 1950-1969. He has taken money supply (current and lagged money supply), real gross national product (current and lagged) and lagged changes in the rate of inflation as independent variables. Vogel concluded that the coefficients of current and lagged money supply are highly significant indicating that an increase in the growth rate of money supply causes a proportionate increase in the rate of inflation within two years. Similarly, the rate of inflation is found to be inversely influenced by the rate of growth in real income. But it is not significantly influenced by the past change in the rate of inflation.

Harbergere and Vogel's study show that money supply (Current and Lagged) has greater influence in the inflation rate in the economy. Similarly, lagged change in the rate of inflation is another cause of inflation in their model.

Since long Nepal is suffering from the volatile rate of inflation. The main goal of monetary policy, in present days, is to maintain the price stability in Nepal. But in Nepal, supply of money is continuously increasing in trend. so, inflation in Nepalese economy may be the result of money supply. Similarly, past changes in the rate of inflation may be another cause of inflation in Nepal as explained in Harberger and vogel's studies (Vogel, 1974).

Parikh and Stormer, in their paper studied the relationship between money supply and price in Bangladesh. They used monetary data for the period 1973 to 1986. The results of the study cast doubt over the monetarists claim that structural problems in developing countries are largely the result of inflation, which is, itself, ultimately due to a failure of the monetary authorities to exercise appropriate control over the money supply. The main conclusion is that strict erogeneity of the money supply is rejected (Parikh and Stormer, 1988).

Shrivastav and Saxena, in their study indicated that money supply is one of the crucial factors governing the price level in developing countries. In their view, normally any increase in money supply if not simultaneously compensated by increase in output, results in the upward behaviour of prices. They have studied the casual relationship between money supply, output and prices during the period from 1950/51 to 1964/65. They used the index of wholesale price ( $X_3$ ) as dependent variable and the indices of real output ( $X_2$ ) and the quantity of money ( $X_1$ ) as independent variables. The multiple linear regression equation of prices on output and money supply is

$$X_3 = 85.213 + 0.5066X_1 - 0.3753X_2$$

$$R^2 = 0.83 \quad F_{cal} = 12.8$$

This shows that other factors remaining stable, output exercises as negative effect on prices equivalent to a fall of about 0.4% in the price index with one percent rise in its index while the money supply exercises a positive effect on price equivalent to a rise of 0.5% in the price index with a rise of one percent in its index. Thus, they concluded

that money supply has greater impact on prices level relative to output having positive and negative effects respectively. They have summarized their findings as follows:

- a. The money supply in times of economic development generally follows output and it is the rise in output, which induces rise in money supply rather than other way round.
- b. The money supply and prices move hand in hand and the rise in money supply causes the rise in prices rather than vice-versa.
- c. The output exercises a higher influence on money supply in relation to prices.
- d. The money supply has larger impact on prices relative to output. The rise in money supply has a positive effect on prices.
- e. Prices in a developing economies are not influenced by a single factor. In fact, there is a plurality of causes or factors, which affect them. The money supply is only one important factor in the constellation of price determinants and it can therefore, at best serve as a useful point of emphasis in framing economic policies (Shrivastav and Saxena, 1968).

Lovis Kuijs, in his paper has tried to examine the relationship between monetary policy transmission mechanism and inflation in the Slovak Republic. This study has applied the vector auto regression model (VAR) for investigation. The estimated vector auto regression model suggests that the key causes of inflation are foreign prices, the exchange rate and wage costs, with some additional impact from aggregate demand, but no direct impact of either monetary aggregate or interest rates. However, there is statistically significant indirect impact of monetary policy on prices. In his study, a higher level of broad money tends to lead to higher unit labor costs and a change in interest rates affects the exchange rate and aggregate demand and therefore, higher prices.

His model is, more specifically, focused on the monetary policy transmission mechanism to explain inflation. His conclusion shows that monetary policy transmission mechanism has the indirect effect on prices by affecting the direct causes of inflation such as foreign prices, exchange rate, wage costs and interest rates.

Various previous studies on inflation have shown that money supply is the main cause of inflation. But this study explains an indirect impact on monetary aggregates or interest rates on inflation (Kuijs, 2002).

Nacheaga, in his paper has tried to study the fiscal dominance hypothesis in democratic republic of the Congo (DRC) during 1981-2003 using multivariate cointegration analysis and vector error correction modeling. The fiscal dominance hypothesis signifies that over all fiscal deficit in percent of real GDP affects inflation through its effect on broad money growth or seignorage in percent of GDP. Seignorage can be defined as the ratio of new currency printed during a period to price level during the same period. It can alternatively be expressed as follows:

Seignorage =  $\frac{dMt}{P_t}$ . The hypothesis also signifies that increase in real GDP growth will reduce inflation explicitly through a higher supply of goods or implicitly through higher transaction money demand or both. On the other hand, income velocity of money is supposed to influence inflation directly because an increase in the velocity of money will reduce the demand for money and hence inflation. Lower the demand for money means higher the flight out of money and in turn higher will be the equilibrium rate of inflation because increase in velocity of money captures the impact of the loss of confidence of national currency, resulting from the expectations of a higher inflation or currency depreciations.

The empirical results show a strong and statistically significant long term relationships between budget deficit and money growth (increase in money supply) and between money creation and inflation.

Since long Nepal is suffering from budget deficit and money growth due to the gap between the government expenditure and revenue. On the other hand, gross domestic product has not improved significantly due to various structural rigidities and bottlenecks existing in the economy. Thus, Nepalese economy may continuously be facing the problem of inflation. So, the review of this study suggest to choose the deficit finance as one of the explanatory variables of inflation in Nepal (Nacheaga, 2005).

Aisen and Francisco, in their paper have examined the causes of worldwide diversity of inflation volatility. Sample covering around the 100 countries for the period from 1975 to 1999 showed that higher degrees of political instability, ideological polarization, political fragmentation and low economic freedom are associated with higher level of inflation.

The empirical results imply that executive changes and the index of the freedom are statistically significant and have the expected signs, showing that greater political instability and lower economic freedom lead to higher inflation volatility. Regarding the economic variables, results imply that countries with relatively large agriculture sectors, lower GDP per capita and overvalued currencies have higher inflation volatility.

Nepal is also suffering from political instability, low level of economic freedom, low GDP per capita and relatively large agriculture sector. We should not ignore the impact of these variables on Nepalese inflation, although such variables are not directly going to be tested in this study (Asien and Francisco, 2006).

Barnichon and Peris, in their paper have analyzed four frequently cited sources of inflation in developing countries. They are as follows:

- 1) **Demand pressures:** A standard measure of the relative pace of economic activity is the output gap; the difference between output and potential output.
- 2) **Fiscal and Monetary Policies:** Fiscal imbalances in developing countries with scarce resources often lead to monetization of the fiscal deficit. To capture inflationary pressure stemming from "excess" money supply, we consider the real money gap, the difference between real money stock and equilibrium real money stock (the level equal to the real money demand)
- 3) **Supply Shocks :** Changes in the terms of trade, drought or conflict can lead to persistent change in the price level.
- 4) **Inertia :** Inflation may have a dynamic component arising from the sluggish adjustment of expectations or the existence of staggered wage contracts.



Barnichon and Peris, in their paper have examined the determination of inflation in sub-saharan Africa (SSA), particularly the role of output gap and the real money gaps. The structural gap contain considerable information regarding the evolution of inflation. Interestingly, in SSA, the real money gap plays a larger role in inflation processes than output gap. This highlights the importance of money gap as an indicator of inflationary pressure, alongside the output gap emphasized for the developed countries. Moreover, the evidence supports that targeting monetary aggregates in SSA can provide an effective anchor to control inflation as practiced by a number of countries in the region, especially in the context of IMF-supported programmes. Excess money seems to have a large impact on inflation build up than excess output does.

In Nepal, the supply of money is in increasing trend. The average growth rate of narrow money supply is about 15 percent and average growth rate of broad money supply is about 17 percent during the time period from 1980/81 to 2006/07. On the other hand, the average growth rate of gross domestic product is about 4 percent for the same time period. This implies that average growth of money supply is higher than the average growth of gross domestic product. Thus, money supply plays significant role for development of inflation in Nepal. Thus, money supply may be one of the causes of inflation in Nepal (Branichon and Peris, 2007).

Edimon Ginting, in his paper tried to find out some important questions around the inflationary process in Nepal, particularly the transmission of inflation from India. Because there is open border between the two countries and Nepali currency is pegged to the Indian rupee. So, monetary policy can play only a limited role in the long-run.

He has applied two main frameworks to examine open economy inflation: The purchasing power parity (PPP) and the scandivian approach. While reviewing scandivian approach, he has got three major theoretical implications. First, any change in the trading partners, traded prices will be transmitted, one for one to domestic inflation. Second, since Nepalese currency is being pegged with Indian currency, the difference in productivity growth between tradable and non-tradable sectors would give rise to deviation in the domestic rate of inflation from Indian inflation. Finally, given capital controls, domestic monetary policy could also contribute to the deviation

of domestic inflation and inflation in India through non-tradable prices. He has also examined core inflation to assess the underlying price movements. This study showed that analysis of core inflation measures will make it possible to determine (i) whether or not and to what extent, temporary shocks in Nepal are important source of deviation from inflation in India.

The estimations are based on monthly data from 1996: 8 to 2006: 9 to examine the long and short-run relationship between inflation in Nepal and India using ADF test.

During the study period, it was found that, on an average, head line inflation in Nepal is about 1 percent higher than that in India. However, when estimation equations are estimated for the pair of unbiased core inflation measures, temporary shocks originating from Nepal contribute more to the deviation of headline inflation between Nepal and India. This result implies that core inflation in Nepal may diverge from core inflation in India in the short-run, however, will come back to the Indian level in the long-run. When the two deviate in the short-run, the speed of adjustment to the long-run equilibrium is about 7 percent per month, suggesting that the pass through time period from India to Nepal is about seven to eight months.

This study, being related to Nepal, has focused the imported inflation in Nepal from India. This study has shown that head line inflation in Nepal is about 1 percent higher than in India and also evaluated the speed of adjustment of Nepalese core inflation to the Indian core inflation. So, this study signifies that Indian prices play significant role to determine price level in Nepal (Ginting, 2007).

#### **2.4 Empirical Estimates in Nepal**

Since excess inflation detracts from sustainable economic growth and development, achieving a low and stable inflation is the prime goal of monetary policy. As Nepal has, since long, been facing a significant rate of inflation and inflationary pressure, Nepalese monetary policy has also been adopting the policy of stability with growth. Though a few studies in the past have tried to capture the factor contributing to the Nepalese inflation, they were on the individual basis. But the inflation in Nepal (July, 2007) conducted by NRB is an institutional effort. Some of the studies on inflation in Nepal are reviewed in this section.

Sharma, in his study tries to analyze the relationship between the rate of inflation and growth rate of money supply. He also concludes that inflation in Nepal is also influenced from the Indian price level. The study covers eleven years from 1964/65 to 1974/75. The explanatory variables in his model are money supply (both narrow  $M_1$  and broad  $M_2$ ), gross domestic product (GDP), Indian import price index (IIP), Indian export price index (IEP), Indian Consumer Price Index (ICP) and Indian Wholesale Price Index (IWP), while the dependent variable is the consumer price index for Kathmandu.

He has estimated the following main regression equations.

- 1) Regression of P on GDP

$$P = -47.302 + 1.665 \text{ GDP}$$

(6.490)      (0.521)

$$R^2 = 0.532, \text{ DW} = 1.964; \text{ S.E.E.} = 24.421; n = 11$$

Where, figures in the parenthesis are t-statistics

- 2) Regression between P and  $M_1$  and  $M_2$

$$P = 55.222 + 0.493M_1$$

(8.857)    (0.046)

$$R^2 = 0.927, \text{ DW} = 2.22; \text{ S.E.E.} = 9.642; n = 11$$

$$P = 76.925 + 0.305M_2$$

(7.166)    (0.0293)

$$R^2 = 0.923, \text{ DW} = 1.840; \text{ S.E.E.} = 9.896; n = 11$$

Where, figures in the parenthesis are t-statistics

Comparing  $R^2$  for  $M_1$  and  $M_2$ . It can be observed that  $M_1$  explains price level better than  $M_2$ . With one unit increment of  $M_1$ , the price level rises by 0.493 while in the case of one unit increment of  $M_2$ , the price level rises by only 0.365. 92.7% of the price change is explained by  $M_1$ .

- 3) Regression of P on IWP

$$P = 30.256 + 0.737\text{IWP}$$

(7.731)    (0.048)

$$R^2 = 0.963, \text{ DW} = 1.869; \text{ S.E.E.} = 6.843; n = 11$$

Where, figures in the parenthesis indicate t-statistics

He has concluded that the price level is explained better by the narrow money supply ( $M_1$ ) than by the broad money supply ( $M_2$ ). Among various Indian prices, it has been found that IWP is the best in explaining Nepalese price level. The other variable that determines the price level is the gross domestic product (Sharma, 1976).

Pant explained about inflation in Nepal by taking money supply, Indian prices, food grain prices and gross domestic product as explanatory variables and the rate of change in consumer price index as the dependent variable. So, he put forward his analysis by giving due emphasis on the monetary factors on inflation. He used multiple regression model for the analysis of inflation in Nepal. covering the period of 13 years from 1962/63 to 1972/73.

