

DETERMINANTS OF INFLATION IN NEPAL

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**BY
DEEP RAJ MARAHATTA
CENTRE DEPARTMENT OF ECONOMICS
TRIBHUVAN UNIVERSITY
Kirtipur, Kathmandu, Nepal**

Roll No.: 418/064

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LETTER OF RECOMMENDATION

This thesis entitled "**DETERMINANTS OF INFLATION IN NEPAL**" has been prepared to Mr. Deep Raj Marahatta under my supervision. I hereby recommend this thesis too examination by the Thesis Committee as a partial fulfillment of the requirement for the Degree of Master of Arts in Economics.

.....

Dr. Ram Prasad Gyanwaly

Thesis supervisor

Central Department of Economics

Tribhuvan University

APPROVAL SHEET

We certify that this thesis entitled "**DETERMINANTS OF INFLATION IN NEPAL**" submitted by Mr. Deep Raj Marahatta to central Department of Economics, Faculty of Humanities and Social Sciences, Tribhuvan University, in partial fulfillment of the requirements for the Degree of Master of Arts in Economics has been satisfactory in scope and quality. Therefore, we accept this as a part of the said degree.

Thesis Committee

.....

Dr. Ram Prasad Gyanwaly

Head of Department

.....

Dr. Ram Chandra Dhakal

External Examiner

.....

Dr. Ram Prasad Gyanwaly

Thesis Supervisor

Date :

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TABLE OF CONTENTS

	Page No.
LETTER OF RECOMMENDATION	i
APPROVAL SHEET	ii
ACKNOWLEDGEMENTS	iii
TABLE OF CONTENTS	iv
LIST OF TABLE	vii
LIST OF FIGURES	viii
LIST OF ACRONYMS	ix
CHAPTER – I: INTRODUCTION	1-10
1.1 General Background	1
1.2 Statement of Problem	3
1.3 Objectives of the Study	7
1.4 Significance of the Study	8
1.5 Research Hypothesis	8
1.6 Limitations of the Study	10
1.7 Organization of the Study	10
CHAPTER- II : LITERATURE REVIEW	11-36
2.1 Introduction	11
2.1 Theories of Inflation	11
2.1.1 The Quantity Theory of Money (QTM)	12
2.2.2 Demand-Pull Theory of Inflation	13
2.2.3 Phillips Curve Approach of Inflation	14
2.2.4 Cost-Push Theories of Inflation	16
2.2.5 Rational Expectations (RE) Theory of Inflation	18
2.2.6 Real Business Theory of Inflation	19
2.2.7 New Political Economy Theory of Inflation	20

2.3 Review of Empirical Framework	20
CHAPTER- III : RESEARCH METHODOLOGY	37-50
3.1 Research Design	37
3.2 Definition of variables	37
3.2.1 Independent variables	38
3.3 Source of Data	41
3.4 Coverage of the Study and the Use of Instruments:	42
3.5 Specification of Model	42
3.6 Method of Estimation	46
3.6.1. Coefficient of determination (R^2) :	46
3.6.2. Adjusted coefficient of determination ($\overline{R^2}$):	47
3.6.3 t-test	47
3.6.4. Durbin-Watson (DW):	48
3.6.5 F-test:	49
3.7 Conclusion	50
CHAPTER –IV : EMPIRICAL ANALYSIS OF DATA	51-64
4.1 Historical Trend of Inflation in Nepal	51
4.2 Estimation in Level	57
4.3 Estimation at first difference	63
CHAPTER- V : SUMMARY , CONCLUSIONS AND RECOMMENDATIONS	65-70
5.1 Summary	65
5.2 Conclusion:	66
5.3 Recommendation	68
REFERENCES	
APPENDIX	

LIST OF TABLE

	Page No.
Table 1.0 : Separation of CPI into major groups	
(Based on five averages)	53

LIST OF FIGURE

	Page No.
Figure 1 : Trend of inflation in Nepal	52

LIST OF ACRONYMS

AD	: Aggregate Demand
AS	: Aggregate Supply
CPI	: Consumer Price Index
D-W	: Durbin – Watson
ECM	: Error Correction Model
ER	: Exchange Rate
FD	: Fiscal Deficit
GDP	: Gross Domestic Product
GON	: Government of Nepal
IC	: Indian Currency
IMF	: International Monetary Fund
IWPI	: Indian Wholesale Price Index
M ₁	: Narrow Money Supply
M ₂	: Board Money Supply
MOF	: Ministry of Finance
NCPI	: National Consumer Price Index
NRB	: Nepal Rastra Bank
OLS	: Ordinary Least Square
PC	: Phillips Curve
QTM	: Quantity Theory of Money
RGDP	: Real Gross Domestic Product
SPI	: Sensitive Price Index
VAT	: Valued Added Tax
WB	: World Bank

CHAPTER - I

INTRODUCTION

1.1 General Background

Inflation can be defined as the persistent rise in the general price level across the economy over time. Mild inflation is considered to be desirable for economic growth. However, high and variable inflation, in general, leads to uncertainties in income and expenditure decisions of the different groups of the society; distorts economic growth; lowers saving and investments; and makes more expensive cost of capital. High inflation is more likely to raise unemployment than to lower it (Friedman, 1977). More specifically, it hurts the poorest of the poor having fixed level of income, as Inflation erodes their real wealth. In other words, it further widens the income inequality in society.

High inflation complicates long-term economic planning, creating incentives for households and firms to shorten their horizons and to spend resources in managing inflation risk rather than focusing on the most productive activities (Bernanke, 2006). On the other hand, "Low and stable inflation brings satiability to financial systems and fosters sustainable economic growth over the longer run" (Fergusson, 2005). Private entrepreneurs react it high levels of inflation by lowering their investments, which eventually leads to a retardation's of the country's economic growth. Contrary to this, price satiability preserves the integrity and purchasing power of currency. When prices are stable, both economic growth and stability are likely to be achieved, and long-run interests are likely to be moderate. It further promotes efficiency of market participants. Long-term growth in the economy is possible by

providing a monetary and financial environment in which economic decisions can be made and markets can operate without concern about unpredictable fluctuations in the purchasing power of the money. Thus, primary role of monetary policy should be to maintain price stability (Batini and Yates 2003, Pianalto 2005).

Experiences of industrialized countries show that low and stable inflation is not only beneficial for growth and employment in the long-term but also contributes to greater stability of output and employment in the short to medium term. When inflation is well-controlled, the public expectations of inflation will also be low and stable. In a vicious circle, stable inflation expectations help the central bank to keep inflation low. On the other hand instability in inflation and its expectations jeopardize the orderly functioning of financial and commodity markets as well.

The necessity of spurting economic growth is essential for Nepal. A land-locked least developed country in South Asia the country has per capita income in April 2012 of US \$ 735 report, (GON Economic Survey, 2012) and is ranked 157th out of 187th in "Human Development Report 2011".

It is felt that the situation of prevalent poverty had contributed to the domestic conflict situation over the past decade, which had affected domestic economic growth. During this period the country's economic growth was relatively lower vis-à-vis the average in the South Asian region.

Geographically, Nepal lies between the two giant neighbors, People's Republic of China and Republic of India, in the lap of the Himalayas. The country has an area of 147,181 sq. km. with population of around 26.66million (Central Bureau of Statistics, 2012).On the south, west and east, the country is bordered with India and to the north with Tibet

autonomous region of China and the Himalayan range. This geography has naturally made Nepal more focused towards the south- the open border with India is also responsible for this fact. The geographical situation of porous border of about 1800 km and the huge relative size of Indian economy has made Indian economic policies having multiple effects on Nepalese economic policies.

1.2 Statement of Problem

Nepal is a small open economy with a landlocked territory. A second party acceptance for the sea-approach and huge deficiency with India for trade and chronic problem that our economy is facing. Relying on such a ground accompanied by poor human resources development, lack of technical mind in line with the necessity, abundances of unskilled and semi-skilled human resources, lacking of political stability, traditional way of farming and lack of innovation in agriculture, seasonal employment followed by huge share of underemployment etc. are responsible in falling the economy behind and behind. This bitter truth of Nepalese economy is responsible for all sort of economic problems and malfunctioning. It has ranked the country as a least developed country with poor per capita income of \$735 (GON Economic Survey, 2012) with many other characteristics of deprivation and underemployment. Inflation has caused a serious problem in almost all developing countries Nepal is no exception in this respect as one of the poorest and least developed countries in the world characterized by under utilization of vast natural as well as human resources. The increasing government expenditure for the exploitation of available potential resources needs simultaneously increment in income and output. Since agriculture shares more than 35

percent of the gross domestic product, its decline is automatically reflected in gross domestic product.

As a result gross domestic product is also not increasing significantly. But, Nepal has been suffering from higher rate of inflation such that in many times the rates have been in double digits. Viewing at the price index of past 37 years, it is found that the price situation is deterioration in the successive years. During, the fiscal years in which two digits inflation rates have occurred in the past 37 years.

Nepal seems to be a chronic patient of higher rate of inflation. These cause chronic and upheaval in the economy and therefore disrupt economic stability. A higher rate of inflation increases the inflationary expectations and encourages hoarding of goods to make greater profit rather than investing in productive sectors.

At another corner of the economy, government expenditure is also increasing every year. In this way, impact of inflation is more severe and acute on fixed income groups such as salary and pension earners, the fixed term contractors and the like. Because their money income does not increase in proportion to the increase in the price level and they will be affected negatively. Thus, the higher rate of inflation has become a major impediment to economic growth as it has decreased the real income of the people and as a result, their standard of living has gone down. In order to solve such a great problem, there is need for careful policy to know the exact causes of inflation and to employ necessary efforts to lower down the increasing rises in prices. Therefore, it does not seem wrong to say that inflation has become a major problem of the country.

Economic growth depends upon the level of investment and marginal efficiency of investment. Inflation affects both the magnitude and direction of resource mobilization and their utilization. For development, economists have said that the problem inflation passes a theoretical challenge in the formulation of general theory of development. As we all will see later, there is no general agreement among economists regarding this issue. For the politicians on the other hand the rate of inflation often holds the master key to their very survival in power.

Inflation is usually a persistent or counting tendency for the price level to rise. By 'inflation' in an ordinary language, we mean it as a process of rising prices. A situation is described as 'inflationary' when either the prices or the supply of money are rising, because in practice both will rise together. The impact of 'inflation' is felt unevenly by different groups of people within the national economy. Thus among development economists, it is generally agreed that 'inflation' has both positive and negative effect depending upon one's perception of the objective function to be maximized. But on generalization, 'inflation' does more harm on low and fixed income groups than on high and flexible income groups of the people. Some of the effects of inflation on different economic group of the people are as follows:

1. Debtors fare well during inflation while a creditor, on the other hand, suffers from inflation. Debtors can pay their debts in money whose purchasing power has fallen than at the period when they borrowed. The face value of debts remains constant, and while a paying back their debts, they can afford to sacrifice smaller amount of goods and services. The

precipitants are the sufferers. In terms of goods and services, they will have to be satisfied with lesser amount than in the period of stable prices. 'Inflation' acts as a stimulant to business enterprise and the entrepreneur makes a windfall gain. Through rising prices, their profits will rise. The value of the inventories appreciates to compensate for the fall in the purchasing power of money and the output price rise. But once production cost catches up with rising prices, the entrepreneurs will react by increasing the prices rather than by decreasing his profit. The sufferers on the other hand will be the large consumers. If this condition is allowed to prevail, it will distort the pattern of income distribution.

2. In high 'inflationary' situation, the wage earners will be at a great loss. The rise in the cost of living is not allowed to keep in pace with the rise in the price level. So there will be a fall in the living standard. If the union is well organized, then they can partially offset the rising cost of living by raising the wage rate. But those, on the other hand who depend on fixed income will be most severely hit. They aren't well organized to press for higher pay to compensate for a fall in real income. Similarly, the effects of 'inflation' on investors can also be analyzed. Investors on equities will gain while investors on fixed-interest- yielding bonds will suffer. Equity dividend increase when corporate earnings increase but bond income remains fixed. In the 'inflationary' period, it is the small middle class investors who losses the most because much of their savings is invested in fixed bearing securities, insurance, and saving accounts. If 'inflation' is sever, their saving will be completely wiped out.

3. Savings will be discouraged and banking habit will be discouraged. There is a loose relationship between the values of the people. This is especially applicable in the case of underdeveloped countries. This will be major hindrances to the growth of financial assets, which is very vital to the growth of the economy.

4. Lastly, it should be remembered that every individual within the national economy belongs to one of these groups 'debtors', 'creditors', entrepreneurs, wage earners and investors. Thus opposition is always expressed against 'inflation'. On balance there is a substantial body of opinion that argues a 'moderate rate of inflation' but the definition of this term in terms of optimally criteria is not to be found. Thus it is very difficult to state which rate of 'inflation' is stated as moderate. In case of underdeveloped countries a low proportion of national products is invested. In order to achieve economic growth, the percentage of national product invested has to be increased and it must be diverted to projects where productive efficiency is the highest. Prolonged and continuous 'inflation' in this context does not help to achieve either of the ends.

1.3 Objectives of the Study

In view of the above research problem, the broad objectives of this study analyze statistically factors affecting inflation rate in Nepal. This involved national specifying and estimating an inflation regression model with the consumer prices index as the dependent and gross domestic product, fiscal deficit money supply exchange rate and IWPI as the explanatory variables.

The specific objectives of this study therefore are:

i) To review the historical inflationary trend in Nepal.

ii) To know the main determinants of inflation in Nepal.

1.4 Significance of the Study

This study might be applicable for policy issues in monetary and fiscal management in Nepal. This study will also provide basis for inflation targeting, "as an anchor for monetary policy" of NRB. In this context, the present study attempts to delineate the possible factors determining inflation in Nepal. Through studies in the past have tried to capture the factors contributing to the Nepalese inflation, they were on individual basis. Nevertheless, the present study is an effort to update the previous findings. The study further reiterates that the role of Indian inflation has direct impact on the Nepalese inflation in both short and long term. In this scenario, this study will be helpful to monetary and fiscal authorities to formulate the appropriate policy so as to curb inflation in Nepal. So, this study is helpful to policy makers, researchers, academicians and students.

