DETERMINANTS OF INFLATION IN NEPAL

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In

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By

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DECLARATION

I, BISHOW BANIYA, declare that this thesis entitled DETERMINANTS OF INFLATION IN NEPAL submitted to Central Department of Economics is my own original work unless otherwise indicated or acknowledge in the thesis. The thesis does not contain materials which has been accepted or submitted for any other degree at the University or other institution. All sources of information have been specifically acknowledged by reference to the author(s) or institution(s).

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LETTER OF RECOMMENDATION

This thesis entitled *determinants of inflation in Nepal* has been prepared by Ms. Bishow Baniya under my supervision. I hereby recommend this thesis for examination by the thesis committee as a partial fulfillment of the requirements for the Degree of Master of Arts in Economis.

....

Prof. Dr. Ram Prasad Gyanwaly

(Thesis Supervisor)

Date: 18/11/2021

APPROVAL LETTER

We clarify that this thesis entitled *determinants of inflation in Nepal* submitted by **Ms. Bishow Baniya** to the Central Department of Economics. Faculty of Humanities and Social Science, Tribhuvan University, in partial fulfillment of the requirement of the requirements for the degree of **Master of Arts** in **Economics** has been found satisfactory in scope and quality. Therefore, we accept this thesis as a part of the Degree.

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ABBREVIATIONS

ADF	-	Augmented Dickey Fuller Test
CPI	-	Consumer Price Index
CUSUM	-	Cumulative Sums
ECM	-	Error Correction Model
EXR	-	Exchange Rate
FY	-	Fiscal Year
GEXP	-	Government Expenditure
ICPI	-	Indian Consumer Price Index
M2	-	Broad Money Supply
NCPI	-	Nepalese Consumer Price Index
NRB	-	Nepal Rastra Bank
OLS	-	Ordinary Least Squares
WB	-	World Bank

CHAPTER I

INTRODUCTION

1.1   Background of the study

Inflation is simply rise in general price level over a period of time which caused decrease in purchasing power of money, there is no universally accepted definition of inflation. The inflation rate between any two periozds of time is measured by the percentage increase in the relevant price index from the first period to the second period.

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). Private entrepreneurs react to high levels of inflation by lowering their investment, which eventually leads to a retardation of the country's economic growth. Contrary to this, price stability preserves the integrity and purchasing power of currency. When prices are stable, both economic growth and stability are likely to be achieved, and long-term interest rates 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 money. Thus, the primary role of monetary policy should be to maintain price stability. (Batini & Yates, 2003). Pianalto (2005) in economics, inflation (or less frequently, price inflation) is a general rise in the price level in an economy over a period of time. When the general price level rises, each unit of currency buys fewer goods and services; consequently, inflation reflects a reduction in the purchasing power per unit of money – a loss of real value in the medium of exchange and unit of account within the economy. The opposite of inflation is deflation, a sustained decrease in the general price level of goods and services.

The price level and its growth, inflation, is an important economic indicator. Inflation can be defined as the persistent rise in the general price level across the economy over time. Inflation is an increase in the volume of money and credit relative to available goods resulting in a substantial and continuing rise in the general price level. More precisely, inflation is a substantial and continuing increase in the volume of money and credit relative to available goods, resulting in a substantial and continuing rise in

the general price level. There is an important distinction between this definition and a popular misconception that results from our attempts to measure the general price level.