In his empirical analysis, he found that changes in broad money supply were superior to change in narrow money supply and one year lagged money supply exerted more pressure on changes in prices in Nepal than current one, for both definition of money supply. Among various Indian prices, change in Indian wholesale prices were to be preferred to other Indian prices for explaining the changes in prices in Nepal. At the sometime three months lagged Indian wholesale prices give better explanation than the current or six months lagged wholesale prices. The factors responsible for Nepalese food grain prices were Indian food grain prices, per capita food grain production in Nepal. At the same time, it was found that the changes in price in Nepal were caused by structural changes in the economy rather than by the changes in money supply i.e. there is weak association between the money supply and the price level (Panta, 1997).

Khanal, in his study investigated some causes of inflation in Nepal. The explanatory variables in her model were money supply, real income, past changes in the rate of inflations Indian wholesale price index, government expenditure and foreign exchange reserve while the dependent variable was the rate of inflation. This study covered the period of sixteen years from 1965/66 to 1980/81 and the main conclusions were given below:

- (i) The rate of increase in one year lagged narrow as well as broad money had a significant impact upon the current rate of inflation. Thus, it could be said that

people do not realize immediately the increase in money supply and as a result money illusion at work in the economy.

- (ii) To some extent, the past changes in the rate of inflation also influence the current rate.
- (iii) The rate of increase in real income had no role to influence the rate of increase in price level.
- (iv) The current Indian wholesale price was the most significant factor for the domestic rate of inflation. The increase in price level in India would immediately raise the domestic price level.
- (iv) The increase in the level of output also influenced significantly the rate of inflation.
- (v) The increase in foreign exchange reserves was not so much significant in influencing the rate of inflation. (Khanal, 1983)

Khatiwada, in his study tried to investigate major determinants of inflation in Nepal by analyzing both the monetary and structural variables and found whether inflation; was solely imported from India or also the domestic factors were responsible for it. He concluded that both domestic as well as external factors were responsible for increasing the general level of prices in Nepal. The explanatory variables in his model were money supply (both narrow and broad money), Indian prices (wholesale, consumer, import and export), gross domestic product, government expenditure, foreign exchange reserves, petroleum prices and expected rate of inflation where the dependent variable was the rate of inflation.

In his analysis, the ordinary least square method of regression analysis had been applied and regression coefficients had been estimated by a general matrix. He also employed Durbin-Watson test for autocorrelation. He divided the study period into two parts. First stage covered the period from 1965/66 to 1979/80 and the second stage covered the period from 1970/71 to 1979/80. The division of the period was made to include the effect of the rise in petroleum prices in the Nepalese price

situation. The rise in price on petroleum products was visualized significantly only after 1970, so the separate analysis had been done.

His major findings of the study were:

- (i) The impact of broad money supply on the rate of inflation was lower than the narrow money supply because broad money had not got so much liquidity in the economy because of the underdeveloped banking and monetary system.
- (ii) The Nepalese price situation was found highly associated with India prices. The economic dependence of Nepal with India due to structural barriers and provision of free trade and transit facility between the countries had made the domestic price situation highly sensitive to Indian prices.
- (iii) Current money supply had no significant impact on the price level. While one year lagged money supply had significant impact. Therefore, it could be said that money illusion was actively operating in Nepalese economy but the illusion ended in about a year.
- (iv) Petroleum price was found to have two way impacts upon the domestic prices situation. Firstly, it affected the general price level by increasing the cost of transportation and secondly, it hinted the Indian price level and correspondingly the Nepalese price level too.
- (v) Gross domestic product had no significant effect upon the price level but the government expenditure played a significant role in the Nepalese economy. (Khatiwada, 1985)

Pant, in his study has tried to examine (i) sources of inflation (ii) quantification of inflation by external and domestic factors and (iii) causes of variation in inflation rates among the Asian countries. The main objective of his book is to analyze the causes of inflation under fixed exchange rate system. In his book, log linear model is tested for selective five Asian countries (China, India, Philippines, Thailand and Nepal) for the period from 1951 to 1971.

The empirical results found, for the selected countries, were satisfactory because the variables had the expected signs with considerable degree of statistical significance.

According to the results, inflation was influenced by external and domestic factors. In India, domestic factors had played a key role for the sharp increase in the price level during the period under study.

Thirty years period covering (1955-1985) was considered for the study in context of Nepal. The empirical results show that the coefficients of all the variables are not significant. The coefficients of real income and import prices have opposite signs than expected. The result shows that the Indian wholesale price affects the Nepalese price level very significantly by a coefficient almost equal to unity. The result shows that the Indian wholesale price index and Nepalese price index change by the same amount. He has extended his study by adding change in exchange rate of Nepalese rupee as the variable to capture the effects of exchange rate change. The coefficient of Indian wholesale price index was 0.514. This implies that one unit change in wholesale price of India changes the Nepalese price level by 0.514 units and this is relatively satisfactory. His study has left to include the lagged values of money supply and Indian wholesale price in the model to find the effect of lagged values of the variable on the Nepalese price level. Thus, his study has left significant space for further research on Nepalese inflation (Pant, 1988).

Neupanem, in his paper analyzed the causes of inflation in Nepal by using monetarist and structuralist theory of inflation. The objective of this study was to examine the model that could visualize the exact situation of inflation in the Nepalese economy covering the period of eighteen years from 1971-1988.

He modified the monetarist model in the context of Nepal, where financial institutions were relatively underdeveloped and economic activities were insufficiently monetized. In his study, narrow definition of money was considered and cost of holding money was defined as the difference between the current and previous year's rate of inflation i.e.  $c_t = P_t - P_{t-1}$ .

Main conclusions of the analysis of monetarist model were summarized below:

- (i) The coefficient of one year lagged money supply was statistically significant while two years lagged money supply was found to be following unexpected sign and also statistically insignificant. The coefficient of current year money supply followed the expected sign but was statistically insignificant in this

study. This might be lagged in adjustment between money supply and price level.

- (ii) The growth rate of per capita income followed the correct sign but was found insignificant.
- (iii) The cost of holding money had been found to be another important variable to explain inflation in Nepal.

Thus, money supply (current and one year lagged), real income per capita and cost of holding money were the important variables for explaining inflation in Nepal and these variables explain about 71 percent variation of inflation in Nepal.

Neupane developed the structuralist model for Nepal and considered three types of bottlenecks which created inflation in our country; they were agricultural bottleneck, foreign exchange bottleneck and fiscal constraints.

Main conclusions found from the structuralist model were given below:

The growth rate of expected cost of holding money had been found to be highly significant while the growth rate of output producing sectors had been found insignificant. The percentage change in the import price index was also statistically significant but the government budget deficit variable showed positive impact on inflation and was also significant but it had been shown that government budget deficit would cause very little change in the price level.

Neupane found that explanatory power of structuralist model was 74 percent from which the model can be judged reasonably successful in explaining inflation in Nepal (Neupane, 1992).

Sharma, in his study, accepted that one of the crucial factors that govern the price level was money supply. However, domestic price could also be affected by world prices in a small economy like Nepal, which is highly dependent on imports. The objective of this paper was to find out the causative factors of both internal and external origin and estimate their relationship with inflation in Nepal. He applied ordinary least squares method using annual data from International Financial Statistics year Book of 1991 for the period 1964-1990.



He tested the data and the model for model for multi-collinearity, heteroscedasticity activity and autocorrelation among the explanator variables. He employed Durbin-Watson test for autocorrelation and in the absence of any obvious possible sources hetroske drasticity; he employed the white test for homoscedasticity.

His major findings of the study were as follows:

- (i) Money supply including its lagged value, income and world prices (Indian prices) affected the inflation in Nepal.
- (ii) The coefficient of income was found insignificant in the model, which might probably be owing to imprecise measurement of income.
- (iii) Money supply was the prominent cause of inflation in Nepal and prices could take time to respond to money supply.

Thus, the empirical studies reviewed in the context of Nepal and other countries indicate that the technique of regression is employed to investigate the factors causing inflation. Among the variables included in category of explanatory variables, money supply and Indian prices were found to be most significant variables (Sharma, 1992).

NRB, has tried to present the institutional effort to capture the factors contributing to the Nepalese inflation. It has attempted to examine the responsible factors determining inflation in Nepal. Researchers have used the model of Khan and Schimmelpfenning to explain inflation in Nepal. However, they have slightly changed the model by including cost push factor (i.e. money wage rate) as one of the explanatory variables and have used the foreign factor (Indian consumer price index) in place of exchange rate. The explanatory variables under the study were the money supply, velocity of money, real gross domestic product, money wage rate and external factor while the dependent variable was the consumer price index. This study had applied double natural logarithm model for investigation.

Empirical results suggest that Nepalese inflation was mainly determined by Indian inflation with narrow money only having an effect in the short-run (less than one year). This result was similar with previous studies, which have concluded that

inflation in Nepal is mainly determined by Indian inflation and growth rate of domestic money supply (NRB, 2007).

## **2.5 Conclusions**

The classical theory signifies that supply of money is the main determinant of general price level in an economy i.e. there is proportional relationship between money supply and general price level i.e. a 100 percent increase in money supply will increase the price level by 100 percent. Keynesian theory concludes that change in aggregate demand or supply plays a key role in determining the price level and employment in the economy. Thus, the factors which shift the aggregate demand curve rightwards and aggregate supply curve leftwards are the main cause of inflation in the economy. The demand side factors like money supply, government expenditure, deficit financing, taxes, autonomous investment expenditure, etc. and supply side factors such as wage rate, interest rate, import price, price of the petroleum products, exchange rate, profit margin by the firm etc. are the main causes of inflation in the economy. The Phillips curve theories stress upon the simple trade-off between inflation and unemployment. Its key implication is that level of unemployment can only be reduced by increasing inflation. Theory of monetarists, on the other hand, establish the unique role of money as an independent and ultimate cause of inflation. At the same time, structuralists have put their view on inflation in different way as compared to other theories. According to them, structural bottlenecks are the main causes of inflation in developing countries. They have given little importance on money supply as independent causes of inflation.

After analyzing the above literature, it has been found that Indian inflation has a significant influence on Nepalese inflation in Nepal. On the other hand, Domestic money supply, structural bottlenecks in the economy play profound role for the inflation in Nepal. This study tries to justify and update the facts about the causes of inflation in Nepalese economy.

## **CHAPTER-III**

### **RESEARCH METHODOLOGY**

#### **3.1 Introduction**

It consists of research design, sources of data, coverage of the study, instruments, data processing technique, method of estimation hypotheses, models and data analysis techniques.

#### **3.2 Research Design**

The analytical aspects involved in this study are qualitative and quantitative assessment. The research design of the study is focused with hypotheses testing studies. This study has made some hypotheses about the inflation. These hypotheses have to be tested by using appropriate statistical tools.

#### **3.3 Sources of Data**

The present study attempts to get various results using only the secondary data that are collected from various sources as mentioned below:

- 1) The data for the variables consumer price index of Nepal (NCPI), Narrow Money Supply (M1), Broad Money Supply (M2) and Foreign Exchange Reserves (FER) are collected from "Quarterly Economic Bulletins", a quarterly publication of Nepal Rastra Bank.
- 2) The data for the variable Real Gross Domestic Product (RGDP), and Fiscal Deficit (FD) are collected from "Economic Surveys", a yearly publication of Ministry of Finance.
- 3) The data for the variable wholesale price Index of India (IWPI) is taken from "International Finance Statistics" a publication of International Monetary Fund (IMF).

### **3.4 Coverage of the Study**

The empirical analysis of the study covers 28 years time period from 1979/80 to 2006/07. This time period is selected on the assumption that 28 years period is sufficient to analyse various rise-fall situation of the economy.

### **3.5 Instruments**

The simple calculations like ratio, percentage, etc. are done with the help of ordinary calculator, the simple and multiple regression equations are derived by using the computer programme called SPSS. Different tests and errors are also calculated with the help of this program.

### **3.6 Data Processing Technique**

It is necessary for the time series data to check whether variables on individual basis used for the study are stationary or not. If variables are non-stationary, they produce spurious relationships. All the time series data have been converted into natural log form and their first difference has been taken into account for the study purpose. The change in natural logarithms of variables is used as proxy for the percentage change of the variable in this study. Thus, inflation is the change in natural logarithms of National Urban consumer price index at base year 1995/96. Consumer price index is the fiscal year (mid-July to mid-July) average of the monthly movements. Regarding the money supply, the data for narrow money supply (M1) is the sum of currency in circulation and demand deposits in commercial banks and data for broad money supply (M<sub>2</sub>) is calculated by adding narrow money supply saving and fixed deposits of commercial bank. Real gross domestic product, during the time periods, is calculated by dividing nominal gross domestic product by GDP deflator at base year prices 1995/96. GDP deflator indices at different base year prices are transferred at the single base year price 1995/96. For example, GDP deflator of 1992/93 is 256.02 at the base year 1984/85 and is 81.19 at the base year 1995/96. For the same year. If we have to transfer the GDP deflator 352.91 of 1997/98 at the base year 1984/85 into base year 1995/96, the formula used is  $\frac{81.19}{256.2} \times 352.91 = 111.91$ .

Since wholesale price index of India is collected from "International Finance Statistics" and based upon the fiscal year from January to December, it requires an adjustment to convert into our fiscal year. The adjustment is made simply by taking the average of the data of two time periods. For example data for fiscal year 2003/04 is calculated by taking the average of the data of 2003 and 2004. Finally data are converted into growth rate form, by the same procedure. Similarly the figures for the deficit finance are collected directly from economic survey of Nepal where it is calculated by deducting government expenditure from revenue (including grants) and expressed in the growth rate form.