1.5 Research Hypothesis

In consistent with objective above, this study tests the following null hypothesis.

i. H_0 : Narrow money supply has no effect in inflation rate in Nepal.

H_1 : Narrow money supply has a significant positive effect on inflation rate in Nepal.

ii. H_0 : Broad money supplies no effect in inflation rate in Nepal.

H_1 : broad money supply has a significant positive effect on inflation rate in Nepal.

iii. H_0 : Indian wholesale price index has no effect on inflation rate in Nepal.

H_1 : Indian wholesale price index has a significant positive effect on inflation rate in Nepal.

iv. H_0 : Fiscal deficit has no effect on inflation rate in Nepal.

H_1 : Fiscal deficit has a significant positive effect on inflation rate in Nepal.

v. H_0 : Real gross domestic product has no effect on inflation rate in Nepal.

H_1 : Real gross domestic product has a significant positive effect on inflation rate in Nepal.

vi. H_0 : Fixed exchange rate has no effect on inflation rate in Nepal.

H_1 : Fixed exchange rate has a significant positive effect on inflation rate in Nepal.

Null hypothesis (H_0) means that there is no significant statistical relationship between the explanatory variables and dependent variables. The alternative hypothesis (H_1) means that there is a significant statistical relationship between inflation and chosen explanatory variables. Using t-

test at 5% level of significance all the above hypothesis will be given level of significance. D-W test is applied to test the presence or absence of auto correlation between the terms.

1.6 Limitations of the Study

The study is expected to have limitation due to lack of time by the researcher. As the choice of time plays a vital role in the analysis the result of the study may not be applicable to the country as a whole and forever. So the study is based on secondary data and information. So, the study holds all the obvious limitations of using secondary data.

1.7 Organization of the Study

The structure of this study consists of five chapters. The chapter I includes 'Introduction' of the study. The II chapter provides a review of main economic theories of inflation and some empirical studies of determinants of Inflation in national and international level. Chapter III is the discussion of methodology used in the study. The chapter IV covers empirical analysis of results and chapter V or last chapter concludes the study with summary, conclusion and recommendation.

CHAPTER- II

LITERATURE REVIEW

2.1 Introduction

A variety of literature exists on determinants of inflation based on different techniques and time periods. Different sets of explanatory variables have been analyzed by different inflation theories and researchers. This chapter attempts firstly to survey the literature on theories of inflation explanation on order to understand and identify the determinants of inflation which are suggested by various theories. The second aim of the chapter is to consult the existing empirical studies on Nepalese as well as international inflation. Moreover the chapter attempts to review various statistical methodologies applied to analyze relation between inflation and its influencing factors. The chapter reviews some of the theories related with the inflation briefly in section 2.2. Section 2.3 and 2.4 present the review of international and national empirical studies on determinants of inflation respectively.

2.1 Theories of Inflation

Understanding the cause of price rises is essential to control inflation. Unfortunately for policy makers, the economic literature has a plethora of explanations which attempts to explain the causes of price rise in the economy. The wide range of explanations is due to differences in underlying assumptions, such as on market efficiency, economic development etc. in this chapter, the seven major theories of inflation are reviewed; with relevant theories in the conclusion for appropriate to explain the price behavior in Nepal.

2.1.1 The Quantity Theory of Money (QTM)

Classical and neoclassical economists believe that the only way to price rises, hence inflation, is through the oversupply of quantity theory of money in an economy. If money is doubled, price also doubles in full employment situation where money plays as a means of transactions only. The well-known equation of exchange that explains QTM is :

$$MV = PT \dots\dots\dots (1)$$

Where, M is money supply; V is the velocity of money, which is the measure of number of times one unit of money crosses the hands from one transaction to another; p is the general price level; and T represents the real volume of transactions.

In classical system, both V and T are assumed to be constant in the short-run and hence the above equation of exchange can be written to yield a price equation for the economy as follows:

$$P = \bar{V} * M / \bar{T} \dots\dots\dots (2)$$

It simply states that doubling the money supply doubles the price level, proportionate relationship between quantity of money and price.

If we take the natural logarithm and differentiate the above equation, we can get the percentage change of the above variables as :

$$\pi = (v-g) + m \dots\dots\dots (3)$$

Where, π , v , g and m represents the percentage changes in P , V , T and M , respectively. With V and T constants, both v and g are zero and hence inflation equals the growth rate of money supply. This states that inflation is only a monetary phenomenon and therefore, only reduction in money

supply could fight against inflation in simple classical or neo-classical relationship.

The modern QTM accepts that inflation occurs when the rate of growth of the money supply exceeds the growth rate of the real aggregate output in the economy. According to the monetarists, the QTM implies that inflation is always everywhere a monetary and demand side phenomena. In their view, cost-push arguments for inflation are misleading because they primarily are based on some microeconomic observations on the supply side. Monetarists believe in general that the firm specific cost increase cannot be inflationary as long as they are not related to, or accommodated by, increase in the money supply. Thus, the causation runs from inflation to costs, and not vice-versa.

2.2.2 Demand-Pull Theory of Inflation

According to this theory, inflation is generated by pressure of excess demand of goods and services for the available supply in the economy, especially when the economy approaches to the full employment level. If aggregate demand rises, the multiplier effects of the increase in the aggregate demand becomes disabled due to supply constraints and hence the only way to clear the goods market is through raising the money prices of the goods.

The main causes of increase in aggregate demand are the following- some are related with Keynesians and others with Monetarists:

- *Depreciation or devaluation of the exchange rate:* This increases the price of imports and reduces the foreign price of economy's exports. If consumers buy fewer imports while foreigners buy more exports; or if an export is more elastic than imports, the aggregate demand in the economy will rise. If the economy is already at full

employment or there is supply bottleneck, it is hard to increase output and so prices are pulled upwards.

- *Reduction in taxation:* If taxes are reduced (either by lowering the rate or by escaping the people from tax-net), consumers will have more disposable income causing demand to rise. A reduction in indirect taxes (taxes on goods and services such as VAT) will mean that a given amount of income will now buy a greater real volume of goods and services than it would be before its reduction.
- Deficit financing of the government: It results increase in money supply and then aggregate demand of the economy, whatever be the sources of financing.
- *Faster economic growth in other countries* - It may accelerate the exports of goods and services of the economy. Since exports are counted as an injection of aggregate demand, it causes demand-pull inflation in the economy.

2.2.3 Phillips Curve Approach of Inflation

The Neo-Keynesians macroeconomics (*or Keynesian neoclassical synthesis*) is based primarily on the Phillips curve (developed by Alban W. Phillips and Richard Lipsey in the late 1950s, and popularized by Paul Samuelson and Robert Solow in the early 1960s). The neo-Keynesian IS-LM model does not consider for continuous price increases. The Keynesian neo classical synthesis incorporated labor market dynamics into the IS-LM model by taking into account the Phillips Curve (PC) to eliminate the missing wage / price block, or inflation equation, in the system:

$$\pi = \alpha.U \dots\dots\dots (4a)$$

Where, π represents the inflation rate and u is the unemployment rate. The trade-off or negative correlation, between inflation and unemployment was stated by $\alpha < 0$. That is, the higher of the inflation rate the lower is the unemployment rate, and vice-versa. Furthermore, an increase in the inverse of U , or simply a decrease in U , was interpreted as an indication for *excess demand* in labor and hence in good markets, following the demand-pull explanation for inflation.

The demand side determination of inflation within the IS-LM-PC framework, however, failed to explain *stagflation* in the late 1960s and 1970s. The oil price shocks in the 1970s caused global recessionary and cost-push inflationary effects at the same time. The observed evidence on incompatibility between the PC relationship and the co-existence of stagnation and inflation was actually predicted by *monetarist economist* such as Milton Friedman and Edmund Phelps who proposed a so-called *expectations-augmented PC* in the late 1960s.

$$\pi = \alpha \cdot U + \beta \pi^e \dots\dots\dots (4 b)$$

Where π^e is inflation expectations and β represents the expectation adjustment parameter. In the short run, there is still a negative relationship between inflation and unemployment for a given π^e . that is, inflation expectations act as a shift variable in the model. However, assuming that $\beta = 1$ and $\pi^e = \pi$ in the long run, the Pc must be vertical according to the monetarist critique of the standard Pc. In other words, there is no trade-off between π and U in long run, the vertical long run Pc represent a kind of "natural rate of unemployment"

According to monetarists, the formation of inflation expectations is backward looking, or adaptive. Because all information are not available to economic agents during their formation of price expectations.

$$\pi^e = \lambda \pi_{t-1} + (1-\lambda) \pi^e_{t-1} \dots \dots \dots (5)$$

Where λ and $1-\lambda$ are the adjustment parameters, or weights. Equation (5) states that expected rate of inflation at time t is also weighted average of the actual inflation rate and the expected inflation rate in the previous period. This equation of expectations is interpreted as an appropriate measure of inflation inertia. The concept of backward-looking (or less informed) expectations is also used by as a major determinant of money demand in his famous analysis of hyper inflation (Phillip Cagan 1956).

2.2.4 Cost-Push Theories of Inflation

Cost-push theories of Inflation largely attribute inflation to non-monetary, supply-side effects that change the unit cost and profit mark up components of the prices of individual products (Humphrey, 1998). Cost-push Inflation occurs due to increase in cost of production of goods and services in the economy. Sometimes costs may increase simply due to economic booming; for example, increase in general wages because of rapid expansion in demand. This is demand pull inflation rather than cost-push because increases in wages are simply the reaction of the market pressure in demand. Therefore, it is important to look at why costs have increased.

Main causes of increase in the cost:

- *Wages*: The trade union may be able to push wages up without increasing the productivity of labors. Firms, then, are forced to increase their prices to pay the higher claims and maintain their profitability.
- *Profits*: Firms having more power and ability to raise prices, independently to demand, can make more profit and result cost-

push Inflation. This is most likely to occur, when markets become more concentrated and move towards monopoly or perhaps oligopoly.

- *Imported Inflation*: In a global economy, firms import a significant proportion of their raw materials or semi-finished products. If the cost of these imports increases for reasons out of domestic control, then once again firms will be forced to increase prices to pay the higher raw materials costs.
- *Exchange rate changes*: If there is depreciation in the exchange rate, then exports will become cheaper abroad, but imports will appear to be more expensive. Firms will be paying more of their overseas raw materials leading to increase prices of domestic economy.
- *Commodity price changes*: If there are price increases on world commodity markets, firms will be faced with higher costs if they use raw materials. Important markets would include the oil market and metals markets.
- *External shocks*: This could be either for natural reasons or because a particular group or country will gain more economic power. An example of the first was the Kobe earthquake in Japan, which disrupted world production of semi-conductors for a while. An example of the second was the case of OPEC which forced up the price of oil four-fold in the early 1970s.
- *Exhaustion of natural resources*: As resources run out, their price will inevitably gradually rise. This will increase firm's cost and may push up prices until they find alternative sources of raw materials (if they can). For example, in many countries such a problem has been caused by erosion of land when forests have been cleared. The land quickly became useless for agriculture.

- *Taxes*: increase in indirect taxes (taxes on expenditure) increase the cost of living and push up the prices of products in the shops.

The structuralist approach to inflation is one of the major versions of the cost-push theories of inflation. The structuralist inflation models (developed in the 1960s) explain inflation with the productivity differences between the industrial and agricultural sectors. In general the traditional sectors responds to monetary (aggregate- demand) shocks with a lag. This lag is accompanied by a partial increase in industrial output and employment in the short run, which in turn increases wages and hence the demand for agricultural products. This increase implicates a change in *relative prices* in favor of foodstuffs. Higher agricultural prices lead to higher wage demands in this sector. Increasing wages increases the demand for industrial products, and the mechanism continues to work. In this model, aggregate supply chronically *lags behind* aggregate demand as result of the temporary output rigidities in one of the sectors. Therefore, the structuralist model is accepted as cost-push theory.

2.2.5 Rational Expectations (RE) Theory of Inflation

This theory has been formulated by John Muth and is supported by new classical economists such as Robert E. Lucas, Thomas J. sergeant, Neil Wallac etc. this theory states that individuals and companies, acting with complete access to the relevant information, forecast inflation in the future without bias. Errors on their forecasts are assumed to result from random components.

Unlike in adaptive expectations principle, people do not consistently make the same prospect. Economic agents form their macroeconomics expectations "rationally" based on all past and current relevant information available, and not only on past information. The expectations

are, however, totally random, or independent of each other. The RE approach to the business cycle and prices generated a vertical PC both of the short and long run. If the monetary authority announces a monetary stimulus in advance, people expect that price rise.

Fully anticipated monetary policy cannot have real effects even in the short run. Thus, the central bank can affect the real output and employment only if can find a way to create a price surprise. Otherwise, forward- looking expectation adjustments of economic agents will fail the pre-announced policy. Likewise, if a disinflation policy is announced in advance, it cannot reduce prices if people do not believe that the government will really carry it out. That is price expectations are closely related to the policy credibility and reputation for successful implementation.

2.2.6 Real Business Theory of Inflation

The real business cycle (RBC) theorists (such as Edward C. Prescott, Finn E. Kydland and Charles I. Plosser) argued that upswings in economic activity originate from real (or aggregate supply) shocks rather than monetary (or aggregate demand) shocks. It assumes fixed aggregate demand curve, continuous market clearing, imperfect information, and rationality of expectations. The effects of supply shocks (e.g, process and production innovations, discovery of new sources of raw materials, changes in relative prices of foods and energy, bad weather and nominal effective exchange rate changes) causes inflation, which is based on the business cycle.

It does not, however, explicitly explain inflation; rather, it particularly focuses on real output effects of adverse, or negative, supply shocks such as deviations of factor productivity from trend or relative price changes

caused by oil price shocks. However, the main contribution of RBC economists is that they call our attention to the possibility of the important role of supply shocks in explaining inflation.

Neoclassical, monetarists and new classical economists ignored the possibility of adjustment lags.