There are various indices which measure the price level, such as; consumer price index (CPI): wholesale price index (WPI); sensitive price index (SPI); gross domestic product (GDP) 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 measure of prices on households. Through this procedure, we tend to think of inflation as an increase in the price indexes so that any increase in an index is labelled "inflation". A continuous rise in price level is termed as inflation. Inflation is an ongoing process whereby prices are rising persistently year after year. Shapiro (2010) defines inflation as a rising price level. If such a rise in price level persist for long it is known as inflation. Consumer price index, gross domestic product deflator and other several indices measure the changes in price level. The use of these measures is purposely applied wherever appropriate. However, the rate of percentage change in consumer price index as a measure of inflation is widely used. We also here adopt this definition of inflation for our purpose. Inflation is everywhere and is interestingly touchy issue in macroeconomics. All daily newspapers cover the news about inflation. There is no dearth of literature on inflation. It is the mostly discussed issue all over the world among policy makers and academia. It is because of the fact that its effects are widespread and severe and the impacts are far reaching. Inflation has been the major concern for the government since it has serious implication for the living of common peoples. Moreover, it affects several macroeconomic variables such as saving, investment, real interest, real wage, real income and level of employment. Inflation depreciates domestic currency and the imports become more expensive which further push up the domestic prices. In short, inflation is a burning issue in the macroeconomics and main objective and function of central bank is to control inflation. Table 1 shows that price index has increased persistently over the years. It has increased by little over twenty-five times (from 6.4 to 165.9) during 1975-2020. This means the purchasing power of the Nepalese rupee has decreased by the same speed. The impact of rising prices on the real sector is stylized fact. It constrains the rise of per capita real GDP and thereby reduces the standard of livings of the common people in the country. The stationary price level has thus been one of success parameters of the government. However, it has been a

Herculean task to achieve in developing countries. In case of Nepal, however, there appear some positive signals in slowing down the speed of price rise in the later years. For instance, CPI took nine years to double from 6.4 in 1975 to 12.5 in 1984; it doubled even faster within six years between 1985 and 1991 and it took eight-year period between 1991 to 1999. This has, however, turned upside down since the doubling period lengthened to 11 years between 1999 and 2010. This clearly indicates that prices have accelerated at slower motion especially after 1991's political change. One of the reasons for this might be relatively improved supply situation of the commodities during this period. Partly because Nepal's improved bilateral relation with India in the changing context and partly because of the sharply improved trade openness index due to trade liberalization policy adopted by the government during early 1990s (Bowdler & Nunziata, 2004). Some empirical studies substantiate that trade openness index has important bearing on the combating hyperinflation. This paper attempts to examine the relation between inflation and other related variables that influence the inflation in the country and suggest policy implications.

Table 1.1

Consumer Price Index for the period 1975-2020

Fiscal Year	M2	CPI	Fiscal Year	M2	CPI	Fiscal Year	M2	CPI
1974/75	2,064.4	4.2	1990/91	37,712.5	16.1	2006/07	395,518.2	49.8
1975/76	2,524.0	4.1	1991/92	45,670.5	19.5	2007/08	495,377.1	53.2
1976/77	3,223.0	4.3	1992/93	58,322.5	21.2	2008/09	630,521.2	59.9
1977/78	3,772.1	4.7	1993/94	69,777.1	23.1	2009/10	719,599.1	65.6
1978/79	4,511.4	4.9	1994/95	80,984.7	24.9	2010/11*	921,320.1	71.9
1979/80	5,285.3	5.4	1995/96	92,652.2	26.9	2011/12	1,130,302.3	77.8
1980/81	6,307.7	6.1	1996/97	103,720.6	29.1	2012/13	1,315,376.3	85.5
1981/82	7,458.0	6.7	1997/98	126,462.6	31.5	2013/14	1,565,967.2	93.3
1982/83	9,222.4	7.7	1998/99	152,800.2	35.1	2014/15	1,877,801.5	100.0
1983/84	10,455.2	8.2	1999/00	186,120.8	36.3	2015/16	2,244,578.6	109.9
1984/85	12,296.6	8.5	2000/01	214,454.2	37.2	2016/17	2,591,702.0	114.8
1985/86	15,159.0	9.8	2001/02	223,988.3	38.3	2017/18	3,094,466.6	119.6
1986/87	17,498.2	11.2	2002/03	245,911.2	40.1	2018/19	3,582,137.6	125.1
1987/88	21,422.6	12.4	2003/04	277,306.1	41.7	2019/20	4,230,969.8	132.8
1988/89	26,605.1	13.4	2004/05	300,440.0	43.6			
1989/90	31,552.4	14.7	2005/06	346,824.1	47.1			

Source: Nepal Rastra Bank, Base year (2014/15 =100)