The figure for the foreign exchange reserves (includes gold, SDRs, IMF Reserve Trenches position, foreign exchange) are also converted into growth rate form by adopting the same procedure.

The difference between the current and previous rate of inflation has been taken as a proxy for expected cost of holding money. So, its data can be generated from the rate of inflation.

### 3.7 Hypotheses

This study test the hypothesis that the dependent variable has a significant relationship with independent variables. The general hypothesis is tested as;

$H_0 : \frac{\delta y}{\delta x_i} = 0$ ; there is no significant relationship between dependent variable i.e. inflation and independent variables i.e. narrow money supply, broad money supply, Indian wholesale price index, fiscal deficit, real gross domestic product, expected cost of holding money, foreign exchange reserves

$H_a : \frac{\delta y}{\delta x_i} \neq 0$ ; there is significant relationship between dependent and independent variables.

Where,

$H_0$  = Null hypothesis and  $H_a$  = Alternative hypothesis

The notation  $\delta$  implies the rate of change in respective variables.

$y$  = dependent variable  
 $X_i$ s are independent variables.

### 3.8 Method of Estimation

The ordinary least square (OLS) method is applied all over the study. It is worthwhile to mention brief theoretical concept about it. There are two types of variables: dependent and independent variables or explained and explanatory variables. The dependent variable is assumed to be Stochastic i.e. it has probability distribution. The explanatory variables, on the other hand, are assumed to have fixed values i.e. they are non-stochastic in character. If we are studying the dependence of a variable on only a single explanatory variable, such a study is known as simple or two variable regression analysis. However, if we are studying the dependence of a variable on more than one explanatory variable such that general price level on money supply, real gross domestic product fiscal deficit etc. It is known as multiple regression analysis.

We generally use simple and multiple regression analysis in order to find the effect of various variables on inflation. Therefore, regression models are as follows:

- 1)  $Y = a_0 + a_1X + U$ ..... for one explanatory variable
- 2)  $Y = a_0 + a_1X_1 + a_2X_2 + \dots + a_nX_n + U$ ....for more than one explanatory variables.

Where,

$a_i$ s are parameters ( $i = 0, 1, \dots, n$ )  
 $x_i$ s are explanatory variables and  $U$  is error term.

### 3.9 Models

General economic theory suggests that inflation is created by the disequilibrium situation between supply of and demand for money. In an economy, excess aggregate demand over excess aggregate supply increases the general price level. Therefore, factors responsible for excess aggregate demand and low aggregate supply are assumed to be the causes of inflation.

Both structural and monetary factors are equally significant to cause inflation in Nepal. It is believed that money supply plays due role to sustain price rise. Besides

this, other factors like GDP, cost of holding money and foreign exchange reserves can not also be neglected. Inflation in Nepal is also supposed to be explained by India prices because of unrestricted trade with India. Therefore, the explained (dependent) variable in the model is the rate of inflation and it is calculated simply by the change in natural logarithm of national urban consumer price index. The national urban consumes price (NUCPI) is considered as proxy for the consumer price index. Rate of inflation is defined as the percentage change in NUCPI. The explanatory (independent) variables are as follows:

### 3.9.1 Money Supply

Money supply (narrow and broad money) is included in the model, regarding the classical and its refinement by monetarist views of inflation. Various lags in money supply are also included as explanatory variables considering the view of 'money illusion' to explain the rate of inflation and must effective one is selected for further explaining the rate of inflation. Thus, estimating equation are

$$d\ln(\text{NCPI}_t) = a_0 + a_1 d\ln(M_{1t} | M_{1t-1}/M_{1t-2}) + U_t \dots(1)$$

$$d\ln(\text{NCPI}_t) = a_0 + a_1 d\ln(M_{2t} | M_{2t-1}/M_{2t-2}) + U_t \dots(2)$$

Where,  $d\ln$  is the change in natural logarithm which show the percentage change in the variable.

$\text{NCPI}_t$  is consumer price index of Nepal.

$M_{1t}$ ,  $M_{1t-1}$  &  $M_{1t-2}$  are the current, one year and two year lagged narrow money supply respectively and  $M_{2t}$ ,  $M_{2t-1}$  &  $M_{2t-2}$  are the current, one years two year lagged broad money supply respectively

$U_t$  = error term.

$a_0$  = Constant term i.e. inflation independent with the money supply.

$a_1$  = Coefficient of respective money supply.

And expected pattern of signs of the parameters are  $a_0 < 0$  or  $a_0 > 0$  and  $a_1 > 0$  for both the equations.

### 3.9.2 Wholesale Price Index of India (IWPI)

Empirical studies on money supply and imports (Khatiwada, 1987) revealed that expansion in money supply impinges upon imports, especially from India. When

prices across the border are higher than prices of administered commodities at home, there is a tendency of trade distortion due to smuggling and no fiscal or administrative action other than hiking their prices becomes effective. The analysis of market interlinkages thus shows that explanation of price behaviour in Nepal would be incomplete without considering this structural phenomenon. Thus, Indian price is one of the important cause of inflation in Nepal. The appropriate variable to capture such prices would be the import price index. But such an index is not available and either we have to derive such an index from the available trade statistics or to choose from Indian wholesale, consumer, import or export price indices that one, which can work as a proxy for Nepal's import price. Moreover, a preliminary investigation of the correlation between various India prices and consumer prices in Nepal shows that the correlation is the highest when Indian wholesale price (IWPI) is chosen. So, for the second alternative, IWPI seems to be the appropriate proxy import price variable. Thus, IWPI is taken as another explanatory variable. In order to examine the lagged impact of IWPI; the study introduces one year and two year lagged IWPI as the explanatory variables and most effective one is selected for further explaining the rate of inflation. Thus, the estimating equation is;

$$d\ln(\text{NCPI}_t) = a_0 + a_1 d\ln(\text{IWPI}_t | \text{IWPI}_{t-1} / \text{IWPI}_{t-2}) + U_t \dots (3)$$

Where,  $\text{IWPI}_t$ ,  $\text{IWPI}_{t-1}$ ,  $\text{IWPI}_{t-2}$  are current, one year and two year lagged wholesale price index of India respectively.

$a_0$  = Constant term, i.e. inflation independent with IWPI

$a_1$  = Coefficient of respective IWPI.

And, expected pattern of sign of parameters are  $a_0 < 0$  or  $a_0 > 0$  and  $a_1 > 0$

### **3.9.3 Fiscal Deficit (FD)**

There is lack of adequate infrastructure and other essential services in the country. The private sector is slow and less interested in developing infrastructure in the country. So, public sector needs to play an important role to increase investment in the country. Therefore, government expenditure has witnessed an increasing trend. Revenue from tax and non tax source is not adequate to finance the growing government expenditure and hence there is growing budget deficit. Different countries experience suggests that the main problem on inflation is large fiscal deficit



and printing of new money to finance it. Even though the nature of fiscal deficit, in Nepal, has also been increasing in trend, the supply of output has not been increased as increase in fiscal deficit to the GDP ratio.

In order to finance the growing budget deficit, the government has borrowed from domestic, as well as foreign sources. Most of the internal borrowing comes from the banking sector which is highly inflationary. Similarly, the growing amount of external borrowing has helped to increase money supply and thus contribute for inflation in the country. Fiscal deficit, in fact, has the indirect effect on inflation through the increase in the money supply. Thus, budget deficit has been considered as explanatory variable in the model. The estimating equation is

$$d\ln(\text{NCPI}_t) = a_0 + a_1 d\ln(\text{FD}_t) + U_t \dots(4)$$

Where,  $\text{FD}_t$  is the fiscal deficit

$a_0$  = Constant term, i.e. inflation independent with fiscal deficit

$a_1$  = Coefficient of fiscal deficit and expected pattern of sign parameters are  $a_0 > 0$  or  $a_0 < 0$  &  $a_1 > 0$ .

### 3.9.4 Real Gross Domestic Product (RGDP)

Real gross domestic product at constant price is considered as proxy for the real income. Real gross domestic product is expected to reduce inflation. The supply side theory suggests that there is an inverse relationship between the real GDP growth and inflation. The theory of Phillips curve reveals that countries that on an average have higher rates of economic growth or lower unemployment have higher rate of inflation. On this basis, it would be difficult to argue that there exists any systematic relationship between inflation and growth, either positive or negative. However, it is taken as another explanatory variable to explain the rate of inflation in the model. The estimating equation is

$$d\ln(\text{NCPI}_t) = a_0 + a_1 d\ln(\text{RGDP}_t) + U_t \dots(5)$$

Where,  $\text{RGDP}_t$  is real gross domestic product at time period  $t$

$a_0$  = Constant term, i.e. inflation independent with RGDP

$a_1$  = Coefficient of RGDP

and expected pattern of sign of parameter are  $a_0 < 0$  or  $a_0 > 0$  and  $a_1 < 0$  or  $a_1 > 0$ .

### 3.9.5 Foreign Exchange Reserve (FER)

Foreign exchange reserve is also considered to be an important cause of inflation in various countries. In Nepal, it is increasing year by year which increased the monetary base, then money supply. The empirical estimates in Nepal have shown that it is an important explanatory variable. Therefore, it has been considered as another explanatory variable to explain the rate of inflation in the model. The estimating equation is

$$\text{dln (NCPI}_t) = a_0 + a_1 \text{dln (FER}_t) + U_t \dots(6)$$

Where,  $\text{FER}_t$  is percentage change in foreign exchange reserve

$a_0$  = Constant term, i.e. inflation independent with FER

$a_1$  = Coefficient of FER

and expected pattern of sign of parameter are  $a_0 < 0$  or  $a_0 > 0$  and  $a_1 > 0$ .

Due to lack of data, the model explains the relationship between inflation and foreign exchange reserve for the time period 1980/81 to 2006/07.

### 3.9.6 Expected Cost of Holding Money

According to monetarists, expected cost of holding money plays a vital role in the inflationary behaviour of the economy. Interest rate is possible variable to explain cost of holding money in the developed countries but in context of Nepalese financial system, it plays a very little role to determine inflation. Therefore, interest rate is not suitable variable in this study. In the process of expectation formation, immediate past experience gets greater weight than the more remote past. The difference between the current and previous year inflation rate ( $E_t - P_t - P_{t-1}$ ) has been used as the proxy to estimate the expected cost of holding money.

Baumol (1996) says, "The change in the price level affects on the purchasing power of a stock of cash holdings, whereas a fall in prices will raise the real value of cash holdings." If inflation persists, the real value of cash holding decreases thus, cost of holding money increases. Consequently, cash becomes less attractive and mostly substituted with physical assets (e.g. land, building, jewellery etc.). Therefore, people have a tendency to substitute physical goods with money, which creates inflationary

situation. Thus, it is taken as another explanatory variable to explain the rate of inflation in the model. The estimating equation is

$$d\ln(\text{NCPI}_t) = a_0 + a_1 d\ln(\text{EH}_t) + U_t \dots (7)$$

Where,  $\text{EH}_t$  is rate of growth of expected cost of holding money

$a_0$  = Constant term, i.e. inflation independent with  $\text{EH}_t$

$a_1$  = Coefficient of expected cost of holding money.

and expected pattern of sign of parameter are  $a_0 < 0$  or  $a_0 > 0$  and  $a_1 > 0$ .

i.e. the expected cost of holding money is assumed to be positively associated with inflation.

Altogether, inflation in Nepal is the function of money supply growth, GDP growth, growth of expected cost of holding money, fiscal deficit growth, Indian inflation and foreign exchange reserve growth i.e. The functional relationship in a single equation will be

$$\ln(\text{NCPI}_t) = f(\ln M_{1t} | \ln M_{1t-2} | \ln M_{1t-1} | \ln M_{2t} | \ln M_{2t-1} | \ln M_{2t-2} | \ln Y_t | \ln \text{EH}_t | \ln \text{IWPI}_t | \ln \text{IWPI}_{t-1} | \ln \text{IWPI}_{t-2} | \ln \text{DFY}_t | \ln \text{FER}_t)$$

### **3.10 Statistical Test of Significance of the Least Square Method**

#### **3.10.1 The Test of Significance (the t-test)**

The t-test is used to find out the statistical significance of the individual parameters at a given level of significance. It determines the statistical reliability of the estimates of the regression coefficients. The following hypothesis are used to compute t-test statistical.

Null Hypothesis ( $H_0$ ):  $a = 0$ , i.e. the regression parameter are not statistically significant.

Alternative hypothesis ( $H_a$ ):  $a \neq 0$ , i.e. the regression parameters are statistically significant.

A test is said to be statistically significant if the value of the statistics lies in the critical region i.e. calculated t value lies above the tabulated t-value. In this case, null

hypothesis is rejected. Similarly, a test is said to be statistically insignificant, if the value of the t-statistics lies in the acceptance region i.e. calculated t-value lies below the tabulated t-value.

### **3.10.2 The Overall Significance of the Estimated Regression Model (F-test)**

The F-test is applied to test the overall significance of the regression model at a given level of statistical significance. It attempts to show whether the movement in the dependent variable is significantly explained or not with the change in independent variables.

The following hypotheses are used to compute the F-test statistics.

Null Hypothesis ( $H_0$ ):  $\alpha = 0$ , i.e. there is no line or relationship between dependent and the independent variables.