2.2.7 New Political Economy Theory of Inflation

The theories as mentioned above mainly focuses on macroeconomics determinants of inflation (e.g. monetary and real shocks, and inertia in inflation) and simply ignore the role of *non-economic factors* such as institutions, political process and culture on process of inflation. They also overlook the possibility that sustained by government deficits may be partially or fully endogenized by considering the effects of the political process and possible lobbying activities on government budgets, and thus, on inflation. Political forces, not the social planner, choose economic policy in the real world. Economic policy is the result of a decision process that balances conflicting interests so that collective choice may emerge (Drazen, 2000). It therefore provides fresh perspectives on the relations between timing of election, policy maker performance, political instability, policy credibility and reputation, central bank independence and the inflation process itself.

2.3 Review of Empirical Framework

Inflation is usually a common problem of any economy. Socially it is not desirable, so controlling inflation is one of the goals of monetary policy of any economy. Thus, several studies on inflation have been conducted

in the world economy. In this section, the study is concentrated to some empirical studies on inflation in the world.

Harberger (1963) has developed an econometric model to find the causes of inflation in Chile in "The Dynamics of inflation in Chile". The main objective of the study was to identify the factors that cause the Chilean inflation and also find out the dynamic process by which money supply affected 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 the real income and past change in the rate of inflation are considered as independent variables. Harberger's study covers the period of 1939 to 1958 and uses the ordinary least square technique to estimate the general price level. He introduces both percentage change in current money supply and percentage change in one year lagged money supply in the model. According to his study the effect of an increase in money supply upon the price level doesn't occur simultaneously. And one way of capturing the lagged effect of money supply on inflation is to introduce the lagged money supply as explanatory variables in the model.

Vogel (1974) developed a monetary model for explaining inflation in Latin America. The author's model considered the rate of inflation (p_t) as a dependent variable and the percentage change in money supply during current and previous and percentage change in the real income during current period (Y_t) and change in inflation rate lagged by one year and two years (p_t and p_{t-1}) as explanatory variables. Vogel (1974) concluded that the coefficients of M_t and M_{t-1} are highly significant and thus indicate that an increase in the rate of growth of money supply cause a proportionate change in the rate of inflation within two years. At the same time the rate of inflation is found to be inversely influenced by the growth

rate of real income. The rate of inflation is not found to be so much influenced by $(p_{t-1} - p_{t-2})$, rather inflation is lagged by one year, p_{t-1} has much influence on the current rate of inflation. The increase in the last equation above is mainly attributed to the high significance of p_{t-1} .

The first study of Domac and Elbirt (1998) examines the behavior and determinants of inflation in Albania by employing three different approaches. Firstly, the authors decomposed inflation into four components: seasonal, cyclical, trend, and random. Secondly, they used Granger causality test on both the consumer price index (CPI) and key economic variables, to investigate their information content. And, lastly, they apply cointegration and error-correction techniques to the process of inflation to a monetary model. The model is expressed as:

$$\log p_t = \alpha \log M1 + \phi \log y_t + \beta \Delta \log p_t + \nu \log e_t + \gamma \log p_t f$$

Where P, M and e are price, money supply and exchange rates respectively. The authors conclude that (1) inflation exhibits strong seasonal patterns associated with agriculture seasonality's with monetary aggregates matching inflation by lag of two-months and that the exchange rate also exhibits a stable seasonality pattern; (2) Granger causality test shows that M_1 (currency in circulation plus demand deposits) and the exchange rate have predictive impact for most components of the CPI and that credit to the government is a good predictor of medical care, transportation and communication prices. The study finds that an increase in the fiscal deficit would undermine competitiveness by producing appreciation in the real exchange rate. (3) Lastly, cointegration and error correlation model shows that inflation is positively related to both money supply and the exchange rate and negatively related to real income in the long run. The impact of the exchange rate on inflation occurs a month

later, while the impact of real income and money take place two and four months later respectively.

The second study by Dlamini *et al* (2001) attempts to identify the relevant influencing factors of inflation in Swaziland using both monetary and structural variables over the period 1974-2000. The CPI of Swaziland is taken to be the dependent variable with the explanatory variables being the real income (Y), nominal money supply (m), nominal interest rate (r), nominal exchange rate (e), nominal Wages (w) and South African consumer prices (sp). The estimated equation is thus:

$$\ln p_t = \ln \alpha + \beta_1 \ln y_t + \beta_2 \ln R_t + \beta_3 \ln E_t + \beta_4 \ln M_t + \beta_5 \ln spt + \beta_6 \ln wt + Ut$$

Due to the limitation of sector data, annual time series are used. The authors apply co integration techniques and errors correlation model (ECM) to estimate relationship between inflation and its determinants. The study found that money supply and interest rate has insignificant influence on inflation. The coefficient of real income growth was also insignificant, though it was positive. However, foreign price (i.e. South African inflation) and exchange rate has a significant long-run influence in inflation. It was also found that a large interdependence between wages and inflation exist both in the short and long run. The authors conclude that changes in the lagged exchange rate, South African inflation and nominal wages were major determinants of inflation in Swaziland.

Khan and Shimmelpfennig (2006) have examined the relative importance of monetary and supply side factors for inflation in Pakistan over the period 1998:1 to 2005:6. The model consists of money supply, credit to private sector and 6-month Treasury bill rate as monetary variables and nominal exchange rate, wheat prices guaranteed by the

government as supply side factors. Both annual and nominal GDP are interpolated to 12- month moving average as activity variable. The open economy generalized monetarist model includes administered wheat prices to reach at hybrid monetarist - structuralist model, which is given as:

$$\dot{P} = f (\dot{m}, \dot{y}, \dot{v}, \dot{r}, \dot{e}, \dot{w})$$

where a dot over a variable denotes growth rate (First derivative with respect to time), thus p is prices, m stands for money, stands for money, y for real GDP, v is the velocity of money, r is the interest rate, e is exchange rate and w is wheat support price. The variables are taken in the natural logarithm form. The authors estimate the above relation in both the short term and long term using a vector error correlation model (VECM). The authors conclude that in the long run, monetary factors play a dominant role in inflation with a lag effect of one year, whereas administered prices influences inflation in the short-run only.

Hammermann and Flangan (2007) in their studies of persistent inflation differentials across 19 transition economies used annual data from 1994-2004. The researchers used an OLS panel regression model. The results from the model show that central banks incentives towards higher short run inflation is a key reason for the observed inflation differentials. Unanticipated shocks to supply and demand are also found to be important determinates of cross country inflation differentials. The evidence on the political and constitutional mileu is mixed but result stressed the fact that the more a central bank is independent the lower inflation in that country. Fiscal considerations have also found to explain the inflation differentials, countries with high government debt and low financial market development have been found to have high inflation.

The researchers conclude by stating: " Central bank in Russia, Ukraine, Belarus and Moldova appears to have a reason to choose higher inflation rates due in some cases to fiscal pressure but mainly to make up for, and to perhaps exploit lagging internal and external liberalization in their economies out of forecasts based on projected developments in terms of trade in the underlying structure of these economies and assuming now change in institutions, suggest that incentives towards inflation may be diminishing, but not to the point where inflation levels below 5% would credibly announced as targets". Hammermann and Flangan (2007) recommended in liberalizing the economy, to promote faster financial market development, to eliminate labor market over hangs and to improve the independence of central banks, in order to avoid high inflation rates.

Basher and Elsamadisy (2010) have applied ADF tests of stationarity, both Engle-granger and Johansen method of co integration, error correction model to analyze empirically the determinants of inflation in Gulf Co-operation council (GCC) countries: Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and UAE. The study has used annual data series covering the period from 1980 to 2008. The main variables considered are domestic consumer price indices, broad money (M_2), government expenditure, foreign price, nominal effective exchange rate, household consumption, government consumption, and domestic investment. The results obtained are:

- i) The money supply stands out as a significant determinant of inflation both in short-run and long run.
- ii) Both foreign prices and the nominal effective exchange rate are found to be more successful to explain inflation in the long run than in the short run.

- iii) Government expenditure does not exert a significant effect on inflation in short run unlike aggregate demand (non-oil output).
- iv) The speed of adjustment reveals that it takes about 2.9 years for 50 percent of a shock to the long run equilibrium to dissipate.

Chimobi and Igwe (2010) have analyzed the short run dynamics and long run relationships among budget deficit, money supply (M_2) and inflation for the period running from 1970 to 2005. They have employed ADF test to test the order of integration of annual time series, maximum likelihood test procedure of co-integration, established by Johansen and Juselius (1990) and the error correction model. It also has employed Granger Causality test to determine whether current and lagged values of one affect another. The study has concluded that there exists long term relationship between money supply and inflation and there is uni-directional causality running from money to inflation and bilateral causality between budget deficit and inflation. Moreover, it has also showing that money supply causes budget deficit. The error correction term with its -0.94 indicates that about 94 percent of the errors in the short run are corrected in the long run.

Khan and Gill (2010) have employed the OLS method of regression to examine the relationship between inflation and its determinants in Pakistan from both monetary and fiscal perspectives covering the period from 1970 to 20007. The variable in the study include various measures of inflation (CPI, WPI, SPI and GDP deflator) as explained variable and money supply, budget deficit, exchange rate, inflationary expectation, imports, interests rates, wheat support price, support prices of sugarcane, cotton and rice and wheat as explanatory variables. The study has found that the exchange rate, value of imports, the support price of sugarcane,

cotton, rice and wheat have affected all the indicators of inflation positively, and however, the support price of wheat independently has effected only GDP deflator. Inflationary expectation has also contributed positively to cause all the four indicators of inflation. The rate of interest is found to influence CPI, WPI and GDP deflator inversely and it is insignificant to explain sensitive price index (SPI). On the other hand, money supply (M_2) and budget deficit have played no role to determine all the indicators of inflation in Pakistan in the long run.

There have been limited empirical studies on inflationary process in Nepal. Most of them were performed before 2007 and whatever studies have done in the area of inflation, most of them follow OLS method of regression and annual data series. They have not used advance technique of co integration and error correction model. It may be due to insufficiency of time series observation and high frequency data. Some of the studies are reviewed in the following section.

Pant (1978) has analyzed the inflationary process in Nepal applying OLS method of regression where the variables used are Nepalese price level, money supply (M_1), GDP, and Indian inflation (WPI) on annual basis covering the period from 1964/65 to 1976/77. The findings of the study has revealed that money supply, Indian inflation and future expectation of prices exert positive significant influence on price level of Nepal and GDP has significant negative impact to determine prices in Nepal. For example, 10 percent change in money supply; Indian price and price expectation increase the price level in Nepal by 1.8percent, 1.2 percent and 6.5 percent respectively. Similarly, a one percent increase in GDP reduces the Nepalese price almost by one percent. Further, the significance of Indian inflation to explain prices in Nepal indicates that

the supply of money is capable to stabilize the prices as long as Indian prices are rising.

Khatiwada (1981) in his study has attempted to analysis the determinants of inflation for the period 1965/66 to 1979/80. In his study, he has found both domestic as well as external factors are responsible for increasing the general price level in Nepal. The study combines both monetary and structural approaches of inflation to analyze the determinants of inflation in Nepal. So the explanatory variables in the model are money supply (both narrowly and broadly defined), Indian prices (wholesale, consumers import and export), gross domestic product (at constant price), government expenditure, foreign exchange reserves, petroleum products and expected rate of inflation. And the dependent variable is the rate of inflation. He has attempted a stepwise simple regression technique to estimate the rate of inflation with various explanatory variables including lagged values of the variables.

The ordinary least square method of regression analysis has been applied over the study. He has also analyzed the period separately from 1970/71 to 1979/80 by including petroleum prices to find the effect of the rise in petroleum prices of inflation in Nepal.

The empirical analysis of rate of inflation and money supply shows that current money supply (narrowly as well as broadly defined) has no impact upon the price level. However one year lagged money supply both (narrow and broad) have significant impact on Nepalese inflation. But two year lagged money supply (narrow and broad) have insignificant impact upon the price level with low explanatory power. Nepalese rate of inflation and Indian prices show a greater associations between them. The

coefficient of GDP has been found unexpected (i.e. opposite to the theoretical view). But statistical test shows that it has no significant impact upon the price level. Similarly, the coefficient of government expenditure is not statistically significant. The coefficient of current foreign exchange reserve is statistically significant but negative, showing inconsistency with theoretical hypothesis. Petroleum prices are also responsible for increasing the general price level in Nepal. But one and two year lagged foreign exchange reserve and expected rate of inflation have insignificant impact upon the domestic price level.

In conclusion, his study shows that one year lagged money supply (narrow and broad) has significant impact upon the general price level. Indian price is also responsible factor of inflation in Nepal. Similarly, the study examines the impact of increase in price of petroleum products on price level in Nepal. Price of petroleum products, supply of money, wholesale price of India are continuously increasing. Whether these factors still explain inflation in Nepal or not will be the subject matter of investigation of this study.

Pant (1988). "Sources of Inflation in Asia: Theory and Evidences" has attempted to identify (i) sources of inflation (ii) quantification of inflation created by external and domestic factors and (iii) causes of variation in inflation rates among the Asian countries. The purpose of his book is to analyze the causes of inflation under fixed rate system. His log linear model is tested for selective five Asian countries (China, India, Philippines, Thailand and Nepal) for the period 1951 to 1971.

The empirical results found, for 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 increases in the price level during the period under study.

In case of Nepal, thirty years period (1955-1985) was considered for the study. The empirical results show that the coefficients of all variables are not significant. The coefficients of real income and imports prices have opposite signs than expected. But another empirical result shows that the Indian wholesale price affects the Nepalese price level very significantly by a coefficient almost equal to unity. The result indicates that the wholesale price index of India and Nepalese price index change by the same amount. He has extended his study by adding the variables as the change in exchange rate of Nepalese rupee to capture the effects of exchange rate change. Then the coefficient of Indian wholesale price index was reduced to 0.514. This indicates that one unit change in the wholesale price of India changes the Nepalese price level by 0.514 units and this is relatively satisfactory.