Table1.1 presents the relationship between inflation and the growth of money supply in Nepal during 1975-2020. Both the inflation and the growth of money supply move in the same direction but broad supply has always been higher than inflation. High positive correlation between money supply and consumer price index exhibits a very close association between these two variables. Many studies have shown that inflation and real GDP have opposite trends (i.e. when inflation increases the real GDP decreases). Inflation is higher for almost all years and that of real output seems to be lower for almost all years. However, the high correlation coefficient between prices and real GDP demonstrates strong association between two variables. Figure 3 presents the inflation rates in Indian and Nepalese economies. This clearly shows that inflation, with an exception for a few years, is always higher in Nepal compared to India. Since there is the higher dominance of imported Indian goods in the domestic market, inflation in Nepal is dependent on inflation in India.

There are several factors that may influence the inflation. In Nepal, price level, budget deficits, money supply, real GDP are continuously rising for many years. However, this does not prove that one causes other. This study examines that fluctuation of inflation in Nepal, structure weighted of CPI and determinants of inflation in Nepal.

CPI is the most usually reported price index for measuring the consumer good inflation in almost all of the economies. By name, it is an index for measuring the price movements of consumer goods and services only, not the goods and services used in the production process.

So the prices of the intermediates inputs or the factors production are not included by consumer price index. Though CPI stands for the average of the price indices of the consumer goods and services in the economy, its actual calculation remains a black box for the public as the complete procedure is not published by the calculation agencies. Since the coverage, purpose and methodology for CPI are often revised, the authorities are often accused of manipulating the CPI statistics.

1.2 Statement of the Problem

One of the fundamental objectives of macroeconomic policies of both developed and developing countries is to achieve high economic growth rate with lower price level. Likewise, the fundamental objectives of monetary policy of Nepal are to attain high and sustained economic growth with low level of inflation. However, country is facing high level of inflation with low economic growth. The existence of high inflation distorts the all economic activities. High inflation rate directly hits the lower income groups and retirees who live with a fixed income. Similarly, it also hits the production sector. Inflation increases the misallocation of resources and reduces the production due to increase in cost of production. The Nepalese economy is heavily influenced by the country's political situation. It has made only slow progress in connecting with the global economy and improving living of standard. Nepal's inflation rate is not stable. South Asian countries have common factors that influence nation's inflation which includes high population density, low per capita incomes, and large share of population in agriculture. Countries are highly dependent on oil, capital and machinery import that make countries vulnerable in terms of trade and other supply shocks. Low purchasing power of money, low income group and wage earner are more suffers than business people; rise in the cost of construction thus adversely affects the economic development etc. In order to acquire the knowledge of determinants of inflation in Nepal, following research question is developed:

➢ How is the weighted structure of CPI in Nepal?
➢ How is the fluctuation of inflation in Nepal?
➢ What are the determinants of inflation in Nepal?

1.3 Objectives of the Study

The study has following objectives:

➢ To show the weighted structure of CPI in Nepal.
➢ To examine the fluctuation of inflation in Nepal.
➢ To analyze the determinants of inflation.

1.4   Significance of the Study

Inflation is one of the major macroeconomic variables that influence all other macroeconomic variables. Variables that have strong linkage with inflation, are channelized the most to control hyperinflation or chronic depression. Behavior of inflation is crucial to make plans, policies and predict the path of country's economy. Many countries are affected; some is collapsed because of hyperinflation. Inflation distorts the smooth functioning of the economy. Monetarist economist believe that money supply have more responsible factor for inflation. When monetary authority increase the size of money supply from target level then it's supposed to increase the inflation rate.

The study is conducted to understand the various determinants of inflation variables. The significance of this study therefore is to enhance the understanding of stated determinants of inflation returns in developing economies, particularly in Nepal. Theoretically, the study is aimed at Contributing to existing literature on Real GDP, broad money supply, Indian CPI and Government Expenditure their effect inflation in Nepal. By researching on this matter this study help make suitable policy for controlling inflation.

1.5   Delimitations of the Study

There are a few limitations to the study.

- Despite wage and salary index being one of the influencing variables of the price level, the study will not include it because of the unavailability of data series from 1975.
- The use of mathematical tools and methods for this study may now draw the same conclusion compare to the old research.