Alternative hypothesis ( $H_a$ ):  $\alpha \neq 0$ , i.e. there is linear relationship between dependent and independent variables.

If calculated F value lies below the tabulated F value at the specific level of significance with given degrees of freedom, we accept the null hypothesis. That is, dependent variable is not influenced by the change in explanatory variable. Conversely, if calculated F value lies above the tabulated F value at chosen level of significance and given degree of freedom. We reject null hypothesis. That is, change in explanatory variables influence the dependent variables.

### **3.10.3 The Coefficient of Determination ( $r^2$ or $R^2$ )**

The coefficient of determination  $r^2$  (two variable case) or  $R^2$  (more than two variable case) measures the percentage of total variation in dependent variable (general price level in our case) explained by the explanatory variables in the model. It is non-negative quantity and the value of this lies between zero and one i.e.  $0 < r^2$  or  $R^2 < 1$ . If it is 1, 100 percent variation in dependent variable is explained by the explanatory variables. It means, the model is perfectly fitted. And if it is zero, there is no relationship between explained and explanatory variables.

### 3.10.4 Adjusted Coefficient of Multiple Determination ( $\bar{R}^2$ )

The term adjusted means adjusted for the degree of freedom associated with the sums of squares entering into the formula of  $R^2$ . According to H. Theil "It is good practice to use  $\bar{R}^2$  rather than  $R^2$  because  $R^2$  tends to give an overly optimistic picture of the fit of the regression, particularly when the number of explanatory variables is not very small compared with the number of observations" (Theil, 1978, p. 135).

### 3.10.5 Durbin Watson (DW) Test

Durbin Watson test is a test of auto-correlation among the residuals. Auto-correlation refers to the relationship existing between the successive value of the error terms. Errors terms are those, which are not included in the research novel. They may be linked to each other with certain functional relationship. When error term in one period is correlated with the error term of another period, our estimates may be false. Durbin Watson (1950) have suggested a test to test first order autocorrelation because existence of auto-correlation among the random variables violates the principle of OLS estimators and the regression (the test) is done to check whether the estimates are free from auto-correlation or not.

In order to test for the incidence of auto-correlation, Durbin Watson test has been applied in the present study. For this,

Null hypothesis ( $H_0$ ):  $\rho = 0$  i.e. there is not autocorrelation among the residuals

Alternative hypothesis ( $H_1$ ):  $\rho \neq 0$  i.e. there is auto-correlation among the residuals.

Durbin Watson have suggested to examine a lower bound  $d_L$  and upper bound  $d_U$  such that if the computed  $d$  lies outside these critical values, a decision can be made regarding the presence of positive or negative auto-correlation. These theoretical upper and lower limits are found in a certain level of significance depending upon number of observations and the number of explanatory variables used in the study.

The decisions are made as follows:

$d = 0 \Rightarrow$  perfect positive auto-correlation.

$0 < d < d_L \Rightarrow$  positive auto-correlation.

$d = 4 \Rightarrow$  perfect negative auto-correlation

$4 - d_L < d < 4 \Rightarrow$  Negative auto-correlation

$d_u < d < 4 - d_u \Rightarrow$  Neither positive nor negative autocorrelation

$d_L \leq d \leq d_u$  and  $4 - d_u \leq d \leq 4 - d_L \Rightarrow$  Indecisive region

i.e. we can not make any decision when d statistics lies in these region.

### **3.10.6 Stationary Time Series Test (Unit Root Test)**

If a time series is stationary, its mean, variance and auto-covariance (at various lags) remain the same no matter at what point we measure them; that is, they are time invariant. We need to check up the time series data, whether it is stationary or not, because if a time series is non stationary, we can study its behavior only for the time period under consideration. That is, the results cannot be generalized in other time periods. Therefore, the process of forecasting, such time series (non-stationary) may be of little practical value. In order to check whether the time series is stationary or not, this study uses Augmented Dickey Fuller (ADF) test. The hypotheses are;

Null hypothesis (Ho): If it is accepted, there is a unit root. The time series is non stationary.

Alternative hypothesis (Ha): If it is accepted, the time series is stationary.

## CHAPTER-IV

### ANALYSIS AND INTERPRETATION

#### 4.1 Introduction

Nepal has experienced the significant rate of inflation and the inflationary pressure since a long period and the problem is very serious now a days. This chapter tries to investigate the causes of inflation in Nepal based on the period from 1979/80 to 2006/07. We can find various responsible factors for increasing the Nepalese price level from a macroeconomic point of view. This study has used ordinary least square method to analyze empirically the relationship between the dependent and independent variables.

The eight identified variables (NCPI, M1, M2, IWPI, RGDP, FD, FER,  $EH_t$ ) are initially subject to time series analysis to check whether a series is stationary or not before using it in a regression. The formal method to test the stationary of a series is the unit root test. If a time series is stationary; its mean, variance and auto-covariance (at various lags) remain the same independent with time, no matter at what point we measure them. If the time series is non-stationary; we can study its behaviour only for the time period under consideration. That is, the results cannot be generalized in other time periods. The forecasting made by using non-stationary variables will be little significance. In this case, non-stationary data need to be made stationary in order to avoid the problem of spurious regression. The general procedure to do this task is to take first difference of the series. If the series becomes stationary by its first difference it is said to be integrated of order first symbolized as  $I(1)$  and so on. The non stationary of series is checked through Augmented-Dicky Fuller test as mentioned in methodology chapter. The unit root test is formed on each variable. The table 4.1 gives the statistics and associated p-values of the Augmented-Dicky Fuller test of above mentioned eight variables.

Interpolated Dickey-Fuller test at 1 percent, 5 percent and 10 percent critical value for  $n = 27$  are -3.736, -2.994 and -2.628 and for  $n = 26$  are -3.743, -2.997, -2.629 as given in STATA 9. First difference of time series has  $n-1$  observations with their corresponding  $n$  log levels.

Table 4.1 indicates that all time series data, in log levels, have presence of unit root at greater than 5 percent level of significance; except for broad money supply ( $M_2$ ) and Indian wholesale price index (IWPI). Time series data for  $M_2$  and IWPI reject the null hypothesis of a unit root at 5 percent level of significance. On the other hand, all the variables are stationary at 5 percent level of significance in their first difference of log levels. Thus, all the variables which are taken to be integrated of order one (i.e. first difference of log levels) are stationary. They are integrated in the following table 4.1.

**Table 4.1**  
**Augmented Dickey Fuller for Tests for unit root**

Variables	Log levels		1 <sup>st</sup> difference of log levels	
	t-statistics	p-value	t-statistics	p-value
NCPI (n = 27)	-3.367	0.0122	-3.455	0.0092
$M_1$ (n = 27)	-2.270	0.1817	-3.741	0.0036
$M_2$ (n = 27)	-2.888	0.0468	-3.037	0.0316
IWPI (n = 27)	-2.828	0.0544	-3.783	0.0031
RGDP (n = 27)	-1.614	0.4758	-5.484	0.0000
FD (n = 27)	-1.908	0.3281	-5.033	0.0000
FER (n = 27)	-0.544	0.8831	-3.999	0.0014
$EH_t$ (n = 26)	-----	-----	-7.148	0.0000

Source: Based on Appendix B and C.

## 4.2 Simple Regression Analysis

The empirical results estimated by applying simple regression analysis can be presented as follows :

### 4.2.1 Inflation and money supply

#### (A) Narrow money supply

Money supply is regarded as a significant cause of inflation. The excess demand theory reveals that a higher growth rate of money supply than the growth rate of real output creates inflationary situation in economy and pushes the price level up. The average annual growth rate of narrow money supply is about 14 percent during the time period between 1979/80 and 2006/07 (Appendix E).



The simple regression estimation of rate of inflation on the percentage change in current narrow money supply gives the following results:

$$\begin{array}{rcl}
 \text{dlnNCPI} = & 0.025 & + \quad 0.413\text{dlnM}_{1t}\dots\dots\dots(1) \\
 t & 1.113 & \quad 0.276 \\
 p & 2.758 & \quad 0.011 \\
 R^2 & = & 0.233 \quad F = 7.606 \\
 \bar{R}^2 & = & 0.203 \quad DW = 1.494 \quad N = 27
 \end{array}$$

In equation (1), the coefficient of percentage change in current narrow money supply indicates that 100 percent change in growth rate of current narrow money supply leads to 41.3 percent change in price level in Nepal. The p value shows that t and F-statistics are significant at 1.1% level of significance. This implies that we are 98.9 percent confident that we made right decision. Thus null hypothesis is rejected. That is, there is significant positive relationship between the growth rate of current narrow money supply and the rate of inflation. This result is significantly consistent with the monetary theory of inflation.

The value of adjusted coefficient of determination ( $\bar{R}^2 = 0.203$ ) signifies that 20.3 percent of total variation in inflation is explained by current narrow money supply.

The tabulated lower limit and upper limit values of Durbin Watson statistics for 5 percent level of significance and  $N = 27$  are 1.316 and 1.469 respectively. DW statistics has found above the upper limit thus leading to accept the null hypothesis that there is no auto correlation between the error terms.

To examine the possibility of money illusion in the economy, percentage change in one year lagged narrow money supply is used as an explanatory variable and the result of estimated regression equation of Nepalese inflation on the percentage change in one year lagged narrow money supply are given in appendix G.

Observing the results between Nepalese inflation and percentage change in one year lagged narrow money supply, it can be concluded that percentage change in one year lagged narrow money supply is not responsible factor to raise the price level in Nepalese economy. This shows that there is not lagged effect of one year lagged

narrow money supply (one year lagged). This shows that the economy is free from money illusion.

Looking at the results between Nepalese inflation and percentage change in two year lagged narrow money supply, it can be concluded that percentage change in two year lagged narrow supply is not a significant determinant of Nepalese inflation, if we neglect the effects of other variables in the economy. There is no lagged effect of percentage change narrow money supply (lagged by two years). This shows that the economy is free from money illusion. The estimated results are given in appendix G.

**(B) Broad Money Supply**

The simple regression between the rate of inflation and the percentage change in current domestic broad money supply gives the following results:

$$\begin{aligned} \text{dlnNCPI} &= 0.008 + 0.466 \text{ dln } M_{2t} \dots\dots\dots(2) \\ t & \quad 0.348 \quad 3.254 \\ p & \quad 0.731 \quad 0.003 \\ R^2 & = 0.298 \quad F = 10.587 \\ \bar{R}^2 & = 0.269 \quad DW = 1.934 \quad N = 27 \end{aligned}$$

Equation (2) shows that the coefficient of percentage change in current domestic broad money supply is positive and significant at 0.3 percent level of significance i.e. t and F-statistics are statistically significant at 0.3 percent level of significance. This implies that we are 99.7 percent confident that we made the right decision. The coefficient of percentage change in current domestic broad money supply indicates that 100 percent rise in current domestic broad money supply increases the inflation by 46.6 percent in Nepal. The adjusted coefficient of determination ( $\bar{R}^2 = 0.269$ ) signifies that only 26.9 percent of total variation in Nepalese inflation is explained by the current domestic broad money supply. The tabulated lower and upper limits of Durbin Watson statistics for N = 27 are 1.316 and 1.469 respectively. Since calculated DW statistics lies above the upper limit, thus leading to accept the null hypothesis that there is no auto correlation between the error terms.

To confirm the possibility of money illusion, the regression model has included the percentage change in one year lagged and two year lagged broad money supply as the

explanatory variable separately. The simple regression estimation results show that there is no statistically significant relationship between Nepalese inflation and the percentage change in lagged values of broad money supply. The simple estimation results are given in appendix G.

Looking at the results between rate of inflation and current broad money supply, the demand deposit in the commercial banks is used to purchase the consumer goods and services in Nepalese economy. On the other hand, the percentage change in lagged values of broad money supply has no significant effect on Nepalese inflation. This result signifies that time deposit in the commercial banks is also used to purchase the consumer goods and services in Nepalese economy. That is, loans provided by commercial banks are used in non-productive sectors like consumption, housing, trade etc.

#### **4.2.2 Nepalese Inflation and Wholesale Price of India**

The influence of world price in Nepalese economy is examined by taking the Indian wholesale price assuming India as rest of the world to Nepalese because large volume of international trade of Nepal is heavily dependent with India. Traditionally, India has been a major trading partner of Nepal both on export and import due to long porous border, free movement of people and capital and special regime of trade and payment between two countries. Nepalese currency is pegged to Indian currency and the exchange rate with other currencies are determined with the help of India monetary market and its currency. Since Nepal exports few gold and services and imports larger amount of consumer, intermediate and capital goods from India, a change in the price of capital goods and consumer goods in foreign market directly affect the cost of production and hence the price level in general in domestic economy. In this case, it can be expected that large the trade concentration with India, higher will be the effect of Indian prices on Nepalese inflation. This signifies that imported inflation may have been one of the several causes to affect inflation in Nepalese economy. The trade concentration of Nepal with India is given in appendix D.

The results of simple regression estimation of Nepalese inflation on the percentage change in current Indian wholesale price is as follows:

$$d\ln NCPI = 0.033 + 0.742 d\ln IWPI_{1t} \dots \dots \dots (3)$$

t	1.759	2.855	
p	0.091	0.009	
$R^2$	=	00.246	F = 8.150
$\bar{R}^2$	=	0.216	DW = 1.744      N = 27

In equation (3), the coefficient of percentage change in current Indian wholesale price index is positive and it is 0.742. It signifies that 100 percent rise in Indian prices produces 74.2 percent increase in price level in Nepal. t and F-statistics are significant at 0.9 percent level of significance. This implies that we are 99.1 percent confident that we made right decision. Since DW statistics lies above the upper limit, there is no significant auto correlation between the error terms. The adjusted coefficient of determination (i.e.  $\bar{R}^2 = 0.216$ ) signifies that 21.6 percent of total variation in inflation is explained by the current wholesale price of India.