His study has not included the lagged values of money supply and Indian wholesale price in the model to find the effect of lagged values of the variables on Nepalese price level. In Khatiwada's study, inflation was also influenced by the lagged values of money supply. So, his study has left large space for further research on Nepalese inflation.

Bista (2001) has attempted to analyze the factors responsible for inflation in Nepal covering time periods from FY 1974/1975 to FY 1988/1999. This study combines monetary, fiscal and structural factors to analyze the determinants of inflation in Nepal. So the explanatory variables in the model are money supply (both narrowly and broadly defined), real income, expected cost of holding money, Indian wholesale

price, deficit financing, and foreign exchange reserves and the dependent variables is inflation rate. He has applied the ordinary least square method of regression analysis for estimating the inflation in Nepal.

The empirical analysis shows that one year lagged values of money supply (both narrow and broadly defined), expected cost of holding money, the wholesale price index of India lagged by one year are found mostly significant factors responsible for creating inflation in Nepal. The coefficients of real income, current money supply, foreign exchange reserves, and deficit financing have no significant impact upon the general price level in Nepal.

The previous study on inflation in Nepal by Khatiwada (1965/66-1979/80) has found that there was immediate impact of Indian wholesale price index in Nepalese inflation. But this study shows that lagged impact of wholesale price of India has significant impact of inflation in Nepal. Thus, whether lagged or current Indian wholesale price is responsible in creating inflation in Nepal will be one of the subject matters of investigations of this study.

Pandey (2005), in his study, has attempted to analyze the cause of inflation in Nepal. The study covers the time series data of the period from FY 1972/1973 to FY 2003/2004. He has used double log linear regression model to analyze the causes of inflation. The explanatory variables in the model are average money supply (both narrow and broad money), total government expenditure, real gross domestic product, wholesale price index of India (lagged by 6 months) and exchanges rates with India and united states of America. The dependent variable is inflation.

The empirical result shows that all the variables except government expenditure have the expected sign. The coefficients of average money supply, wholesale price of India and exchange rate with Indian currency have been found to be statistically significant indicating that these are the most important determinants of inflation in Nepal.

The coefficient of government expenditure has unexpected sign and statically insignificant similarly the coefficient of real gross domestic product, coefficient of exchange rate with US dollar and coefficient of expected inflation are also found statically insignificant implying that they do not have the significant role in explaining the price level in Nepal. But the researcher has not ignored the possibility of indirect effects of government expenditures on price level through monetary expansion. Another estimated equation in which one year lagged money supply is introducing along with the significant variables shows that the lagged average money supply has insignificant impact upon the price level.

The empirical results confirm that Nepalese inflation is influenced by both monetary as well as structural factors. Indian prices, money supply and exchange rate changes are the most significant determinants of inflation in Nepal. The coefficient of money supply indicated that each 10% change in money supply causes 3.7 percent change in the rate of inflation in Nepal. The result is different to the other previous results found in Khatiwada's and Nar Bahadur's analysis. In their study current money supply has significant impact upon the general price level. Therefore, this study provides the space for further research on this determinant of inflation.

Paudel (2005) has tried to examine the effect of budget deficits on inflations in Nepal using time series data of fiscal year 1976/1977 to 2000/2001. He has specified two models for investigation. First model was linear regression model. It was specified to understand the effect of budget deficit on inflation. Broad money supply, budget deficit, domestic credit and foreign exchange reserve were independent variables and GDP deflator was dependent variable. Second model was specified to capture the indirect effects of budgets deficits on inflation. It was log linear model. Budget deficit, domestic credit and foreign exchange reserve were independent variables and broad money supply was the dependent variable in the model. GDP deflator was calculated at the base year price of 1995/95.

The estimated equations show that the coefficients of budget deficits were positive and significant at 1percent level in both models. Broad money supply had negative coefficient which was unexpected (opposite to the expected sign) and it was found insignificant at 1percent and 5 percent level of significant. But it was found significant at 10 percent level. The coefficient of domestic credit was positive but insignificant. The coefficient of foreign exchange reserve was found positive and significant at 1percent level of significance. The explanatory power of independent variables was more than 98 percent. Durbin Watson Statics show that the model was free from the auto correlation problem.

His study has also found that the budgets deficits do have significant direct and indirect effects on the price level in Nepal. However the previous studies have found that there is no significant role of deficit financing on Nepalese inflation. The unique features of his study is that is has taken the GDP deflator as the dependent variable. Thus whether the deficit financing play a significant role or not in determining inflation in

Nepal, is one of the subject matter that was going to be analyzed in this study.

NRB (2007) has tried to explain the factors determining inflation in Nepal. The study covers the time period from 1978 to 2006. Researchers have used the model of Khan and Schimmelpfennig for explaining inflation in Nepal. But they have slightly changed the model by including the cost push factor (i.e. money wage rate) as one of the explanatory variables and also have used the foreign factor (Indian consumer price index) in place of the exchange rate. Altogether, money supply, velocity of money, real gross domestic product, money wage rate and external factors were the dependent variables and consumer price index was the dependent variable. Their study has used double natural logarithm model for investigation.

An empirical result suggests 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 to previous studies, which have concluded that Nepalese inflation is basically determined by Indian inflation and growth rate of domestic money supply. The same periods taken by this study are same with the periods selected by NRB for the investigation. But this study will choose some other explanatory variables may be found significant determinants of inflation in Nepal.

Conclusions

From the review of literature of inflation in international level we can reach the conclusion that major common determinants of inflation are money supply, government expenditure, foreign prices, exchange rate, GDP, budget deficit and petroleum prices. Most of the studies have

employed advanced technique of co integration and error correction modeling (ECM) to estimate both long run and short run inflationary process. Unit root test are applied to test stationary of data and hence to solve the problem of spurious regression. They have used long series of high frequency data, monthly and quarterly, which has made the analysis of inflation more dynamic and applicable and solve the inflationary problem.

The review of literature at national level point out that most of the studios on inflationary process in Nepal has applied OLS method of regression, with the notable expectation of Pandey (2005) and NRB (2007), have ignored long term relationships. National studies also have considered money supply, Indian inflation, government expenditure, exchange rate, GDP, price expectation wage rate and budget deficit etc as the major determinants of inflation in Nepal. Annual time series data has been considered by most of the studies on inflation in Nepal. It is because of unavailability of high frequency data. Hence, the review of national literature on inflation compels to note that in the absence of high level statistical model, the determinants of Nepalese inflation has not been analyzed actually before. Accordingly, the conclusion of these studies also seems controversial in the sense that Khatiwada (1989), Neupane (1992) and NRB (2011) have found money supply insignificant to determine inflation in Nepal. There is still debate on lagged impact on Indian inflation on Nepalese inflation. Similarly significance of government expenditure, GDP and petroleum prices is also under debate. The previous studies have left some doubt in the analysis of inflationary process in Nepal which requires further studies utilizing current techniques has highlighted in international studies, with high frequency data. However, this study tries to explain inflationary process in Nepal

adopting high level statistics, long-run inflation and hybrid inflation model using annual series data of money supply, fixed exchange rate, real gross domestic product, fiscal deficit and Indian inflation show that, a clear analysis of determinants of inflation in Nepal will be possible.

CHAPTER- III

RESEARCH METHODOLOGY

3.1 Research Design

This study derives various relationships using different relevant variables. Both monetary and structural factors are responsible for inflation in Nepal. As our objective is to obtain the relationship of inflation with money supply, RGDP, FD and ER and also IWPI as Indian prices are believed to influence Nepalese variables, we have two different types of variables namely dependent and independent variables. The empirical relationships are tested with the help of statistical and economical tools. Our objective is to study the factors that affect inflation in Nepal. We determine the empirical relationship between various objectives using regression equations.

3.2 Definition of variables

This study derives various relationships using different relevant variables. These relevant variables are discussed below:

a) Dependent variable

Rate of inflation is the sole dependent variable that is taken in the whole analysis. There are various price indices such as the wholesale price index, import price index, personal consumption expenditure implicit price deflator, wage rate etc that can also be used to measure the rate of inflation. But as data as these indices are not available in Nepal, log of consumer price index is used as the dependent variable to explain rate of inflation.

The data on weighted consumer price index have been divided into two groups-food and beverage and non-food and services in Nepal and is available since Nepal Rastra Bank launched first household budget survey in 1973/74 covering 18 urban centers in the country. The national urban consumer's price index (CPI) is heavily weighted by the prices of basic food items (about two third of the total weight). So substantial change in CPI is possible only if there is some change in the prices of food items. This index records prices in some 18 urban centers of the country, which comprise a small section of the population. Also the weights given to various commodities have not been revised since 1994/95. From these shortcomings of CPI it can be realized that inflation Nepal is more or less food price inflation.

3.2.1. Independent variables

Since the present study tries to measure the impact of monetary aggregates and other structural variable on inflation in Nepal, the main explanatory variables are discussed below:

a) Money supply

The two forms of monetary aggregates used in Nepal are narrow money supply and the broad money supply. Narrow money supply is defined as the sum of currency and demand deposits, both held by the public. Currency consists of paper currency as well as coins. The broader definition of money supply includes narrow money: as well as fixed deposits. These definitions are in terms of uses. From the sources side narrow money is derived as the summation of the net foreign assets and the net domestic assets of the banking sector with the deduction of time deposits while broad money is composed of the net foreign assets and net domestic assets of the banking system.

When the economy's money stock-rises, money income of the people also rises. Rise in money income causes increase in the demand for goods and services. But if the supply of goods and services is insufficient to meet the demand, then obviously inflation occurs.

b) Gross Domestic Product

As the economy's price structure depends also on the level of output in the economy, GDP is considered as another explanatory variable in the study. If an economy is troubled by inflation, one way to ease the pressure of inflation is to increase the economy's output. When the supply of goods and services increases, the excess demand lowers and inflationary pressures decreases to some extent.

Supply inelasticity of domestic output in the wake of rapidly growing population is another structural factor supposed to affect prices in Nepal. Food bottlenecks are supposed to generate inflation because food grain prices are more flexible than the non-food prices and the former carry a heavy weight in the CPI. Since agricultural output constitutes, on the average, more than two third of GDP, the variable per capital supply of food grain is represented by the GDP.

c) Indian Wholesale Price Index

In the seventies it was recognized that inflation had become a worldwide problem. During that period both developed and developing countries were largely unable to control their price levels. Inflation transmits across national boundaries and the small and open economics, especially countries with fixed exchange rate regime, highly suffer from it. Quantity theory of money is often criticized for its failure to accommodate the influence of worldwide inflation. This theory presupposes the money market equilibrium that is unlikely in a developing economy where

financial institutions and money markets are underdeveloped. But now the monetarists have also increasingly realized that a small open economy is assumed to settle world rate of inflation at least in the long run.

Because of close geographical proximity, open boarder of about 550 miles, family ties between the residents of two countries free and unlimited convertibility of Indian currency in Nepal, large scale Nepalese trade with Indian and more importantly the fixed exchange rate is taken as Indian 'inflation. When prires in India rise, they are transmitted to Nepal through higher import prices. On the other hand, price rise in India means higher export price for Nepal. If export prices are higher than the domestic prices, not only exportable surplus but also essential goods in short supply in the home market leak out to India creating acute shortage and upsurge in their prices in domestic markets. However, this kind of import of Indian inflation can be minimized by resorting to third country goods. But diversion of trade is less feasible because of very low marginal rate of substitution between Indian and third country goods... So, Nepal becomes the price taker to the prevailing market condition of India.

d) Fiscal Deficit

Deficit financing is the most popular financial tool which is in practice in both the developing and developed countries. Specifically speaking, it is the difference between government expenditure need and collected revenue in particular point in time. In Nepal also deficit financing is increasing year by year by considerable amount which might cause in the rise in price level. Though it is the component of government expenditure, Its praiseworthy to assess its role separately triggering the

inflation in Nepal. So it is also taken as the separate variables in our study.

e) Exchange rate

The external balance of the country's macro-economy, which focuses on achieving overall balance of payments sustainability overtime, is one of the important objectives of the monetary policy in Nepal that can be achieved through appropriate national exchange rate policy given the political and economical situation. Exchange rate arrangements are of many types ranging from one extreme of clean floating rate system to the opposite polar case of hard pegs. Specifically, one can list the exchange rate -arrangement into clean float, managed or dirty float, adjusted peg, crawling peg, currency board, dollarization and monetary union.

Nepal has adopted the conventional fixed peg exchange rate arrangements with Indian currency (IC) and flexible exchange rate system with rest of the currencies after frequent changes over of on the past. That, is the exchange rate of Nepalese rupee with other currencies is basically determined in the demand and supply forces in the foreign exchange market where as the exchange rate or is official determined by Nepal Rastra Bank (NRB) at fixed level. Currently, the exchange rate of NC with IC is Rs 1.60 per unit of IC, which was fixed in 1993. That is why it is taken as separate variables in our study.

3.3 Source of Data

The collection of data is the important part of research study. But, this study is conducted with the help of secondary data only. There are different national and international agencies that provide the data for inflation. As the study uses secondary data the sources include various publications. Chiefly the sources are as described below.

- i) The data on money supply, consumer price index of Nepal are taken from Quarterly Economic Bulletin, Nepal Rastra Bank,
- ii) For the data on gross domestic product and fiscal deficit the source is the Economic Survey, Fiscal Year 2011 GON\MOF.
- iii) The Indian Prices are collected from the International Financial Statistics, year book 2011 published by International Monetary Fund.

3.4 Coverage of the Study and the Use of Instruments:

The present study covers the period of thirty seven years from 1975 to 2011 A.D. The analysis is done on annual basis. Hence, the number of observations is thirty seven in each model. In order to estimate the regression equations, the calculations are done and analyze by using Computer under the SPSS programming.

3.5 Specification of Model

This study attempts to seek the effect of monetary variables and other structural variables on the price level in Nepal. So, two types of models are presented here.

I) Monetarist Model

a) Closed Economy Framework

Monetarists believe that inflation is the result of excess of money supply over demand. Following the quantity theory approach and taking rate of inflation as the dependent variable and the current narrow and broad money supply as the explanatory variables, the simple regressions that will be done are as fallows:

$$\ln P_t = a_0 + a_1 \ln M_{1t} + U_t \dots \dots \dots (1)$$

$$\ln P_t = b_0 + b_1 \ln M_{2t} + U_t \dots \dots \dots (2)$$

Where, P_t = National consumer price index at time t

M_{1t} = current narrow money supply at time t

M_{2t} = Current broad money supply at time t

a_0, b_0 = constants

a_1, b_1 = coefficients on narrow and broad money supply respectively and both are assumed to be positive.

U_t = stochastic (error term)

b) Open Economy Framework

Under the conditions of full employment of resources and the prevailing system of fixed exchange rates, monetary expansion in any one country affects the prices in the both the countries, through the adjustment process of actual money stock to desired money stock. The estimating equation of rate of inflation on the growth rate of Indian wholesale price index is given below:

$$\ln P_t = a_0 + a_1 \ln IWPI_t + U_t \dots \dots \dots (3)$$

Where, P_t = National Consumer price Index at time t.

$IWPI_t$ = The current Indian wholesale price

a_0 = Constants

a_1 = Coefficients of $IWPI_t$ which is also assumed to be positive.

U_t = Error term

II) Structuralist Model

a) Fiscal Bottleneck

The simple regression between rate of inflation and fiscal deficit is

$$\ln P_t = a_0 + a_1 \ln FD_t + U_t \dots\dots\dots(4)$$

Where, P_t = National Consumer price Index at time t.

FD_t = Fiscal deficit at time t.

a_0 = Constant

a_1 = Coefficient on FD_t and is also assumed to be positive

U_t = Error term

b) Foreign Exchange Bottleneck

The simple regression between rate of inflation and foreign exchange rate is $\ln p_t = a_0 + a_1 \ln ER_t + U_t \dots\dots\dots(5)$

Where, P_t = National Consumer price Index at time t.

a_0 = Constant

a_1 = Coefficient on ER_t and is also assumed to be positive

ER_t = Exchange rate at time t.

U_t = Error term.

From the above estimating equations of monetarists and structuralist model, we have taken following hybrid models for the study purpose:

HYBRID MODELS:

$$i. \ln P_t = a_0 + a_1 \ln M_1 + a_2 \ln IWP + a_3 \ln RGDP + a_4 \ln FD + a_5 \ln ER + u_t \dots(6)$$

$$\text{ii. } \ln P_t = a_0 + a_1 \ln M_2 + a_2 \ln IWP + a_3 \ln RGDP + a_4 \ln FD + a_5 \ln ER + u_t \quad (7)$$

$$\text{iii. } \ln P_t = a_0 + a_1 \ln M_1 + a_2 \ln IWP + a_3 \ln FD + a_4 \ln ER + u_t \dots \dots \dots (8)$$

$$\text{iv. } \ln P_t = a_0 + a_1 \ln M_2 + a_2 \ln IWP + a_3 \ln FD + a_4 \ln ER + u_t \dots \dots \dots (9)$$

$$\text{v. } \ln P_t = a_0 + a_1 \ln M_1 + a_2 \ln IWP + a_3 \ln FD + u_t \dots \dots \dots (10)$$

$$\text{vi. } \ln P_t = a_0 + a_1 \ln M_2 + a_2 \ln IWPI + a_3 \ln FD + u_t \dots \dots \dots (11)$$

$$\text{vii. } \ln P_t = a_0 + a_1 \ln M_1 + a_2 \ln IWPI + a_3 \ln ER + u_t \dots \dots \dots (12)$$

$$\text{viii. } \ln P_t = a_0 + a_1 \ln M_2 + a_2 \ln IWPI + a_3 \ln ER + u_t \dots \dots \dots (13)$$

$$\text{ix. } \ln P_t = a_0 + a_1 \ln M_1 + a_2 \ln IWPI + u_t \dots \dots \dots (14)$$

$$\text{x. } \ln P_t = a_0 + a_1 \ln M_2 + a_2 \ln IWPI + u_t \dots \dots \dots (15)$$

Above those equations are also tested at first difference, if there is the presence of auto-correlation. Then

$$\text{i. } \Delta \ln P_t = a_0 + a_1 \Delta \ln M_1 + a_2 \Delta \ln IWP + a_3 \Delta \ln RGDP + a_4 \Delta \ln FD + a_5 \Delta \ln ER + u_t \dots \dots \dots (6.a)$$

$$\text{ii. } \Delta \ln P_t = a_0 + a_1 \Delta \ln M_2 + a_2 \Delta \ln IWP + a_3 \Delta \ln RGDP + a_4 \Delta \ln FD + a_5 \Delta \ln ER + u_t \dots \dots \dots (7.a).$$

$$\text{iii. } \Delta \ln P_t = a_0 + a_1 \Delta \ln M_1 + a_2 \Delta \ln IWPI + a_3 \Delta \ln FD + a_4 \Delta \ln ER + u_t \dots \dots \dots (8.a)$$

$$\text{iv. } \Delta \ln P_t = a_0 + a_1 \Delta \ln M_2 + a_2 \Delta \ln IWPI + a_3 \Delta \ln FD + a_4 \Delta \ln ER + u_t \dots \dots \dots (9.a.)$$

$$\text{v. } \Delta \ln P_t = a_0 + a_1 \Delta \ln M_1 + a_2 \Delta \ln IWPI + a_3 \Delta \ln FD + u_t \dots \dots \dots (10.a.)$$

$$\text{vi. } \Delta \ln P_t = a_0 + a_1 \Delta \ln M_2 + a_2 \Delta \ln IWPI + a_3 \Delta \ln FD + u_t \dots \dots \dots (11.a.)$$

$$\text{vii. } \Delta \ln P_t = a_0 + a_1 \Delta \ln M_1 + a_2 \Delta \ln IWPI + a_3 \Delta \ln ER + u_t \dots \dots \dots (12.a.)$$

$$\text{viii. } \Delta \ln P_t = a_0 + a_1 \Delta \ln M_2 + a_2 \Delta \ln IWPI + a_3 \Delta \ln ER + u_t \dots \dots \dots (13.a.)$$

$$\text{ix. } \Delta \ln p_t = a_0 + a_1 \Delta \ln M_1 + a_2 \Delta \ln IWPI + u_t \dots \dots \dots (14.a.)$$

$$\text{x. } 4. \Delta \ln p_t = a_0 + a_1 \Delta \ln M_2 + a_2 \Delta \ln IWPI + u_t \dots \dots \dots (15.a.)$$

3.6 Method of Estimation

For the purpose of estimating the models described earlier, the ordinary list square regression method is used in the study simple and multiple regression analysis are done by using matrix operations. The variables are used in various combinations; sometimes the monetary variables are used alone and sometime used jointly with structuralist variables. The inflation is regressed on different monetary and structuralist variables. Variables are transformed into logarithms before running regression to eliminate variability of the variable as well to apply linear regression model, so those coefficient estimated are interpreted as elasticity coefficient, the statistical significance of the estimated coefficients will be tested at 1% or at 5% or at 10% level of significance.

With regard to above equations of the model following measures are carried out to check the reliability of the analysis

3.6.1. Coefficient of determination (R^2) :

The R-squared (R^2) statistic measures the success of the regression in predicting the values of the dependent variable within the sample i.e. R^2 is used for judging the explanatory power. R^2 measures the dispersion of

observations around the regression line. Closer the observations to the line, better the goodness of fit that is the better is the explanation of variations of the dependent variable by the changes in the explanatory variables. The statistic will equal one if the regression fits perfectly, and zero if it fits no better than the simple mean of the dependent variable. It can be negative if the regression does not have an intercept or constant, or if the estimation method is two-stage least squares.

3.6.2. Adjusted coefficient of determination ($\overline{R^2}$):

This measure will also be employed to get additional information about the goodness of fit. One problem with using R^2 as a measure of Goodness of fit is that the R^2 will never decrease as more repressors are added. In the extreme case, we can always obtain an R^2 of one if you include as many independent repressors as there are sample observations.

The adjusted, commonly denoted as $\overline{R^2}$, penalizes the R^2 for the addition of repressors', which do not contribute to the explanatory power of the model.

3.6.3 t-test

This test is performed in order to identify the statistical significance of an observed sample regression coefficient and the formula for calculating the value is:

$$t = \frac{\hat{a}_i}{\sigma_{(ai)}}$$

where, \hat{a}_i = estimated value of a_i

$\sigma_{(ai)}$ = standard error o a_i

$$\sigma_{(a_i)} = \sqrt{\text{var } a^i} = \sqrt{\left[\frac{\sum e^2}{N-k} \right] - \left[\frac{1}{\sum x^2} \right]}$$

The calculated value is compared with the theoretical (tabulated) value of t which is defined in the critical region in a two-tailed test, with $n-k$ degree of freedom.

The decision to accept or reject null hypothesis is made on the basis of the value of the test statistic obtained from the data at hand.

The t -statistic, which is computed as the ratio of an estimated coefficient to its standard error, is used to test the hypothesis that a coefficient is equal to zero.

If t falls in the critical region we reject the null hypothesis, that is, we accept that the estimate a_i is statistically significant at specific level of significance. If t falls in the acceptance region, we accept the null hypothesis, that is we conclude that our estimate a_i is not statistically significant. At the specific level of significance. In other words if the calculated value of t is greater than the tabulated value it can be concluded that it is statistically significant at the specified degree of freedom.

3.6.4. Durbin-Watson (DW):

The Durbin-Watson (DW) test value is calculated by using the following formula:

$$DW = \frac{\sum_{t=2}^n (e_t - e_{t-1})^2}{\sum_{t=1}^n e_t^2}$$

The value of d lies between 0 to 4 and the d-statistics is interpreted as:

- i) If $d = 2$; $\rho = 0 \Rightarrow$ there is no autocorrelation. Thus if calculated $d \approx 2$ we accept that there is no autocorrelation in the function.
- ii) If $d = 0$; $\rho = +1 \Rightarrow$ there is a perfect positive autocorrelation. Thus if $0 < d_{cal} < 2$, there is some degree of positive autocorrelation, which is stronger when deal is closer to zero.
- iii) If $d = 4$; $\rho = -1 \Rightarrow$ there is a perfect negative autocorrelation. Thus if $2 < d_{cal} < 4$, there is some degree of negative autocorrelation, which is stronger higher the value of d_{cal} . d_{cal} indicates the calculated value of Durbin-Watson statistics.

3.6.5 F-test:

For the purpose of analysis of variance, this test will be used. The F-statistic tests the hypothesis that all of the slope coefficients (excluding the constant or intercept) in a regression are zero. For ordinary least squares models, the F-statistic is computed as

$$F = \frac{R^2 / (k - 1)}{(1 - R^2) / (N - k)}$$

Where, R^2 = coefficient of determination

k = number of b's (including the intercept b_0)

N = number of observations in the sample.

The observed F-variance ratio is compared with the theoretical value of F_t (i.e. table value of F) at specific level of significance with $v_1 = (k-1)$ and $v_2 = (N-k)$ degrees of freedom.

If, $F > F_t$ we reject null hypothesis.

If, $F < F_t$ we accept null hypothesis.

3.7 Conclusion

Inflation has been a major problem of developed as well as the developing countries. Nepal, too, has been experiencing a moderate inflation over the past few decades. Population growth with no corresponding growth in output has put upward pressure on prices. In a developing country like Nepal, government has to undertake various infrastructure and welfare projects. The increasing demand for government expenditure has led to widening fiscal deficit. To meet the deficit, government has turned to various sources like domestic borrowing, external borrowing, foreign exchange reserve and excess money supply. Excess money supply; both M_1 and M_2 , has led to an increase in aggregate demand which in turn has caused the rise in the general level of price.

CHAPTER –IV

EMPIRICAL ANALYSIS OF DATA

This chapter is divided into two parts. The first part studies the trend of inflation in Nepal. This analysis is done with the help of their actual time series data. This part will fulfill the objective to study the historical trend of inflation in Nepal which is done through analysis of actual figures. The second part deals with the data analysis based on regression approach the data assessed were regressed and result obtained shown below. The equation was estimated to capture the relationship between explanatory variables and the rate of inflation. The model was estimated to examine the impact of these explanatory variables on the inflation rates viz. M_1 , M_2 , RGDP, FD, ER and IWPI.

4.1 Historical Trend of Inflation in Nepal

The price level and its growth, inflation, is an important economic indicator. There are various indices which measure their price level, such as consumer price index (CPI): wholesale price index WPI, sensitive price index (SPI), gross domestic product (GDP), and deflator and so on. In Nepal, there are three main price indices, namely: the CPI; the WPI; 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 measures of prices on households.