To check the impact of percentage change in lagged values of wholesale price of India on Nepalese inflation, percentage change in one year and two year lagged wholesale price of India are taken as explanatory variables separately.

The estimated regression equation by taking one year lagged Indian wholesale price ( $IWPI_{1t-1}$ ) as an explanatory variable gives the following results::

$d\ln NCPI =$	0.042	+	0.578	$d\ln IWPI_{1t-1} \dots \dots \dots (4)$
t	2.062		2.080	
p	0.050		0.048	
$R^2$	=	0.053	F = 4.328	
$\bar{R}^2$	=	0.117	DW = 1.695	N = 26

Equation (4) shows that the coefficient of percentage change in one year lagged Indian wholesale price is positive and significant at 4.8 percent level of significance. This implies that we are 95.2 percent confident that we made right decision. The coefficient of percentage change in one year lagged Indian wholesale price signifies that 100 percent change in one year lagged Indian wholesale prices causes 57.8 percent change in price level in Nepalese economy. The value of  $\bar{R}^2$  (0.117) indicates that 11.7 percent of total variation in inflation is explained by one year lagged

wholesale price of India. Since calculated DW statistics has found above the tabulated upper limit, error terms are thus free from auto correlation.

Again, the estimated regression equation by taking two year lagged Indian wholesale price (IWPI<sub>1t-2</sub>) as an explanatory variable gives the following results:

$$\begin{array}{rcll}
 \text{dlnNCPI} = & 0.037 & + & 0.622 \text{ dlnIWPI}_{1t-2} \dots\dots\dots(5) \\
 t & 1.792 & & 2.855 \\
 p & 0.086 & & 0.038 \\
 R^2 & = & 0.174 & F = 4.837 \\
 \bar{R}^2 & = & 0.138 & DW = 1.483 \quad N = 25
 \end{array}$$

Equation (5) shows that the coefficient of two year lagged Indian wholesale price is positive and significant at 3.8 percent level of significance i.e. t and F-statistics are significant at 3.8 percent level of significance. This implies that we are 96.2 percent confident that we made right decision. Equation (5) can be interpreted as 100 percent change in two year lagged Indian wholesale price produces 62.2 percent change in price level in Nepalese economy. The value of  $\bar{R}^2$  (0.138) signifies that 13.8 percent of total variation in inflation is explained by two year lagged Indian wholesale price. Since calculated DW statistics lies above tabulated upper limit, there is no significant auto correlation between the error terms.

### 4.2.3 Inflation and Real Gross Domestic Product

The supply side theory states that an increase in physical volume of output will lower the price level in the economy. The former (new) version of Phillips curve theory says that there is an inverse relationship between the inflation and unemployment. It implicitly signifies that there exists positive relationship between the inflation and output growth. The annual average growth rate of real GDP (at constant price) during the study period is about 5 percent. It was found negative during the period 1979/80, 1982/83 and 2001/02. Even though attempts were made for the use of potentially available resources through the implementation of fiscal and monetary policies, the agricultural, industrial and services sectors are not improving their productivity due to various factors like lack of capital and technology, lack of skilled manpower,

conflicts, political instability etc. Thus, there arises discrepancy between the projected and actual growth of RGDP.

The model showing the simple regression equation between the rate of inflation and percentage change in RGDP (i.e. real GDP growth) has been dropped due to the appearance of theoretically unexpected sign in the equation. However, the results are given in appendix G.

Virtually, when RGDP increases, economic condition of a country also improves and the price level would be maintained at optimum level. The reasons behind the result obtained may be higher rate of indirect taxes, low productivity, high wage rate of labors than their productivity more than the normal profit or super normal profit gained by the businessmen etc. Hence, the cost of production and trade margin of businessmen also increases thereby the inflation in the economy. In one side, the growth rate of agricultural and industrial sectors are not satisfactory as warranted by increasing population. On the other hand, another important reason in increasing price level could be the long open border between Nepal and India and thereby uncontrolled export of commodities. The positive association between the variables depicts the Phillips curve relationship as in the theoretical review. The results shows that 100 percent increase in real GDP is achieved through 5.9 percent inflation. This signifies that there exists high level of unemployment in Nepalese economy.

#### **4.2.4 Inflation and Fiscal Deficit**

Fiscal deficit is used to mean any public expenditure that is in excess of public revenue in any one fiscal year. Fiscal deficit in budget is mainly restored to enable the government to obtain necessary resources for plan. Fiscal deficit, in general, has been regarded as a significant and useful weapon in case of underdeveloped economies like Nepal in order to create more employment opportunities and mobilizes physical as well as human resources through higher level of government expenditure. It may lead to inflationary pressure and loss of confidence in the currency. If the effect of deficit financing may be disastrous to the economy when its limit is exceeded. The general rise in price level is generally associated with the financing of deficit through the banking system from printing of new money and creating interest-bearing debt. In this regard, economy faces the excess demand of output subject to supply constraint and

thus occurs the inflationary pressure in the economy. Looking at the time series data of fiscal deficit between 1979/80 and 2006/07, it was Rs.1670.7 million in fiscal year 1979/80. But it as reached at Rs.45892.5 million in fiscal year 2006/07. The average growth of fiscal deficit during the study period is about 12 percent (Appendix E).

The results of estimated simple regressing equation of Nepalese inflation on the percentage change in fiscal deficit is found to be statistically insignificant. The effects of explanatory variable upon the explained variable is insignificant at 10 percent level of significance. The results are given in appendix G.

The reason behind the results obtained is that fiscal deficit faced by Nepalese economy is not big enough to create inflation in Nepal. On the other hand, the reason not having significant relationship between the inflation and growth rate of FD may be due to the definition of inflations as the growth rate of national urban consumer price index which represents only the price movements in urban Nepal.

#### 4.2.5 Inflation and Foreign Exchange Reserve

It is general conception that increase in international reserves assists to accelerate the inflation because an expansion in foreign exchange reserves increases the monetary base and expansion of total money supply given the constant money multiplier and thus the inflation. Since foreign exchange reserve has continuously been increasing year by year in Nepal, it would be rational to find out the impact of this growing international reserve on the rate of inflation. The average growth rate of international reserve is about 15 percent during the period under study (Appendix E).

The estimated simple regression equation taking percentage change in foreign exchange reserve as explanatory variable and rate of inflation as explained variable gives the following results:

$$\begin{array}{l}
 \text{dlnNCPI} = 0.071 + 0.078 \text{ dlnFER} \dots\dots\dots(6) \\
 \text{t} \quad \quad \quad 7.396 \quad \quad 1.907 \\
 \text{p} \quad \quad \quad 0.000 \quad \quad 0.068 \\
 \text{R}^2 = 0.127 \quad \quad \quad \text{F} = 3.638 \\
 \bar{\text{R}}^2 = 0.092 \quad \quad \quad \text{DW} = 1.529 \quad \quad \quad \text{N} = 27
 \end{array}$$

Equation (6) indicates that the coefficient of percentage change in foreign exchange reserve is positive and significant at 6.8 percent level of significance i.e. t and F-statistics are statistically significant at 6.8 percent level of significance. This implies that we are 93.2 percent confident that we made right decision. The coefficient of percentage change in foreign exchange reserve signifies that 100 percent rise in international reserves increases the inflation by 7.8 percent in Nepal. The adjusted coefficient of determination ( $\bar{R}^2 = 0.092$ ) indicates that only 9.2 percent of total variation in Nepalese inflation is explained by the foreign exchange reserves. The tabulated lower and upper limits of Durbin-Watson statistics for N = 27 are 1.316 and 1.469 respectively. Since calculated DW statistics lies above the upper limit thus leading to accept the null hypothesis that there is no auto correlation between the error terms.

The results highlight that increase in foreign exchange reserves increases the money supply and hence the inflation in Nepal. This shows that foreign exchange reserve is a significant cause of inflation in Nepalese economy. On the other hand, it also signifies that central bank (NRB) will take long time to control inflation through controlling the money supply in Nepalese economy.

#### 4.2.6 Inflation and Expected Cost of Holding Money

In fact, the first difference of change in inflation rate is taken as proxy to estimate the expected cost of holding money. Interest rate could be another possible variable for it. But it is not deemed to have adequate representation of the opportunity cost of holding money because of its diversity in every sector.

The estimated simple regression equation between the rate of inflation and the percentage change in expected cost of holding money gives following results:

$$\begin{array}{l}
 \text{dlnNCPI} = 0.082 + 0.484 \text{EH}_t \dots\dots\dots(7) \\
 t \quad \quad \quad 12.588 \quad 3.236 \\
 p \quad \quad \quad 0.000 \quad \quad 0.004 \\
 R^2 = 0.304 \quad \quad F = 10.475 \\
 \bar{R}^2 = 0.275 \quad \quad DW = 0.595 \quad \quad N = 27
 \end{array}$$



Equation (7) indicates that the coefficient of percentage change in expected cost of holding money is positive and significant at 0.4 percent level of significance. This implies that we are 99.6 percent confident that we made right decision. The coefficient of percentage change in expected cost of holding money signifies that 100 percent rise in expected cost of holding money increases the inflation by 48.4 percent. The adjusted coefficient of determination ( $\bar{R}^2 = 0.275$ ) points out that 27.5 percent of total variation in inflation is explained by the expected cost of holding money. On the other hand, the tabulated lower and upper limits of DW statistics for  $N = 27$  are 1.316 and 1.469 respectively. Since calculated DW statistics lies below the lower limit, there is positive auto correlation between the error terms.

The results signifies that since, in most of the developing countries like Nepal, where financial markets are not fully developed, money is mostly substituted with physical assets like land, building, commodities, jewelry etc. So, a small increment in prices, raising the cost of holding money, induces businessmen, middlemen and even rich people to substitute money with physical goods. Hence, a small increment in price of some commodities in Nepal and even in India tend to create artificial shortage due to hoarding and storing in anticipation of higher prices and further rise in price level. Therefore, expected cost of holding money is a significant cause of inflation in Nepalese economy.

The main objective of this study is to dig out the causes of Nepalese inflation so far as possible. From above analysis, it can be concluded that current narrow money supply, current broad money supply current, one year and two year lagged Indian wholesale price, expected cost of holding money are the significant causes of inflation in Nepalese economy. However, foreign exchange reserve is also significant at 6.8 percent level of significance. Other variables under study are insignificant with low explanatory power on Nepalese inflation.

Since money supply (current narrow and current broad), wholesale price of India (current, one year and two year lagged), expected cost of holding money and foreign exchange reserve are significant below 10 percent level of significance, all these variables are again taken as explanatory variables in multiple regression analysis. In order to find out the combined effect of variables under study on Nepalese inflation, this study sets the following multiple regression models:

$$d\ln(\text{NCPI}_t) = a_0 + a_1 d\ln(M_{1t}) + a_2 d\ln(\text{IWPI}_{1t}) + U_t \dots \text{(A)}$$

$$d\ln(\text{NCPI}_t) = a_0 + a_1 d\ln(M_{1t}) + a_2 d\ln(\text{IWPI}_{1t-1}) + U_t \dots \text{(B)}$$

$$d\ln(\text{NCPI}_t) = a_0 + a_1 d\ln(M_{2t}) + a_2 d\ln(\text{IWPI}_{1t}) + U_t \dots \text{(C)}$$

$$d\ln(\text{NCPI}_t) = a_0 + a_1 d\ln(M_{2t}) + a_2 d\ln(\text{IWPI}_{1t-1}) + U_t \dots \text{(D)}$$

$$d\ln(\text{NCPI}_t) = a_0 + a_1 d\ln(M_{2t}) + a_2 d\ln(\text{IWPI}_{1t}) + a_3 \text{EH}_t + U_t \dots \text{(E)}$$

$$d\ln(\text{NCPI}_t) = a_0 + a_1 d\ln M_2 + a_2 d\ln(\text{IWPI}_{1t}) + a_3 \text{EH}_t + a_4 d\ln \text{FER} + U_t \dots \text{(F)}$$

Where,

$d\ln$  is the first difference of natural logarithms. The expected pattern of sign are  $a_0 < 0$  or  $a_0 > 0, a_1 > 0, a_2 > 0, a_3 > 0, a_4 > 0$ .  $U_t$  is the error term.

The multiple linear regression estimates of Nepalese inflation on current narrow money supply and current wholesale price of India gives the following results:

$d\ln \text{NCPI} =$	$-0.002$	$+ 0.321$	$d\ln(M_{1t})$	$+ 0.589$	$d\ln(\text{IWPI}_{1t})$	$\dots \dots \dots$	$(8)$
$t$	$-0.089$	$2.245$		$2.351$			
$p$	$0.930$	$0.034$		$0.027$			
$R^2 =$	$0.377$			$F = 7.255$	$DW = 1.821$		
$\bar{R}^2 =$	$0.325$			$p = 0.003$	$N = 27$		

From equation (8), it is observed that the coefficient of percentage change in current narrow money supply being positive indicates that 100 percent increase in current narrow money supply increase the inflation by 32.1 percent in Nepalese economy. It is statistically significant at 3.4 percent level of significance. On the other hand, the coefficient of percentage change in current Indian wholesale price even being positive signifies that 100 percent increase in wholesale price of India increases the Nepalese inflation by 58.9 percent. It is found to be statistically significant at 2.7 percent level of significance. The tabulated lower and upper limits of Durbin Watson statistics with two explanatory variables at 5 percent level of significance and  $N = 27$  are 1.240 and 1.556 respectively. Since calculated DW statistics lies above the upper limit of DW statistics, there is no auto correlation between the error terms. The adjusted coefficient of determination ( $\bar{R}^2 = 0.325$ ) signifies that 32.5 percent of total variation in inflation is explained by the explanatory variables. F-statistics is found to be statistically significant at 0.3 percent level of significance.