Measurement of the prices in Nepal began from 1973 using the expenditure weightage of the goods and services of the people obtained from the first HBS. Prior to that, equal weights and were assigned for each and every commodity of the baskets. The study limits presentation of inflation figures to 1976-2011 as shown graphically below:

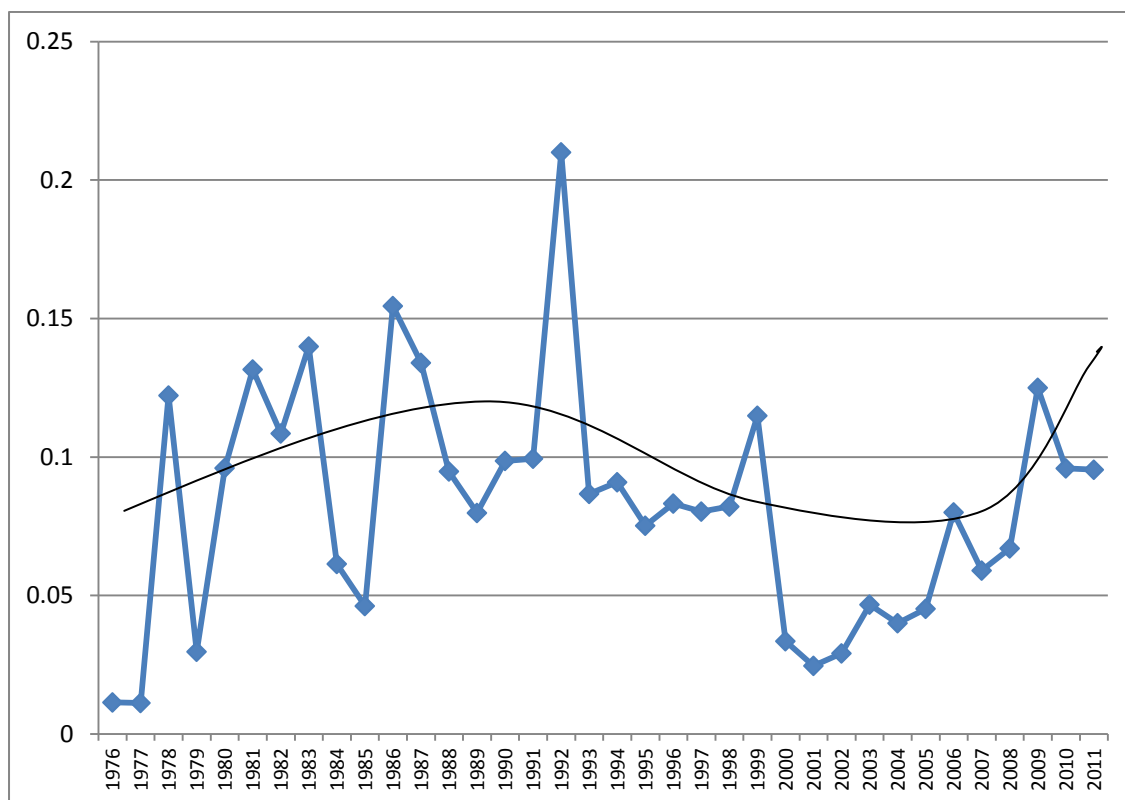
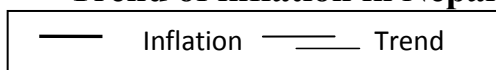


Figure 1

Trend of inflation in Nepal



The figure 1 suggests that inflation had started at the review period at round 4 percent and increased to double digit in the decade of the 1980s. This high inflation period corrected itself with inflation decreasing to about the level at which it had started. The above analysis is made more specific in table 1.0 which analyzes the inflation from 1976 to 2011 on

five- year average basis separated into its two major groups: food and beverages group (FBG) and non-food and services groups (NFS).

Table 1.0:

Separation of CPI into major groups (Based on five years averages)

Years	CPI Inflation	FBG Inflation	NFS Inflation
1976-80	5.22	4.76	6.75
1981-85	9.69	9.40	10.37
1986-90	11.62	12.55	10.02
1991-95	11.26	11.47	10.92
1996-00	7.85	8.31	7.32
2001-05	3.72	2.62	5.00
2006-10	8.5	10.8	8.53
2011	9.5	12.8	9.5

The consumption trend on FBG and NFS varied over time. In the period of 1976-1980, the inflation observed lower average trend by 5.22 percent with comparison to that of the remaining periods except for 2000-2005. Low level of inflation is attributed to tight monetary policy and better food harvest in Nepal and price control measures in India as well.

However, production of food grains declined substantially during the subsequent years. Nepalese rupee dollar was devalued with the Indian rupee by 4.3 percent while revalued with the US dollar. Money supply was substantially increased. Reduction in custom and excise duty did not work to lower inflation substantially due to shortfall in the production of

food grains. Further, there was an upward revision in petroleum prices in 1980. As a result, average inflation increased to 9.69 percent during the first half of 1980's. It was higher than the second half of 1970s. Besides the above reasons, other factors attributable to the upsurge in the price movement were the rise in prices of FBG and increase in the cost of agricultural production (due to the rise in the fertilizers prices), higher inflation in India, the lagged impact of the rise in the petroleum prices, and expansionary fiscal policy at that period. In the same period, production of food grains declined due to a severe drought in Nepal and India. Monetization of fiscal deficit coupled with devaluation of domestic rupee against US Dollar also contributed to increase inflation significantly. Further, during the same period, liquidity requirement of the commercial banks was raised highest at 25 percent of total deposit liabilities.

The inflationary pressure increased to 11.62 percent during the second half of the eighties. Such rise was higher in FBG (12.55 percent) accompanied by that of NSF (10.02 percent). The main contributing factor to this higher rate of inflation was an increase in electricity tariff and fertilizer prices which had affected the cost of production of the domestic goods with their lags effect in the subsequent years. On the other hand, favorable price situation in India and increased production of domestic grains helped to stabilize inflation during the same period. Trade and transit impasse with India (March `1989 to June 1990) further led to supply constraint that resulted in heavy wrestling of petroleum products and hike in the prices of imported goods. As a policy response, economic stabilization programs were initiated in 1986 that resulted in

significant stabilization in external sector. However the program did not stabilize the price situation. Structural adjustment program (SAP) was introduced during the 1988 to 1990 period to reduce structural constraints to growth and maintain desirable level of inflation as well as strengthening the external position of the country.

During 1990s, inflationary pressure continues its double digit level, mainly due to structural changes in the economy. Average inflation over the period 1991-1995 was 11.26 percent. Although there was relatively improved supply situation, the impact of the Gulf war, low agriculture production and relatively higher inflation in India etc. led to an upward pressure on inflation during the period. Nepal witnesses the highest ever-recorded level of inflation, 21.07 percent, in 1992. During that period, average growth rate of the prices of FBG was soared at 24.49 percent and NFS also increased to 14.89 percent. The higher rise in the index of FBG was mainly due to sharp rise in the index of rice and rice product and spices. The devaluation of Nepalese rupees vis-à-vis US dollar and other convertible currencies by 20.9 percent in July, 1991 was also responsible for exceptional rise in the rate of inflation during that fiscal year. Nepal followed the policy of current account convertibility, which pushed up the import prices of raw material, fuels, fertilizers, construction materials and consumer goods as well as the prices of administered goods and services such as milk, petroleum products, education fees and telephone and electricity charges. In addition to this, higher rate of inflation in India also caused rise in the prices of the imported goods from India. Shortfall in the production of food grains also caused shortage in their supply.

The financial sectors reforms and liberal public enterprises policies such as industrial policy, investment and technology policy , etc. contributed to the improvement of production of both agriculture and non-agriculture sectors. Prudential fiscal policy was able to reduce deficit financing, improve revenue mobilization and priorities public expenditures. These all efforts and achievement contributed to remain in the second half of 1990's at 7.85percent.

During 2001-2005 inflation was stabilized at 3.72 percent. Favorable weather condition improves the production of food articles at that period. It led to a smooth supply and situation and helped to contain the prices of FBG at 2.62 percent, while that of NFS contains at 5 percent. However, the hiking the prices of petroleum products, lag effect of revision in the Vat rate during 2005 and poor supply situation due to both unfavorable weather condition as well as deteriorated law and order situation caused inflationary pressure In 2006 at a level of 8.0 percent.

In the period of 2006-2010, inflationary pressure increased at 8.5 percentages which is comparatively higher than 2001-2005 periods. Such rise was higher in FBG (10.8 percent) accompanied by that of NSF (8.53 percent). The main contributing factors to this factor to this higher rate of inflation was in increasing in electricity tariff and fertilizer prices which had affected the lost of production of domestic goods. The higher rise in the index of FBG was mainly due to the sharp rise in the index of cereal product rise, pulses, meat, fish and eggs. Nepal followed the policy of account convertibility which pushed up the import price of raw materials fuels, fertilizers, construction materials and consumer goods as well as

the prices of administered goods and services. Indian inflation also caused rise in the prices of imported goods from India. Poor supply situation due to both unfavorable weather condition as well as deteriorated law and other situation caused inflationary pressure in 2011 at a level of 9.5 percent.

4.2 Estimation in Level

Based upon our objectives, we estimated the various regression equations to examine the relationship among the variables. For this we took various combinations of the variables. Out of them some of the significant regression results are presented below:

MODEL I:

$$\ln \text{NCPI} = -1.61 + 0.28 \ln M_1 + 0.54 \ln \text{IWPI} + 0.041 \ln \text{F.D}$$

(-10.26) (3.51)* (3.67)** (2.13)**

$$R^2 = 0.998 \quad \text{Adjusted } R^2 = 0.997, \text{ D-W} = 0.812 \quad F = 4688.465 \quad N=37$$

Note : * Significant at 1%

** Significant at 5%

The above equation shows that the elasticity coefficient of inflation with respect to M_1 , IWPI and F.D. are 0.29, 0.54 and 0.041 respectively. It means one percent increase in M_1 , IWPI and F.D. causes 0.29 percent, 0.54 percent and 0.041 percent rise in price level respectively. The figure in the parenthesis shows t-statistics. It signifies the narrow money supply, Indian inflation and Fiscal deficit all are responsible for the inflationary

situation in Nepal. However out of the variables taken in IWPI are the most deterministic factors influencing the inflation in Nepal. The goodness of fit between independent variables and dependent variable also appears strong as shown by R^2 and adjusted R^2 . The F and t-statistics also show the significant of variables taken at given level. D-W statistics is 0.812 which indicates the error terms are said to be positively auto correlated.

Model II:

$$\ln NCPI = -1.44 + 0.22 \ln M_2 + 0.63 \ln IWPI + 0.035 \ln F.D$$

(-10.89) (2.91)* (3.561)* (1.741)**

Note: * Significant at 1%

** Significant at 5%

This equation shows that the elasticity coefficient of inflation with respect to M_2 , IWPI and F.D. are 0.22, 0.63 and 0.035 respectively. The figure in the parenthesis shows t- statistics. It signifies that broad money supply, IWPI and fiscal deficit are also responsible for the inflationary situation in Nepal. However, out of the variables taken IWPI is the most deterministic factors influencing the inflation in Nepal. The elasticity coefficient for the fiscal deficit is found to be small. This may be due to structure of national government expenditure. The purchasing power created in general services is low as compared to the expenditure. This in turn may have resulted in lower impact of deficit of inflation. In addition capital expenditure enhances the productivity of the economy in the long run which has lessened the inflationary impact of deficit.

The F and t- statistics also shows the significance of variables taken at given level. But D-W statistics is 0.739 which indicates the error terms are said to be positively auto correlated.

Model III:

$$\ln \text{NcPI} = -1.59 + 0.25 \ln M_1 + 0.43 \ln \text{ER} + 0.67 \ln \text{IWPI}$$

$$(-10.41) * \quad (3.076)** \quad (2.513)** \quad (3.95)*$$

$$R^2 = 0.998 \quad \text{Adjusted } R^2 = 0.998 \quad \text{D-W} = 0.822 \quad \text{F} = 4914.226 \quad \text{N} = 37$$

Note: * significant at 1%

** Significant at 5%

Thus equation shows that one one unit growth in M1 , IWPI and ER causes 0.25 0.67 and 0.43 unit growth in NCPI inflation. The figure in the parenthesis shows that t-statistics. The F and t-statistics also shows that the significance of variables taken at given level. Indian price have more powerful influence in inflation as shown by the coefficients of above model. DW statistics which indicates that the error terms are said to be positively auto correlated. The value of R² and adjusted R² is highly significant at 99 percent of total variation of inflation is explained by narrow money supply, IWPI and exchange rate.

Like to above we estimated the regression equation taking M₂ instead of M₁ and we got the result as,

Model IV:

$$\ln \text{NCPI} = -1.49 + 0.21 \ln M_2 + 0.691 \ln \text{IWPI} + 0.47 \ln \text{ER}$$

$$(-11.78) \quad (2.97)^* \quad (4.13)^* \quad (2.77)^*$$

$$R^2 = 0.9998 \text{ Adjusted } R^2 = 0.998 \text{ D-W} = 0.724, F = 4841.802, N = 37$$

NOTE: * Significant at 1%

Thus equation shows that elasticity coefficient of inflation with respect to M_2 , IWPI and ER are 0.21, 0.69 and 0.47 respectively. The figure in parenthesis shows t-statistics. It signifies that broad money supply, Indian Wholesale Price Index and exchange rate are also responsible for the inflationary situation in Nepal. The F and t-statistics also shows the significance of variables taken at a given level. Again, Indian price have more deterministic factors influencing the inflation in Nepal. The model explains 99.8 percent of the variation is dependent variable i.e. NCPI. The adjusted R^2 value which account for 98% of the variation in consume price index. The D-W statistics which indicates the error terms are said to be positively auto correlated.

Model V:

$$\ln \text{NCPI} = -1.58 + 0.31 \ln M_1 + 0.59 \ln \text{IWPI}$$

$$(-9.62) \quad (3.545)^* \quad (3.282)^*$$

$$R^2 = 0.997 \text{ Adjusted } R^2 = 0.997 \text{ D-W} = 0.739 F = 637.891 N = 37$$

Note: Significant at 1% level

This equation shows that one unit growth in M1 and IWPI causes 0.31 and 0.59 units growth in NCPI inflation. The figure in the parenthesis shows t-statistics. The F and t-statistics also shows the significance of variable taken at a given level. The values of R^2 and adjusted R^2 are very high which shows that 99.7% of the total variation is explained by explanatory variables. The coefficient of M1 and IWPI both are high and have become more powerful then the previous model. D-W statistics is 0.739 which indicates the error terms are said to be positively auto-correlated.

Model VI:

$$\ln\text{NCPI} = -1.43 + 0.25 \ln M_2 + 0.63\ln\text{IWPI}$$

$$(-10.51) \quad (3.22)^* \quad (3.49)^*$$

$$R^2 = 0.997 \quad \text{Adjusted } R^2 = 0.997 \quad \text{D-W} = 0.674 \quad \text{F} = 6071.896 \quad \text{N} = 37$$

Note: * Significant at 1% level

This equation shows that one unit growth in M_2 and IWPI causes 0.25 and 0.63 unit growth in NCPI inflation. The figure in the parenthesis shows t-statistics. The F and t-statistics also shows the significance of variable taken at given level. The values of R^2 and adjusted R^2 are very high which shows that 99.7 percent of the total variation is explained by explanatory variables. In this model, again Indian inflation is more deterministic factor influencing the inflation in Nepal. D-W statistics is 0.674 which indicates the error terms are said to be positively auto-correlated.

Model VII:

$$\ln \text{NCPI} = -2.15 + 0.57 \ln M_1 + 0.31 \ln \text{ER}$$

$$(-31.55) \quad (74.31) \quad (1.56)^*$$

$$R^2 = 0.997, \text{ Adjusted } R^2 = 0.997 \quad F = 5191.018 \quad D-W = 0.692 \quad N = 37$$

Note: * significant at 10% level

This equation shows that one unit growth in M_1 and ER causes 0.57 and 0.31 unit growth in NCPI inflation. The figure in parenthesis shows t-statistics also shows that the significance of variables taken at given level. The value of R^2 and adjusted R^2 is very high which shows that 99.7 percent of the total variation is explained by explanatory variables. Narrow money supply and fixed exchange rate both have more powerful influence in inflation as shown by the coefficient of above model. Durbin statistics which indicates that the error terms are said to be positively auto correlated.

Model VIII:

$$\ln \text{NCPI} = -1.96 + 0.50 \ln M_2 + 0.39 \ln \text{ER}$$

$$(-27.96) \quad (71.77) \quad (1.914)^*$$

$$R^2 = 0.997, \text{ Adjusted } R^2 = 0.996 \quad F = 4843.034 \quad D-W = 0.572 \quad N = 37$$

Note: * significant at 10% level

The above regression equation shows that the elasticity coefficient of inflation with respect to M_2 and ER are 0.50 and 0.39 respectively. It means 1 percent increase in M_2 and ER causes 0.50 percent and 0.39

percent rise in price level respectively. The figure in the parenthesis shows t-statistics. It signifies that broad money supply and fixed exchange rate are responsible for inflationary situation in Nepal. However, among these two variables, M_2 is more deterministic factor influencing the inflation in Nepal. F and t-statistics also shows the significance of variables taken at a given level. The values of R^2 and adjusted R^2 are very high which shows that 99.79% of total variation is explained by explanatory variables. D-W statistics is 0.572 which indicates that error terms are said to be positively auto-correlated.

Besides all these estimations we incorporate real gross domestic product (RGDP) in various combinations of different variables but we could not find them significant. They are not only became insignificant but also made other variables insignificant in some of the cases and even their coefficient were found with theoretically unexpected sign in other cases. That's why we exclude them from our model (for detail see appendix).

4.3 Estimation at first difference:

When we estimated various equations in level form, they were not free from the problem of serial correlation as the time series data are mostly non stationery in level form. Now to obtain the short term relationship and to correct the problem of non stationary also, we estimated the various equations in first difference taking into consideration of the variables chosen in the study. Out of all estimated results, only the significant results have been presented here.

To find out the short term relationship between NCPI inflation, narrow money supply and Indian wholesale price index, we estimated the equation as

Model IX:

$$\Delta \ln \text{NCPI} = 0.033 + 0.184 \Delta \ln M_1 + 0.94 \Delta \ln \text{IWPI}$$

$$(1.73)^* \quad (1.57)^* \quad (1.64)^*$$

$$R^2 = 1.067, \text{ Adjusted } R^2 = 0.116, \text{ D-W} = 1.766, \text{ F} = 3.3300, \text{ N} = 37$$

Note: significant at 10% level

This equation shows that one unit growth in M_1 and IWPI causes 0.18 and 0.29 unit growth in NCPI inflation. The figure in parenthesis shows t-statistics. The F and t- statistics also shows that the significance of variables taken at given level. The Durbin-Watson value is 1.766 which is approximately 2 shows the absence of auto correlation in the model. It shows that the time series data are stationary in first difference.

From the above analysis we came to the conclusion that narrow monetary aggregates, Indian price level are responsible for triggering inflation in Nepal both in short and long-run.

CHAPTER- V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Summary

In summing up the findings derived from the empirical exercises of this study, we come to the following ends.

1. Monetary aggregate particularly the M_1 aggregates has a significant role in determining inflation in Nepal. Monetary authority should rely on narrow monetary aggregate compared to M_2 aggregate because the elasticity coefficient of M_1 monetary aggregate is larger than M_2 monetary aggregate. The result further supports that M_1 is more liquid monetary assets rather than M_2 .

2. International influence on domestic price level is another potent factor guiding the inflationary situation in any country. In views of this, we introduce Indian Wholesale Price Index (IWPI) as an additional explanatory variable. The reason for incorporating this variable in our analysis is that India is our major trading partner sharing open border with her. The statistically significant coefficient of IWPI also supports our hypothesis that Indian inflation has positive impact on Nepalese inflation.

3. Fixed exchange rate system with India also plays a vital role in guiding the inflationary situation in Nepal. Her currency is pegged with Indian currency. There is free mobility of input and output within the area. There is a free mobility of labor between India and Nepal. Also Nepal's trade is

heavily concentrated with India. Beside these, due to open border and strong socio-economic ties, there is a lot of informal trade between the countries. In these circumstances, the fixed exchange rate has reduced the cost of transaction and has also become a source of stability. However, it is said that the longer the fixed exchange rate is maintained, the greater the crisis it might invite.

4. Besides monetary aggregate, IWPI and fixed exchange rate with India, the functioning of government as reflected in fiscal policy are expected to have a positive impact on inflation. Under this back ground, in this thesis, we introduced fiscal deficit as an independent variable and we include it in our model. The statistically significant elasticity coefficient as estimated in this study supports our expectation that fiscal exercise matters in triggering inflation in Nepal.

5.2 Conclusion

Historically, a great deal of economic literature was concerned with the question of what causes inflation and what effect it has. Forecasting inflation is a key for a central bank to adjust its monetary policy to control inflation. Regardless of its monetary policy framework money growth target, exchange rate or inflation target, stabilizing inflation is a primary objective of monetary policy.

The main goal of this work was to determine the factors influencing inflation in Nepal. To have this goal reached analytical method was used, this method allows to systematically analyzing all information and data collected. Applying simple to general approach of model specifications, the explanatory variables of the robust model compares of M_1 monetary

aggregates, Indian wholesale price index and fixed exchange rate with India. The role of IWPI in stimulating inflation as compared to other variables is relatively high implying India inflation is considered as in Nepal instantaneously.

The fiscal deficit as a proxy variable of fiscal operation has also statistically significant role in triggering inflation. The elasticity coefficient for the fiscal deficit is found to be small. This may be due to the structure of national government expenditure. Most of the part of the expenditure is used to finance current and capital expenditure. Political instability is the major reason behind it. The variable namely real gross domestic product (RGDP) unfortunately, could not found to be significant variables in explaining inflation. The inverse relationship between NCPI and real GDP may be due to the performance of agriculture which accounts for nearly more than 35 percent of total GDP. Agriculture has been performing well in Nepal in recent years due to suitable weather condition and due to the effort made by government to improve agricultural performance as the output increases, agriculture will hold the great share of the increase. This in turn implies that output of food item will increase. The increase output will result in lower NCPI.

As Nepal is sharing long open border with India, inflation in home country is attributed by Indian inflation. In contrary to the findings of almost one to one relationship of Indian and Nepalese inflation as depicted in their previous studies taking bivariate relationship may not be resembled with the coefficients estimated in this study where this variable is found to be significant in multivariate case. As narrow monetary

aggregate is more than broad monetary aggregate, it claims its better explanatory power than that of M_2 .

5.3 Recommendation

There are generally three steps of policy options for the anti-inflationary trend, which are: monetary, fiscal and direct control measures. The policy appropriate to control inflation can be selected according to the economic characteristics and nature of inflationary situation of the country. Any one, or both or all the measures can be applied by examining the feasibility, applicability and efficiency of these different methods. From the empirical findings, some of the important policies, which can be adopted for controlling the rising inflationary trend, may be the followings:

1. The money supply is one of the factors for rising inflation in Nepal. It has a partial impact. Therefore the goal of the monetary policy is stabilizing inflation is not fully controlled because on the one hand the elasticity coefficient as obtained in this study is midway to fifty percent and on the other hand a number of structural bottlenecks that have subdued Nepalese economy. Though inflation is guided by both the supply side and demand side, the monetary authority should take its step to curb inflation through later channel. Moreover while taking the monetary measures, monetary authorities are recommended to peruse the goal of achieving price stability via narrow monetary aggregates rather than broad monetary aggregates.

2. The option of the government is fiscal policy that it exercises to control inflation. It can regulate inflation particularly through direct and indirect

channel. By maintaining government expenditure as desired by the economy, inflation can be controlled directly whereas it can regulate inflation by coordinating monetary authority indirectly. Therefore government should follow fiscal discipline and should coordinate with central bank to achieve price stability goal.

3. In order to tame the inflation into desired level, both the monetary and fiscal authorities should have a strong coordination in exercising their policy stances. But in case of Nepal, on one hand government is increasing its expenditure to meet its requirement particularly by using its fiscal tool; deficit financing whereas monetary authority employ its monetary policy by using its monetary variables like CRR to maintain the price stability which are contradictory to each other. What it shows is the price stability if possible if and only if strong co-ordination between the monetary and fiscal side could be maintained.

4. Government must improve productivity in agriculture in order to increase the production of domestically consumed products. As a result increased output is accompanied by increased food production, food is the major share holder in the NCPI, which in turn results reduced inflation. Domestic product is to be encouraged to meet the internal demand. This helps to discourage import and reduce inflation caused by importer. Illegal trade in the border side of the country should be minimized which helps to strengthen the competitiveness of the local industries.

5. As this study shows inflation in Nepal is importer of Indian inflation, the only policy option in this end is to give priority for the establishment

of the industries which can substitute the import substantially. In one hand protection policy is to be adopted for the promotion of domestic products whereas tariff rate is to be regulated so as to discourage import but such a policy should be inline with WTO rules and regulations.

6. Inflation transmits across national boundaries and the small and open economies especially countries with fixed exchange rate regime highly suffer from it. Because of close geographic proximity open border of about 550 miles age old family ties between the residents of two countries, free and unlimited convertibility of Indian currency inflation finds its way to Nepal. It is truth that the longer the fixed exchange rate is maintained, the greater the crisis it might invite.

7. Except these factors the other invisible causes of sky rocketing price hike in the country are the imperfect market mechanism, black marketing, hoarding, and lack of good governance, inefficiency of motoring unit, monopoly of vendors, frequent public demonstration, general strike, and lack of consumer awareness, corrupt bureaucracy, irresponsible politicians, and transitional politics. All these shortcomings can be corrected if and only if political stability could be maintained. So strong and stable government is must.

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APPENDIX I

Year	NCPI	IWPI	RGDP	FD	M ₁	M ₂	ER
1975	8.9	13.43	149537.2	222.6	1337.7	2064.4	1.39
1976	8.8	13.54	154214.3	438.1	1452.5	2524	1.39
1977	9	14.14	157499.5	614.9	1852.9	3223	1.39
1978	10.1	14.19	155130.7	653.8	2060.6	3772.1	1.45
1979	10.4	15.81	170692.2	622.6	2504.9	4511.4	1.45
1980	11.4	18.96	178222.2	785.1	2830.4	5285.3	1.45
1981	12.9	21.3	178948.5	804.2	3207.8	6307.7	1.45
1982	14.3	21.82	194691.5	1688.5	3611.5	7458	1.45
1983	16.3	23.52	205169.6	3047.5	4348.9	9222.4	1.45
1984	17.3	25.17	214537.1	3151.4	4931.5	10455.2	1.45
1985	18.1	26.34	218183.7	3554.8	5480	12296.6	1.45
1986	20.9	27.81	234976.5	3979.7	7029.3	15159	1.68
1987	23.7	29.73	245145.6	4253	8120.2	17498.2	1.68
1988	26.3	32.32	256508.2	4677.8	9596.6	21422.6	1.68
1989	28.4	34.54	272838.6	8547.5	11775.4	26605.1	1.68
1990	31.2	37.63	284047	8406.4	14223	31522.4	1.68
1991	34.3	42.71	294973.6	10655.1	16283.6	37712.5	1.65
1992	41.5	47.79	319218.2	11261.7	19457.7	45670.5	1.65
1993	45.1	50.95	330290.1	11956	23833	58322.5	1.6
1994	49.2	56.74	347920.1	11623	28510.4	69777.1	1.6
1995	52.9	62.45	366223.7	10547.7	32985.4	80984.7	1.6
1996	57.3	64.84	377000	13824.2	36498	92652.2	1.6
1997	61.9	67.76	393900.5	14362	38460.3	103720.6	1.6
1998	67	71.72	417992.4	17777.8	45163.8	126462.6	1.6
1999	74.7	74.21	441518.6	18108.6	51062.5	152800.2	1.6
2000	77.2	79.11	442048.4	17667	60979.7	186120.8	1.6
2001	79.1	82.89	459488.4	24188	70577	214454.2	1.6
2002	81.4	85	481003.5	22940.6	77156.2	223988.3	1.6
2003	85.2	89.6	497739	16437.2	83754.1	245911.2	1.6
2004	88.6	95.5	514485.3	845828.2	93973.7	277310.1	1.6
2005	92.6	100	497739	18046.6	100205.8	300440	1.6

2006	100	104.7	5145485	24779.6	114388.8	347421.8	1.6
2007	105.9	109.8	531682.3	30091.7	113060.8	346824.1	1.6
2008	113	119.8	560123.8	33406.7	126888	395518.2	1.6
2009	127.2	122.4	590107.2	49804.7	154343.9	495377.1	1.6
2010	139.4	133.9	618529.4	41197.4	196459.4	630521.2	1.6
2011	152.7	145.8	64255.3	49622.2	218159	719599.1	1.6