The result in equation (8) indicates that there is slight improvement in the joint effect of current narrow money supply and current Indian wholesale price. However, there is no significant improvement than their individual effect on Nepalese inflation. The estimated multiple regression equation of Nepalese inflation current narrow money supply and one year lagged wholesale price of India gives the following results:

$$\begin{aligned} \text{dln}(\text{NCPI}_t) &= -0.003 + 0.378 \text{dln}(M_{1t}) + 0.446\text{dln}(\text{IWPT}_{1t-1}) \dots \dots (9) \\ t & \quad -0.114 \quad 2.645 \quad \quad \quad 1.761 \\ p & \quad 0.910 \quad 0.014 \quad \quad \quad 0.092 \\ R^2 & = \quad 0.350 \quad \quad \quad F = 6.203 \quad DW = 1.870 \\ \bar{R}^2 & = \quad 0.294 \quad \quad \quad p = 0.007 \quad N = 26 \end{aligned}$$

In the equation (9), the coefficient of current narrow money supply being positive signifies that 100 percent increase in current narrow money supply increases the Nepalese inflation by 37.8 percent. It is statistically significant at 1.4 percent level of significance. The coefficient of percentage change in one year lagged Indian wholesale price being positive indicates that 100 percent increase in one year lagged Indian wholesale price increases inflation by 44.6 percent in Nepalese economy. It is statistically significant at 9.2 percent level of significance.

The adjusted coefficient of determination ( $\bar{R}^2 = 0.294$ ) indicates that 29.4 percent of total variation in inflation is explained by explanatory variables. F-statistics is also significant at 0.7 percent level of significance. The tabulated lower and upper limit of DW statistics at 5 percent level of significance and  $N = 26$  are 1.224 and 1.553 respectively. Since calculated DW statistics is above the upper limit of the DW statistics, there is no auto correlation between the error terms.

The results in equation (9) concludes that current narrow money supply with one year lagged Indian wholesale price is also highly significant to cause inflation in Nepal. The results also signifies that an increase in Indian price has lagged effect on Nepalese inflation i.e. it takes nearly one year to transfer Indian inflation in Nepalese economy. Since an increase in price of Indian wholesale price is transferred to Nepalese economy and then to the consumers. It takes some time to have the effect of an increase in Indian wholesale price on Nepalese consumer price index.

The results of multiple linear regression estimates of Nepalese inflation on current broad money supply and current wholesale price of India are as follows:

$$\begin{aligned} \text{dln(NCPI}_t) &= -0.008 + 0.356 \text{ dln}(M_{2t}) + 0.502 \text{dln}(IWPI_{1t}) \dots \dots \dots (10) \\ t & \quad -0.325 \quad 2.415 \quad \quad \quad 1.947 \\ p & \quad 0.748 \quad 0.024 \quad \quad \quad 0.063 \\ R^2 & = \quad 0.393 \quad \quad \quad F = 7.779 \quad DW = 1.780 \\ \bar{R}^2 & = \quad 0.343 \quad \quad \quad p = 0.002 \quad N = 27 \end{aligned}$$

In equation (10), the coefficients of current broad money supply and current Indian wholesale price being positive indicate that 100 percent increase in current broad money supply and current Indian wholesale price increases the inflation by 35.6 percent and 50.2 percent respectively. The corresponding t value of the coefficient signifies that current broad money supply and current Indian wholesale price are significant at 2.4 percent and 6.3 percent respectively. F-statistics is also significant at 0.2 percent level of significance indicating strong fitness of the model. Concerning the value of  $\bar{R}^2$  (0.344), 34.4 percent of total variation in Nepalese inflation is explained by the explanatory variables. The calculated DW statistics shows that there is no auto correlation between the error terms since calculated DW statistics lies above the upper limit of tabulated DW statistics [Tabulated limits of Durbin Watson Statistics are same as in equation (8)].

This result shows that current broad money supply with current Indian wholesale price is also found to be highly significant to cause inflation in Nepal. The result in equation (10) concludes that investment demand with the rise in price of Indian products increases in Nepalese economy because of higher expected profit by entrepreneurs. However, this does not signify high increase of investment demand.

The estimated multiple regression equation of Nepalese inflation on current broad money supply and one year lagged Indian wholesale price gives the following results:

$$\begin{aligned} \text{dln(NCPI}_t) &= -0.003 + 0.387 \text{ dln}(M_{2t}) + 0.335 \text{dln}(IWPI_{1t-1}) \dots \dots \dots (11) \\ t & \quad -0.135 \quad 2.565 \quad \quad \quad 1.253 \\ p & \quad 0.894 \quad 0.017 \quad \quad \quad 0.223 \\ R^2 & = \quad 0.341 \quad \quad \quad F = 5.956 \quad DW = 2.122 \end{aligned}$$

$$\bar{R}^2 = 0.284 \quad p = 0.008 \quad N = 26$$

In equation (11), the coefficient of current broad money supply and one year lagged Indian wholesale price being positive signify that 100 percent increase in current broad money supply and one year lagged Indian wholesale price increases Nepalese inflation by 38.7 percent and 33.5 percent respectively. t statistics is only significant for current broad money supply at 1.7 percent level of significance. However, it is insignificant for one year lagged Indian wholesale price. However, F-statistics is significant at 0.8 percent level of significance.

Regarding the value of ( $\bar{R}^2 = 0.284$ ), it signifies that 28.4 percent of total variation in Nepalese inflation is explained by the explanatory variables. Depending upon the limits of DW statistics [same as in equation (9)], DW statistics indicates that there is no auto correlation between the error terms.

The reason behind the insignificance of one year lagged Indian wholesale price indicates that since most of the consumer's goods, raw materials petroleum products etc. are imported from foreign countries and huge amount of import transaction of Nepal is with Indian due to its geographical proximity and large-scale trade with India. On the other hand, since Nepalese currency is pegged with Indian currency, it takes no time to import inflation from India to Nepal. This indicates that current Indian wholesale price (i.e. import price index for Nepal) is the most significant factor to cause inflation in Nepal rather than its lagged effect.

Including expected cost of holding money with the most explanatory variables as explained in equation (10), the estimated multiple regression equation of Nepalese inflation on current broad money supply, current Indian wholesale price and expected cost of holding money gives the following results:

$$d\ln(\text{NCPI}_t) = -0.011 + 0.372 d\ln(M_{2t}) + 0.527 d\ln(\text{IWPI}_{1t}) + 0.509 \text{EHt} \dots (12)$$

t	-0.597	3.434	2.238	4.937
p	0.556	0.002	0.036	0.000
$R^2$	=	0.697	F = 16.846	DW = 1.696
$\bar{R}^2$	=	0.655	p = 0.000	N = 26

In equation (12), the coefficient of current broad money supply, current Indian wholesale price, and expected cost of holding money being positive signify that 100 percent increase in current broad money supply, current Indian wholesale price and expected cost of holding money increases the inflation by 37.2 percent, 52.7 percent and 50.9 percent respectively. The corresponding t-value of the coefficients indicate that current broad money supply, current Indian wholesale price and expected cost of holding money are significant at 0.2 percent, 3.6 percent and zero percent level of significance respectively. F-statistics is also significant at zero percent level of significance indicating strong fitness of the model. Regarding the value of ( $\bar{R}^2 = 0.655$ ), it indicates that 65.5 percent of total variation in Nepalese inflation is explained by explanatory variables. Since calculated DW statistics lies above the upper limit of the tabulated DW statistics [Tabulated limits of DW statistics are same as in equation (9)], there is no auto correlation between the error terms.

The results in equation (12) signifies that current broad money supply with current Indian wholesale price and expected cost of holding money is highly significant than in simple regression analysis. This results conclude that investment demand increases in the Nepalese economy with the rise in price of Indian products due to higher expected profit by entrepreneurs. However, this does not signify high increase in investment demand. On the other hand, concerning the expected cost of holding money. It can be concluded that small increment in the prices of physical assets like land, building, jewellery, commodities etc., raising the cost of holding money, induces businessmen, middlemen and even rich people to substitute money with physical goods due to lack of well developed financial market in developing countries like Nepal. Thus, a small increment in price of some commodities in Nepal and even in India tend to create artificial shortage and black market because of hoarding and storing in anticipation of higher prices and further rise in price level. This shows that current broad money supply, current Indian wholesale price and expected cost of holding money are the significant factors to cause inflation in Nepalese economy.

Since the explanatory power of explanatory variables i.e. current broad money supply, current Indian wholesale price, expected cost of holding money with FER is less than in equation (12), the results are given in Appendix H.

## **CHAPTER-V**

### **SUMMARY, CONCLUSIONS AND RECOMMENDATIONS**

#### **5.1 Summary**

This thesis is essentially an attempt to explore some facts about the causes of inflation in Nepal since last 28 years. As the economic development with price stability has one of the main goals of macro economic thinkers and policy makers. This study basically identifies the cause of inflation in Nepal thereby assessing their impact on inflation. Since there have been large number of economic problems in developing countries like Nepal such as low economic growth, low per capita income, unequal income distribution, low level of saving, underdeveloped physical infrastructure, high cost economy leading to higher cost of production and so on. Understanding the cause of inflation is thus significant for price stability and designing policies that can improve the condition of food security, capital formation, redistribution of income, allocation of resources, employment, and so on. The main findings of present study are as follows:

1. In our economy, the average annual growth rate of narrow money supply is 14.08 percent and of broad money supply is 15.98 percent. It shows that broad money supply is higher than narrow money supply. The figure shows that money supply is increasing regularly. The empirical analysis of rate of inflation and money supply indicates that both narrow and broad money supply have positive impact upon the price level. The coefficient of percent is change in current narrow money supply and broad money supply signify that 100 percent increase in the current narrow money supply leads around 27.6 percent rise in national inflation and a 100 percent increase in current broad money supply leads around 46.6 percent rise in national inflation. This implies that larger part of country is not monetized. This shows that money supply is, in fact one of the responsible factor to cause inflation in Nepal.
2. National inflation is significantly affected by current broad money supply than the current narrow money supply. Current narrow money supply increases the price level of 27.6 percent but the current broad money supply increases the price level by 46.6 percent.

3. Current money (narrow and broad) supply have significant impact on national inflation but one year and two year lagged narrow and broad money supply have less power to cause the inflation in Nepalese economy. This shows that people are aware of increase in money supply and realize its effect immediately as Nepalese economy is small.
4. From this study, we found that expected cost of holding money is also a major cause of increase in general price level in Nepalese economy. The coefficient of percent change in expected cost of holding money signifies that 100 percent rise in expected cost of holding money increases the inflation by 48.4 percent. This signifies that financial markets are not well developed in Nepal and money is mostly substituted with physical assets like land, building jewellery etc.
5. The other most important factor that causes inflation in Nepalese economy is current Indian wholesale price index. The coefficient of percentage change in current Indian wholesale price index signifies that 100 percent rise in current Indian wholesale price produces 74.2 percent increase in price level in Nepal. The economic dependent of Nepal upon India and the increasing inflationary trend in India have direct effect on Nepalese inflation. Thus, the results show that the Indian inflation plays a vital role to cause inflation in Nepalese economy.
6. It appears that foreign exchange reserve also plays a role to cause inflation in Nepalese economy. The coefficient of percentage change in foreign exchange reserve implies that 100 percent increase in international reserves rises the inflation by 7.8 percent in Nepal. The result signifies that increase in foreign exchange reserves increase the money supply and hence the inflation in Nepal.
7. The empirical findings obtained from the estimated multiple regression equation of Nepalese inflation on current broad money supply, current Indian wholesale price and expected cost of holding money has higher power of explaining the total variation in inflation because they have explained 65.5 percent of total variation in Nepalese inflation F-statistics is also significant at zero percent level of significance indicating the overall good fit of the



regression model. This implies that there is also multi-colinearity among the current broad money supply, current Indian wholesale price and expected cost of holding.

8. From the above empirical findings, we found that all the independent variables are more or less responsible to cause the inflation in Nepal because findings are positive to established theory. Thus, it shows that inflation in Nepal is not only the monetary phenomenon but is also a structural phenomenon. Mismanagement, lack of transportation facilities, lack of good governance, political instability might have been strong factors in causing inflation in Nepal.

## **5.2 Conclusions**

This study leads us to conclude that, both internal as well as external factors are responsible for increasing the general level of price. The empirical results suggest that current domestic broad money supply is found highly responsible to increase the inflationary trend in Nepal. This result signifies the decision of Nepalese investors on investment demand. Regarding this result, it can be concluded that there is lack of investment demand in Nepalese economy i.e. commercial banks, in Nepal have invested their loan on non-productive sectors like land, buildings, jewellery etc.