APPENDIX II

Year	lnNCPI	lnIWPI	lnRGDP	lnFD	lnM1	lnM2	lnER
1975	2.18605	2.59749	11.91530	5.40538	7.19871	7.63259	0.32930
1976	2.17475	2.60565	11.94610	6.08245	7.28104	7.83360	0.32930
1977	2.19722	2.64901	11.96718	6.42146	7.52451	8.07807	0.32930
1978	2.31254	2.65254	11.95202	6.48280	7.63075	8.23539	0.37156
1979	2.34181	2.76064	12.04762	6.43390	7.82600	8.41436	0.37156
1980	2.43361	2.94233	12.09079	6.66581	7.94817	8.57268	0.37156
1981	2.55723	3.05871	12.09485	6.68985	8.07334	8.74953	0.37156
1982	2.66026	3.08283	12.17917	7.43160	8.19188	8.91704	0.37156
1983	2.79117	3.15785	12.23159	8.02208	8.37768	9.12939	0.37156
1984	2.85071	3.22565	12.27624	8.05560	8.50340	9.25485	0.37156
1985	2.89591	3.27109	12.29309	8.17605	8.60886	9.41708	0.37156
1986	3.03975	3.32540	12.36724	8.28896	8.85784	9.62635	0.51879
1987	3.16548	3.39216	12.40961	8.35538	9.00211	9.76985	0.51879
1988	3.26957	3.47569	12.45492	8.45058	9.16916	9.97220	0.51879
1989	3.34639	3.54212	12.51664	9.05339	9.37377	10.18886	0.51879
1990	3.44042	3.62780	12.55689	9.03675	9.56262	10.35845	0.51879
1991	3.53515	3.75443	12.59464	9.27379	9.69791	10.53775	0.50078
1992	3.72569	3.86682	12.67363	9.32916	9.87600	10.72921	0.50078
1993	3.80888	3.93084	12.70773	9.38899	10.07883	10.97374	0.47000
1994	3.89589	4.03848	12.75973	9.36074	10.25802	11.15306	0.47000
1995	3.96840	4.13437	12.81100	9.26366	10.40382	11.30202	0.47000

1996	4.04830	4.17192	12.84000	9.53418	10.50501	11.43661	0.47000
1997	4.12552	4.21597	12.88385	9.57234	10.55738	11.54946	0.47000
1998	4.20469	4.27277	12.94322	9.78571	10.71805	11.74770	0.47000
1999	4.31348	4.30690	12.99798	9.80414	10.84081	11.93689	0.47000
2000	4.34640	4.37084	12.99917	9.77945	11.01830	12.13415	0.47000
2001	4.37071	4.41751	13.03787	10.09361	11.16446	12.27585	0.47000
2002	4.39938	4.44265	13.08363	10.04066	11.25359	12.31935	0.47000
2003	4.44500	4.49536	13.11783	9.70730	11.33564	12.41273	0.47000
2004	4.48413	4.55913	13.15092	9.66955	11.45077	12.53289	0.47000
2005	4.52829	4.60517	13.11783	9.80071	11.51498	12.61300	0.47000
2006	4.60517	4.65110	15.45363	10.11778	11.64736	12.75829	0.47000
2007	4.66250	4.69866	13.18380	10.31200	11.63568	12.75657	0.47000
2008	4.72739	4.78582	13.23591	10.41651	11.75106	12.88795	0.47000
2009	4.84576	4.80729	13.28806	10.81586	11.94694	13.11307	0.47000
2010	4.93735	4.89709	13.33510	10.62613	12.18821	13.35430	0.47000
2011	5.02848	4.98224	11.07062	10.81219	12.29298	13.48645	0.47000

APPENDIX III

Year	$\Delta \ln \text{NCPI}$	$\Delta \ln \text{IWPI}$	$\Delta \ln \text{RGDP}$	$\Delta \ln \text{FD}$	$\Delta \ln \text{M1}$	$\Delta \ln \text{M2}$	$\Delta \ln \text{ER}$
1976	-0.01130	0.00816	0.03080	0.67707	0.08233	0.20101	0.00000
1977	0.02247	0.04336	0.02108	0.33901	0.24347	0.24447	0.00000
1978	0.11531	0.00353	-0.01515	0.06134	0.10625	0.15732	0.04226
1979	0.02927	0.10811	0.09559	-0.04890	0.19525	0.17898	0.00000
1980	0.09181	0.18169	0.04317	0.23191	0.12217	0.15832	0.00000
1981	0.12361	0.11638	0.00407	0.02404	0.12517	0.17684	0.00000
1982	0.10303	0.02412	0.08432	0.74175	0.11854	0.16752	0.00000
1983	0.13091	0.07502	0.05242	0.59048	0.18580	0.21235	0.00000
1984	0.05954	0.06780	0.04465	0.03353	0.12572	0.12546	0.00000
1985	0.04521	0.04544	0.01685	0.12045	0.10546	0.16222	0.00000

1986	0.14384	0.05431	0.07415	0.11291	0.24898	0.20927	0.14723
1987	0.12573	0.06676	0.04237	0.06642	0.14427	0.14350	0.00000
1988	0.10409	0.08353	0.04531	0.09520	0.16705	0.20235	0.00000
1989	0.07682	0.06643	0.06172	0.60281	0.20460	0.21666	0.00000
1990	0.09403	0.08568	0.04026	-0.01665	0.18885	0.16960	0.00000
1991	0.09473	0.12663	0.03775	0.23705	0.13530	0.17929	-0.01802
1992	0.19055	0.11238	0.07899	0.05537	0.17808	0.19146	0.00000
1993	0.08319	0.06403	0.03410	0.05983	0.20283	0.24454	-0.03077
1994	0.08701	0.10763	0.05200	-0.02825	0.17920	0.17932	0.00000
1995	0.07251	0.09589	0.05127	-0.09708	0.14580	0.14895	0.00000
1996	0.07990	0.03756	0.02900	0.27051	0.10119	0.13459	0.00000
1997	0.07722	0.04405	0.04385	0.03817	0.05237	0.11285	0.00000
1998	0.07917	0.05680	0.05936	0.21336	0.16067	0.19825	0.00000
1999	0.10879	0.03413	0.05476	0.01844	0.12275	0.18918	0.00000
2000	0.03292	0.06394	0.00120	-0.02469	0.17749	0.19726	0.00000
2001	0.02431	0.04668	0.03869	0.31416	0.14616	0.14170	0.00000
2002	0.02866	0.02514	0.04576	-0.05295	0.08913	0.04350	0.00000
2003	0.04563	0.05270	0.03420	-0.33336	0.08205	0.09338	0.00000
2004	0.03913	0.06377	0.03309	-0.03775	0.11513	0.12017	0.00000
2005	0.04416	0.04604	-0.03309	0.13116	0.06421	0.08011	0.00000
2006	0.07688	0.04593	2.33580	0.31706	0.13238	0.14529	0.00000
2007	0.05733	0.04756	-2.26983	0.19423	-0.01168	-0.00172	0.00000
2008	0.06489	0.08716	0.05211	0.10451	0.11538	0.13138	0.00000
2009	0.11837	0.02147	0.05215	0.39935	0.19588	0.22512	0.00000
2010	0.09159	0.08980	0.04704	-0.18973	0.24127	0.24123	0.00000
2011	0.09113	0.08514	-2.26448	0.18606	0.10477	0.13215	0.00000

Model: 1

$$\ln\text{NCPI} = a_0 + a_1\ln M_1 + a_2\ln\text{IWPI} + a_3 \ln\text{RGDP} + a_4 \ln\text{FD} + a_5 \ln\text{ER}$$

variables	Regression Coefficients	t	Sig
constant	-1.478	-6.113	.00
M ₁	.267	3.151	.004
IWPI	.618	3.427	.002
RGDP	-.014	-.665	.511
FD	.017	.689	.496
ER	.320	1.419	.166

$$R^2 = 0.998, \text{ Adjusted } R^2 = 0.997 \text{ F} = 2858.979 \text{ D-W} = 0.835$$

Model :2

$$\ln\text{NCPI} = a_0 + a_1\ln M_2 + a_2\ln\text{IWPI} + a_3\ln\text{RGDP} + a_4 \ln \text{FD} + a_5\ln\text{ER}$$

variables	Regression Coefficients	t	Sig
constant	-1.373	-5.857	.000
M ₁	.217	2.921	.006
IWPI	.681	3.940	.000
RGDP	-.012	-.583	.564
FD	.003	.100	.921
ER	.449	2.008	.053

$$R^2 = 0.998, \text{ Adjusted } R^2 = 0.997 \text{ F} = 2761.439 \text{ D-W} = 0.763$$

Model: 3

$$\Delta\ln\text{NCPI} = a_0 + a_1 \Delta\ln M_1 + a_2 \Delta\ln\text{IWPI} + a_3 \Delta\ln\text{RGDP} + a_4 \Delta \ln\text{FD} + a_5 \Delta\ln\text{ER}$$

variables	Regression Coefficients	t	Sig
Constant	.036	1.714	.097
M ₁	.103	.765	.450
IWP	.363	1.804	.080
RGDP	-.001	-.075	.941
FD	.016	.559	.580
ER	.475	1.791	.083

$$R^2 = 0.224, \text{ Adjusted } R^2 = 0.094 \text{ F} = 1.729 \text{ D-W} = 1.636$$

Model: 4

$$\Delta \ln \text{NCPI} = a_0 + a_1 \Delta \ln M_2 + a_2 \Delta \ln \text{IWPI} + a_3 \Delta \ln \text{RGDP} + a_4 \Delta \ln \text{FD} + a_5 \Delta \ln \text{ER}$$

variables	Regression Coefficients	t	Sig
Constant	.025	1.082	.288
IWPI	.349	1.805	.081
RGDP	-.002	-.237	.815
FD	.007	.219	.828
ER	.496	1.985	.056
M ₂	.171	1.262	.217

$$R^2 = 0.248, \text{ Adjusted } R^2 = 0.123 \text{ F} = 1.984 \text{ D-W} = 1.638$$

Model: 5

$$\Delta \ln \text{NCPI} = a_0 + a_1 \Delta \ln M_1 + a_2 \Delta \ln \text{IWPI} + a_3 \Delta \ln \text{RGDP} + a_4 \Delta \ln \text{FD} + a_5 \Delta \ln \text{ER}$$

variables	Regression Coefficients	t	Sig
Constant	.036	1.811	.080
M ₁	.099	.805	.427
IWPI	.366	1.868	.071
FD	.016	.569	.573
ER	.477	1.838	.076

$$R^2 = 0.224, \text{ Adjusted } R^2 = 0.123 \text{ F} = 2.232 \text{ D-W} = 1.632$$

Model:6

$$\Delta \ln \text{NCPI} = a_0 + a_1 \Delta \ln M_2 + a_2 \Delta \ln \text{IWPI} + a_3 \Delta \ln \text{FD} + a_4 \Delta \ln \text{ER}$$

variables	Regression Coefficients	t	Sig
Constant	.026	1.201	.239
IWP	.355	1.878	.070
FD	.007	.244	.809
ER	.498	2.026	.051
M ₂	.160	1.279	.210

$$R^2 = 0.247, \text{ Adjusted } R^2 = 0.150 \text{ F} = 2.543 \text{ D-W} = 1.635$$

Model:7

$$\Delta \ln \text{NCPI} = a_0 + a_1 \Delta \ln M_1 + a_2 \Delta \ln \text{IWPI} + a_3 \Delta \ln \text{FD}$$

variables	Regression Coefficients	t	Sig
Constant	.036	1.707	.097
M ₁	.168	1.381	.177
IWPI	.273	1393	.173
FD	.010	.344	.733

$$R^2 = 0.139, \text{ Adjusted } R^2 = 0.058 \text{ F} = 1.722 \text{ D-W} = 1.782$$

Model: 8

$$\Delta \ln \text{NCPI} = a_0 + a_1 \Delta \ln M_1 + a_2 \Delta \ln \text{IWPI} + a_3 \Delta \ln \text{FD}$$

variables	Regression Coefficients	t	Sig
Constant	.029	1.265	.215
IWP	.276	1.426	.164
FD	.000	-.005	.996
M ₂	.194	1.497	.144

$$R^2 = 0.147, \text{ Adjusted } R^2 = 0.067 \text{ F} = 1.844 \text{ D-W} = 1.752$$

Model: 9

$$\Delta \ln \text{NCPI} = a_0 + a_1 \Delta \ln M_1 + a_2 \Delta \ln \text{IWPI} + a_3 \Delta \ln \text{ER}$$

variables	Regression Coefficients	t	Sig
Constant	.040	2.114	.042
IWP	.108	.888	.381
FD	.332	1.798	.082
M ₂	.460	1.803	.081

$$R^2 = 0.215, \text{ Adjusted } R^2 = 0.142 \text{ F} = 2.929 \text{ D-W} = 1.608$$

Model: 10

$$\Delta \ln \text{NCPI} = a_0 + a_1 \Delta \ln M_2 + a_2 \Delta \ln \text{IWPI} + a_3 \Delta \ln \text{ER}$$

variables	Regression Coefficients	t	Sig
Constant	.027	1.253	.219
IWP	.340	1.936	.062
FD	.491	2.041	.050
M ₂	.169	1.449	.157

$R^2 = 0.246$, Adjusted $R^2 = 0.175$ F= 3.473 D-W = 1.631

Model: 11

$$\Delta \ln \text{NCPI} = a_0 + a_1 \Delta \ln M_1 + a_2 \Delta \ln \text{FD}$$

variables	Regression Coefficients	t	Sig
Constant	.049	2.647	.012
M ₁	.212	1.771	.086
FD	-.001	-.050	.960

$R^2 = 0.087$, Adjusted $R^2 = 0.031$ F= 1.568 D-W = 1.527

Model: 12

$$\Delta \ln \text{NCPI} = a_0 + a_1 \Delta \ln M_2 + a_2 \Delta \ln \text{FD}$$

variables	Regression Coefficients	t	Sig
Constant	.043	2.005	.053
M ₂	.236	1.842	.074
FD	-.014	-.478	.636

$R^2 = 0.093$, Adjusted $R^2 = 0.038$ F= 1.696 D-W = 1.485

Model: 13

$$\Delta \ln \text{NCPI} = a_0 + a_1 \Delta \ln M_2 + a_2 \Delta \ln \text{IWPI}$$

variables	Regression Coefficients	t	Sig
Constant	.029	1.291	.206
M ₂	.194	1.594	.121
IWPI	.277	1.530	.136

$R^2 = 0.147$, Adjusted $R^2 = 0.96$ F= 2.853 D-W = 1.752