Expected cost of holding money has been found another significant cause of Nepalese inflation. In most of the developing countries like Nepal, where financial markets are not fully developed, money is mostly substituted with physical assets (land, buildings, jewellery etc.). When prices increase, cost of holding money also increases as a result cash becomes unattractive. Therefore, people have a tendency to substitute goods with money, which creates highly inflationary situation. In this case, hoarding, storing and artificial shortages are generated due to which inflation further increases. So that the null hypothesis that there is no significant effect of cost of holding money on inflation was rejected and the alternative hypothesis was accepted.

The current domestic broad money supply with current Indian wholesale price and expected cost of holding money has been found another significant causes of inflation in Nepal. This results leads us to the conclusion that Indian inflation is one of the prominent causes of inflation in Nepal. The economic dependence of Nepal with India

and increasing inflationary trend in India have also directly affected the Nepalese price level.

The empirical results indicates that inflation in Nepal is also mainly determined by current, one year and two year lagged Indian prices indicating the current, one year and two year lagged wholesale price of India as the significant causes of Nepalese inflation. This study attributed to the geographical situation of having a shared open and contiguous border which facilitates informal trade and goods arbitrage, a rigid Pegged exchange rate regime between both the currencies with time varying capital mobility and highly trade concentration between two countries.

Current domestic narrow money supply with current Indian wholesale price is one of the significant causes of inflation in Nepal. This results lead us to the conclusion that Nepalese people change their decision on holding money observing at the price fluctuation in India at the current year. Foreign exchange reserve is also found to be the significant causes of Nepalese inflation. But there are no other reasons to take it as the dominant part of the base money because an increase in base money increases the money supply given money multiplier.

The other variables under consideration in this study like real gross domestic product, fiscal deficit, one year and two year lagged domestic narrow money supply and one year and two year lagged domestic broad money supply are found to be insignificant for Nepalese inflation. The reasons for the insignificance of above stated explanatory variables are of different nature. Real gross domestic product has not significantly been increasing during a long period of time. On the other hand, the growth rate of agricultural and industrial sectors are not satisfactory as warranted by increasing population. It has also been found that fiscal deficit in Nepal is not significantly affecting the price level albeit the growth rate of fiscal deficit is tremendously increasing. It may be due to the fact that fiscal deficit is mostly covered by money creation, might have been reflected by money supply in this situation. The insignificance of lagged money supply (narrow and broad money supply) indicate that people are aware of the increase in money supply. This is sufficient to conclude that money illusion is not operating in Nepalese economy. This result is similar with the basic theory of new classical school (Rational Expectation Approach) in the sense that money is neutral at all the time (i.e. in short run and long-run).

There might be various reasons to have the inflation in Nepalese economy. Some of them are imperfect market mechanism, black marketing, hoarding, lack of good governance, inefficiency of monitoring unit, monopoly of the vendors etc. Other reasonable causes are imperfect money market, lack of sufficient monetization, literacy of banking facility among majority of the people etc. Most of the Nepalese people are the inhabitants of rural area, whose economic activities cannot be comprised during the preparation of data due to the lack of infrastructure, findings, support, mobilization of efficient manpower and the hypothesized manipulation of data in somewhere.

### **5.3 Recommendations**

The ultimate effect of inflation is detrimental to the smooth working of any economy, whether developed or developing. Various approaches are developed as policy options for the anti-inflationary trend, so that the economy is set to the correct path. The policy appropriate i.e. monetary policy, fiscal policy and the direct controlling measures to control inflation can be selected according to the economic characteristics and nature of economic situation of the economy. Any or both or all measures can be applied by examining the feasibility, applicability and efficiency of these different methods. On the basis of empirical findings, some of the important policies, which can be adopted for controlling the rising inflationary trend may be the followings:

1. Since money supply is one of the key factors for rising price level in Nepal, monetary policy should be directed in such a way that there must be proper balance between the money supply and output. Government must be careful before taking internal and external borrowing which are the expansionary factors of money supply.
2. Gross domestic product should be increased significantly so that it can stabilize the price level. Unless gross domestic product is increased simultaneously with the increase in the money income and population, there would be no option to curb the inflation. Since a greater part of GDP is shared by agricultural production; efforts should be diverted towards the increment of

agricultural production. Besides this, industrial output should be raised by establishing small, cottage and import substituting industries.

3. The effect of Indian price on domestic price level should be diagnosed through curtailing the import from India. But due to globalization and regional preferences, economies are helpless to pursue the direct control measures to control inflation. India and Nepal have signed a trade agreement that opens their economies to each other. Preferences are given for their products to cross the border. So the Indian inflation is bound to occur in Nepal. The correct policy measures to wipe out this problem is to establish various import substitute industries in the country and make them competitive against Indian industries so that imports of Indian products and hence import of inflation can be minimized.
4. Illegal cross - border trade should be minimized which may help to strengthen the competitiveness of the local industries. The backwardness and insufficient of infrastructure in Nepal has produced structural inflation. Some part of the country produce more goods than they need, while other parts actually need them, but the excess product of one part of the country can not be sold to the other parts because of the underdeveloped infrastructure of the country. They sell the surplus product to the neighboring Indian parts at low prices. Whereas the other parts of the country import similar products from India at higher prices so an improvement of infrastructure can also help to curb inflation in Nepal.
5. Nepal exports mainly the primary products to India while its imports constitute mainly the manufactured goods. The income elasticity of the primary goods is very low in comparison to that of manufactured ones. A mere increase in the domestic product cannot reduce the price level if the price across the border are relatively attractive. If the grain production in one of these two countries is below normal, the agricultural output naturally has a tendency to move towards the other country. Thus, increased output alone is no guarantee of price stability in the nation. Thus, a policy to promote the quality and quantity of the manufacturing goods should be formulated and implemented by the government.

6. A major portion of the government expenditure contain internal and external borrowing. Both have repercussions on the price level directly and indirectly. The borrowing has been a necessity due to scarce internal resources and growing demand for expenditure. So a correct approach to fight the inflation problem is to increase in the mobilization of internal resources from private sector rather than from banking sector and curtailing of unnecessary government expenditure, especially the recurrent one.
7. Appropriate population policy should be implemented to reduce high growth rate of population so as to curb the demand for the goods and services due to increase in the population.
8. Present tax system mainly relies on indirect taxes, which is counter-productive. Hence, the government should gradually reduce indirect taxes and increase direct taxes and enforce direct taxes very strictly to expand the tax base rather than to expand the tax rate. At the sometime, value added tax (VAT) should be well implemented by the government of Nepal which also help to perform this task. VAT is divided into several stages of production i.e. there is less possibility of tax evasion. It's burden is shared by different factors of production and tax payers do not feel any burden of it. After applying this tax, the government can collect more revenue which will help to minimize external and internal loan. This may help to control the inflation.
9. Government should increase its expenditure as much as possible to increase the productive activities of the people and at the same time monetary authority should also design monetary policy in such a way that it should promote the productive activities of Nepalese people.
10. Since inflation is a continuous phenomenon, a single study made at a time is not sufficient to assess its sources. Therefore, concerned government authorities are suggested to carry out periodic research on this topic.

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## APPENDIX-A

### NOMINAL AND REAL GDP, GDP DEFLATOR, GOVERNMENT EXPENDITURE, REVENUE AND FISCAL DEFICIT

year	NGDP	GDPdef	RGDP	GE	GR	FD
1980	23351	24.7	94538.46	3470.7	1800	1670.7
1981	27307	26.7	102273.4	4092.3	2419.2	1673.1
1982	30988	29.2	106123.3	5361.3	2879.5	2481.8
1983	33821	32.8	103112.8	6979.2	2841.6	4137.6
1984	39290	34.8	112902.3	7437.3	3409.3	4028
1985	46587.03	38.8	120069.7	8394.8	3916.6	4478.2
1986	55734.31	44.5	125245.6	9797.1	4644.5	5152.6
1987	63864.5	49.1	130070.3	11513.2	5975.1	5538.1
1988	76906.12	49.3	155996.2	14105.1	7350.4	6754.7
1989	89269.62	54.9	162604.04	18004.9	7776.8	10228.1
1990	103415.8	60.8	170091.8	19669.3	9287.5	10381.8
1991	120370.3	66.4	181280.1	23549.8	10729.9	12819.9
1992	149487.1	79	189224.1	26418.2	13512.7	12905.5
1993	171473.9	87.6	195746.5	30897.7	15148.4	15749.3
1994	199272	93.7	212670.2	33597.4	19580.8	14016.6
1995	219175	100	219175	39060	24575.2	14484.8
1996	248913	107.9	230688.6	46542.4	27893.1	18649.3
1997	280513	115.7	242448.6	50723.7	30373.5	20350.2
1998	300845	120.3	250079	56118.3	32937.9	23180.4
1999	342036	131.1	260897	59579	37251	22328
2000	379488	137.1	276796.5	66272.5	42893.8	23378.7
2001	411275	140.7	292306	79835.1	48893.6	30941.5
2002	422807	145.5	290589	80072.2	50445.5	29626.7
2003	456675	152.1	300247	84006.1	56229.8	27776.3
2004	496745	159.4	311634	89442.6	62331	27111.6
2005	533538	166.6	320251	102560.4	70122.7	32437.7
2006	582948	178.5	326582	110889	72282.1	38607.1
2007	670589	200.5	335211	133604.6	87712.1	45892.5

Source: Economic survey and statistical year books

Where NGDP = Nominal Gross Domestic Product, RGDP = Real Gross Domestic Product

GDP def = Gross Domestic Product Deflator, GE = Government Expenditure

G.R. = Government Revenue, FD = Fiscal Deficit

Note: Fiscal Year 1980 represents the fiscal year 1979/80 and similarly to other years.

## APPENDIX B

### CONSUMER PRICE INDEX OF NEPAL, MONEY SUPPLY, REAL GDP, FISCAL DEFICIT, FOREIGN EXCHANGE RESERVE AND WHOLESALE PRICE INDEX OF INDIA

Year	NCPI	M1	M2	IWPI	RGDP	FD	FER
1980	19.9	2830.4	5285.3	28.1	94538.46	1670.7	2659.8
1981	22.6	3207.8	6307.7	32.5	102273.4	1673.1	2966.6
1982	25	3611.5	7458	34.8	106123.3	2481.8	3735.6
1983	28.5	4348.9	9222.4	36.6	103112.8	4137.6	3061.3
1984	30.3	4931.5	10455.2	39.3	112902.3	4028	3013.5
1985	31.5	5480	12296.6	41.5	120069.7	4478.2	2383.4
1986	36.5	7029.3	15159	43.6	125245.6	5152.6	3463.3
1987	41.4	8120.2	17498.2	46.4	130070.3	5538.1	4176.2
1988	45.9	9596.6	21422.6	50	155996.2	6754.7	7064.8
1989	49.7	11775.4	26605.1	53.9	162604	10228.1	8310.8
1990	54.5	14223	31552.4	58.1	170091.8	10381.8	11589.8
1991	59.8	16283.6	37712.5	64.7	181280.1	12819.9	18656.6
1992	72.4	19457.7	45670.5	72.9	189224.1	12905.5	24251.4
1993	78.8	23833	58322.5	79.9	195746.5	15749.3	33510.4
1994	85.9	28510.4	69777.1	87.1	212670.2	14016.6	42015.7
1995	92.5	32985.4	80984.7	95.8	219175	14484.8	43084.9
1996	100	36498	92656	102.3	230688.6	18649.3	44438.2
1997	108.1	38460.3	103720.6	106.9	242448.6	20350.2	48541.4
1998	117.1	45163.8	126462.6	112.4	250079	23180.4	65157.7
1999	130.4	51062.5	152800.2	117.6	260897	22328	76650.8
2000	134.8	60979.8	186120.9	123.5	276796.5	23378.7	93858.1
2001	138.1	70576.9	214454.1	130.5	292306	30941.5	105172.5
2002	142.1	77156.1	223988.2	135.2	290589	29626.7	105901.2
2003	148.9	83753.9	245911.1	140.6	300247	27776.3	108329.4
2004	154.8	93969.6	277306	149.1	311634	27111.6	130205.1
2005	161.8	100205.7	300439.9	157.5	320251	32437.7	129896.4
2006	174.7	112998.9	346762.3	164.9	326582	38607.1	165126.7
2007	185.9	126690.3	395320.5	172.5	335211	45892.5	166418.9

Source: Quarterly Economic Bulletins of NRB, Based on Appendix-A, Economic Survey and International Financial Statistics.

Where, NCPI = Consumer Price Index of Nepal, M<sub>1</sub> = Narrow Money Supply, M<sub>2</sub> = Broad Money Supply, IWPI = Wholesale Price Index of India, RGDP = Real Gross Domestic Product, FD = Fiscal Deficit, FER = Foreign Exchange Reserve.

Note: Fiscal year 1980 represents the fiscal year 1979/80 and similarly to other years.

\* Series of IWPI of India is measured at the base year 1995/96. It is calculated by the average of IWPI of year 1995 and 1996 for adjusting the Indian fiscal year into Nepalese fiscal year. Since IWPI is adjusted to make consistent with consumer price index of Nepal by adjusting the base year, this value is not equal to 100.

## APPENDIX C

### GROWTH RATES OF THE VARIABLE

year	dlnNCPI	dlnM1	dlnM2	dlnIWPI	dlnRGDP	dlnFD	dlnFER	EHt
1980								
1981	0.1272	0.1252	0.1768	0.1455	0.0786	0.0014	0.1092	.
1982	0.1009	0.1185	0.1675	0.0684	0.037	0.3943	0.2305	-0.0263
1983	0.131	0.1858	0.2123	0.0504	-0.0288	0.5111	-0.1991	0.0301
1984	0.0612	0.1257	0.1255	0.0712	0.0907	-0.0268	-0.0157	-0.0698
1985	0.0388	0.1055	0.1622	0.0545	0.0615	0.106	-0.2346	-0.0224
1986	0.1473	0.249	0.2093	0.0494	0.0422	0.1403	0.3737	0.1085
1987	0.126	0.1443	0.1435	0.0622	0.0378	0.0722	0.1872	-0.0214
1988	0.1032	0.1671	0.2023	0.0747	0.1818	0.1986	0.5257	-0.0228
1989	0.0795	0.2046	0.2167	0.0751	0.0415	0.4149	0.1624	-0.0236
1990	0.0922	0.1888	0.1705	0.075	0.045	0.0149	0.3326	0.0127
1991	0.0928	0.1353	0.1783	0.1076	0.0637	0.2109	0.4761	0.0006
1992	0.1912	0.1781	0.1915	0.1193	0.0429	0.0067	0.2623	0.0984
1993	0.0847	0.2028	0.2445	0.0917	0.0339	0.1991	0.3234	-0.1065
1994	0.0863	0.1792	0.1793	0.0863	0.0829	-0.1166	0.2262	0.0016
1995	0.0740	0.1458	0.149	0.0952	0.0301	0.0329	0.0251	-0.0122
1996	0.0780	0.1012	0.1346	0.0656	0.0512	0.2527	0.0309	0.0039
1997	0.0779	0.0524	0.1128	0.044	0.0497	0.0873	0.0883	-0.0001
1998	0.0800	0.1607	0.1982	0.0502	0.031	0.1302	0.2944	0.0021
1999	0.1076	0.1228	0.1892	0.0452	0.0423	-0.0375	0.1624	0.0276
2000	0.0332	0.1775	0.1973	0.0490	0.0592	0.0460	0.2025	-0.0744
2001	0.0242	0.1462	0.1417	0.0551	0.0545	0.2803	0.1138	-0.009
2002	0.0286	0.0891	0.0435	0.0354	-0.0059	-0.0434	0.0069	0.0044
2003	0.0467	0.0821	0.0934	0.0392	0.0327	-0.0645	0.0227	0.0182
2004	0.0389	0.1151	0.1202	0.0587	0.0372	-0.0242	0.1839	-0.0079
2005	0.0442	0.0643	0.0801	0.0548	0.0273	0.1794	-0.0024	0.0054
2006	0.0767	0.1202	0.1434	0.0459	0.0196	0.1741	0.2400	0.0325
2007	0.0621	0.1144	0.1311	0.0451	0.0261	0.1729	0.0078	-0.0146

Source: All the calculations, except  $EH_t$ , are the first differences of natural logarithm of data series from Appendix

B. But  $EH_t$  is the first difference of dlnNCPI.

**APPENDIX D**  
**TRADE CONCENTRATION OF NEPAL WITH INDIA**

Fiscal Year	Trade concentration with India (in %)
1978	57.8
1979	53.4
1980	49.8
1981	52.5
1982	51.0
1983	44.9
1984	51.3
1985	52.4
1986	42.0
1987	40.0
1988	34.3
1989	25.8
1990	22.5
1991	29.0
1992	27.38
1993	25.1
1994	27.4
1995	28.0
1996	29.8
1997	2539
1998	31.0
1999	38.2
2000	38.5
2001	47.1
2002	54.8
2003	55.9
2004	57.6
2005	61.3
2006	64.6
2007	63.9*

Source: Inflation in Nepal, 2007 and Economic Survey, 2007/08.

Note: Fiscal year 1980 represents the fiscal year 1979/80 and similarly to other years.

\*Provisional

## APPENDIX E

### DESCRIPTIVE STATISTICS

	N	Minimum	Maximum	Mean	Std. Deviation
dlnNCPI	27	.0242	.1912	.082756	.0393203
dlnM1	27	.0524	.2490	.140804	.0460025
dlnM2	27	.0435	.2445	.159804	.0460115
dlnIWPI	27	.0354	.1455	.067211	.0262851
dlnRGDP	27	-.0288	.1818	.046878	.0364276
dlnFD	27	-.1166	.5111	.122711	.1553124
dlnFER	27	-.2346	.5257	.153193	.1791063
Eht	26	-.1065	.1085	-.002500	.0445256

## APPENDIX F

### CORRELATION MATRIX IN FIRST DIFFERENCE OF DATA

		dlnNCPI	dlnM1	dlnM2	dlnIWPI	dlnRGDP	dlnFD	dlnFER	EHt
dlnNCPI	Pearson Correlation	1	.483(*)	.545(**)	.496(**)	.054	.113	.356	.551(**)
	Sig. (2-tailed)		.011	.003	.009	.788	.575	.068	.004
	N	27	27	27	27	27	27	27	26
dlnM1	Pearson Correlation	.483(*)	1	.813(**)	.272	.097	.212	.469(*)	.113
	Sig. (2-tailed)	.011		.000	.170	.630	.289	.014	.582
	N	27	27	27	27	27	27	27	26
dlnM2	Pearson Correlation	.545(**)	.813(**)	1	.385(*)	.223	.353	.446(*)	-.044
	Sig. (2-tailed)	.003	.000		.047	.263	.071	.020	.831
	N	27	27	27	27	27	27	27	26
dlnIWPI	Pearson Correlation	.496(**)	.272	.385(*)	1	.346	-.089	.308	-.033
	Sig. (2-tailed)	.009	.170	.047		.077	.659	.118	.874
	N	27	27	27	27	27	27	27	26
dlnRGDP	Pearson Correlation	.054	.097	.223	.346	1	-.197	.459(*)	-.239
	Sig. (2-tailed)	.788	.630	.263	.077		.324	.016	.239
	N	27	27	27	27	27	27	27	26
dlnFD	Pearson Correlation	.113	.212	.353	-.089	-.197	1	-.046	-.066
	Sig. (2-tailed)	.575	.289	.071	.659	.324		.818	.749
	N	27	27	27	27	27	27	27	26
dlnFER	Pearson Correlation	.356	.469(*)	.446(*)	.308	.459(*)	-.046	1	.083
	Sig. (2-tailed)	.068	.014	.020	.118	.016	.818		.688
	N	27	27	27	27	27	27	27	26
EHt	Pearson Correlation	.551(**)	.113	-.044	-.033	-.239	-.066	.083	1
	Sig. (2-tailed)	.004	.582	.831	.874	.239	.749	.688	
	N	26	26	26	26	26	26	26	26

\* Correlation is significant at the 0.05 level (2-tailed).

\*\* Correlation is significant at the 0.01 level (2-tailed).

sig. = significance.

## APPENDIX - G

### RESULTS OF SIMPLE REGRESSION EQUATIONS

<p>Dependent variable: Inflation</p> <p>Independent variable: percentage change in one year lagged narrow money supply</p> <p><math>d\ln NCPI = 0.063 + 0.127 d\ln M_{1t-1}</math></p> <p>t            2.502   0.750</p> <p>p            0.020   0.461</p> <p><math>R^2 = 0.023</math>   <math>F = 0.562</math></p> <p><math>\bar{R}^2 = -0.018</math>   <math>DW = 1.448</math>   <math>N = 26</math></p>	<p>Dependent variable: Inflation</p> <p>Independent variable: percentage change in two year lagged narrow money supply</p> <p><math>d\ln NCPI = 0.0667 + 0.095 d\ln M_{1t-2}</math></p> <p>t            2.564   0.546</p> <p>p            0.017   0.590</p> <p><math>R^2 = 0.013</math>   <math>F = 0.298</math></p> <p><math>\bar{R}^2 = -0.030</math>   <math>DW = 1.367</math>   <math>N = 25</math></p>
<p>Dependent variable: Inflation</p> <p>Independent variable: percentage change in one year lagged broad money supply</p> <p><math>d\ln NCPI = 0.040 + 0.255 d\ln M_{2t-1}</math></p> <p>t            1.467   1.562</p> <p>p            0.155   0.131</p> <p><math>R^2 = 0.092</math>   <math>F = 2.439</math></p> <p><math>\bar{R}^2 = 0.054</math>   <math>DW = 1.526</math>   <math>N = 26</math></p>	<p>Dependent variable: Inflation</p> <p>Independent variable: percentage change in two year lagged broad money supply</p> <p><math>d\ln NCPI = 0.073 + 0.044 d\ln M_{2t-2}</math></p> <p>t            2.497   0.251</p> <p>p            0.020   0.804</p> <p><math>R^2 = 0.003</math>   <math>F = 0.063</math></p> <p><math>\bar{R}^2 = -0.041</math>   <math>DW = 1.331</math>   <math>N = 25</math></p>
<p>Dependent variable: Inflation</p> <p>Independent variable: percentage change in real gross domestic change</p> <p><math>d\ln NCPI = 0.080 + 0.059 d\ln RGDP</math></p> <p>t            6.296   0.272</p> <p>p            0.000   0.788</p> <p><math>R^2 = 0.003</math>   <math>F = 0.074</math></p> <p><math>\bar{R}^2 = -0.037</math>   <math>DW = 1.281</math>   <math>N = 27</math></p>	<p>Dependent variable: Inflation</p> <p>Independent variable: percentage change in fiscal deficit</p> <p><math>d\ln NCPI = 0.079 + 0.029 d\ln FD</math></p> <p>t            8.050   0.568</p> <p>p            0.000   0.575</p> <p><math>R^2 = 0.013</math>   <math>F = 0.323</math></p> <p><math>\bar{R}^2 = -0.027</math>   <math>DW = 1.331</math>   <math>N = 27</math></p>

Source: Based on Appendix C, calculations are based on SPPSS 3.0.



**APPENDIX - H**  
**RESULTS OF MULTIPLE REGRESSION EQUATIONS**

Dependent variables: Inflation

Independent variable: Percentage change in current broad money supply, percentage change in current India wholesale price; percentage change in foreign exchange reserve, expected cost of holding money.

$$d\ln NCPI = 0.010 + 0.370 d\ln M_{2t} + 0.522 d\ln IWPI_{1t} + 0.508 I_t + 0.002 d\ln FER$$

t	-0.533	3.138	2.078	4.778	0.063
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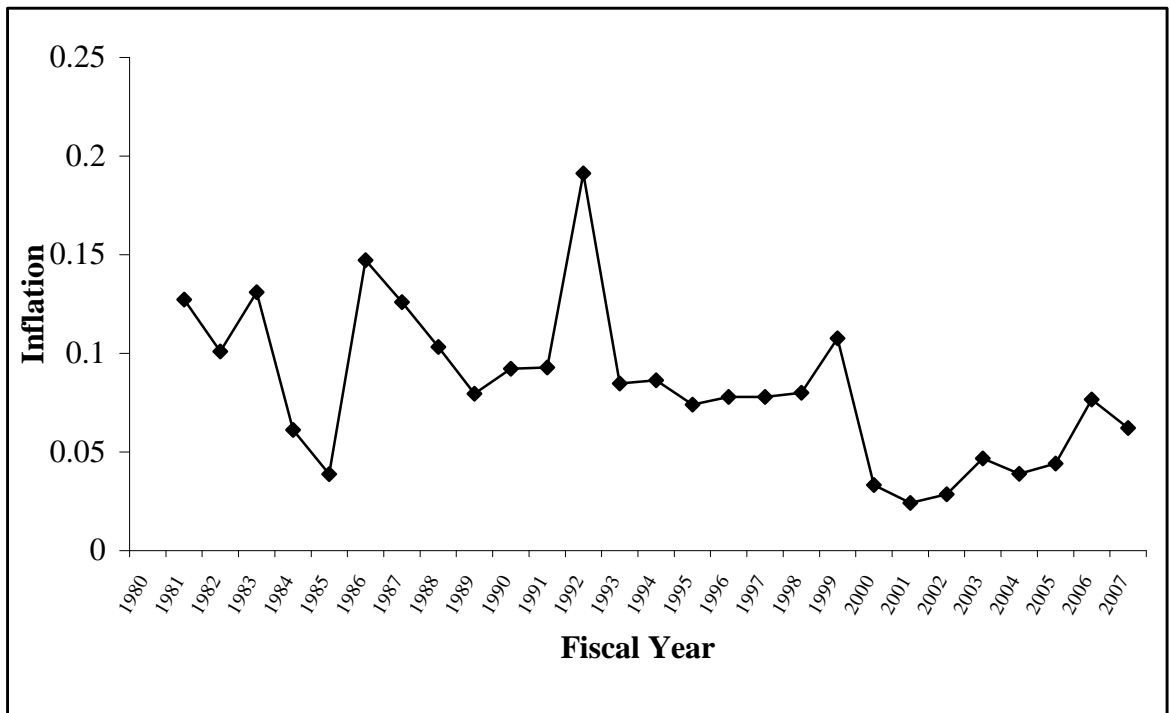
p	0.600	0.005	0.050	0.000	0.950
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R <sup>2</sup>	= 0.697	F = 12.064			
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R̄ <sup>2</sup>	= 0.639	p = 0.000	DW = 1.693	N = 26	
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Source: Based on Appendix C, calculations are based on SPPSS 3.0.

**APPENDIX - I**  
**INFLATION IN NEPAL**



Source: Based on Appendix C.