CHAPTER: II
REVIEW OF LITERATURE

2.1   Theoretical Review

2.1.1 Classical Theory of Inflation

The collective views of classical economists, (viz, Jean Bodin, Richard Cantillon, John Locke, David Hume, Adam Smith and William Petty) on the continuous rise in the general price level are called 'classical theory of inflation'. Irving Fisher, a highly reputed classical economist, was the first to formulate a systematic theory of inflation known as the 'classical theory of inflation' through the formulation of Quantity

Theory of Money. According to quantity theory,

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

Where M = money supply

V = velocity of money circulation

P = general price level

And, T = real volume of transactions

Going by the classical assumptions, the velocity of money (V) and real output (T) are given in the short run. The supply of money (M) is subject to variation depending on the monetary policy of the central bank of the country. Therefore, according to classical theory, prices rise in direct proportion to the rise in money supply.

The above equation can be written as

$$P = \frac{MV}{T} \ldots (2)$$

This simply states that there is positive and proportional relationship between quantity of money and price level. Classical theory of inflation or Quantity theory of money implies that inflation is always and everywhere a monetary phenomenon.

2.1.2 Neo Classical theory of Inflation

The neo classical theory of inflation was developed by the Cambridge economists, also known as neo classical economists. The Cambridge school postulated increase in demand for money as the cause of inflation. The Cambridge version of quantity theory of money is given as

$$M_D = KPQ$$

Where M_D = Demand for money

Q = real output

P = general price level and

K = the constant proportional of total income people want to hold in the form of money

The Cambridge equation yields the price level equation as

$$P = M_D/KQ$$

This equation implies that the general price level increases in proportion to the increase in demand for money, given K and Q. In case K and Q are variables too, the rate of inflation depends on the difference rate of increase in demand for money and sum of the rates of changes in K and Q, given the value of K, the rate of inflation can be obtained as follows.

$$P \quad = \quad mr$$

where,

P = rate of price rise,

m = rate of increase in money demand (M_D) And

r = rate of rise in real income or output (Q)

2.1.3 Keynesian Theory of Inflation

Keynes postulated that inflation is caused by increase in the aggregate demand. But, according to Keynes, the aggregate demand might increase due to increase in real factors like increase in consumer demand due to increase in MPC, increase in investment demands due to upward shift in marginal efficiency of investment (MEI)

and increase in government expenditure. Such changes may take place even when supply of money remains constant. Increase in aggregate demand, aggregate supply remaining constant, creates a demand supply gap which is called "inflationary gap." According to Keynes when inflationary gap occurs in the economy which comes to exist when aggregate demand for goods and services exceeds the available supply of output.

As we know that,

$$Y = C+I+G$$

Where,

      Y= aggregate supply or national output/income

      C= consumption expenditure

      G = government expenditure

The ordinary functioning of an economy should result in distributing and spending income in such a way that aggregate demand for output is equivalent to the cost of producing total output including profit and taxes. Then aggregate demand for all purpose, consumption, investment and government expenditure exceeds the supply of goods at current prices, there is a rise in prices. Keynes defined inflation as a phenomenon of full employment. Regarding full employment; Keynes distinguishes inflation into two names: semi inflation and real inflation. According to him general rise in price below the full employment equilibrium is known as semi inflation and general rise in price beyond the full equilibrium is known as real inflation.

Keynesian demand pull inflation analysis is generally explained in terms of 'inflationary gap.' The inflationary gap is equal to the amount by which aggregate demand at full employment exceeds output at full employment. It therefore indicates an excess of the total demand for goods over their total available supply at constant prices.

The inflationary gap may be convergent or divergent. If the gap is closed by the successive investment, finally, there will be a point where Income equals to the expenditure. This type of gap is called convergent gap. The causes which includes convergent gap close are

a)   Keynesian Effect on Inflation

With fixed money supply, when autonomous investment increases, money income rise. The transaction demand for money increase and less money will be left for speculative purpose. Under those circumstances, the interest rate will rise to equate demand for saving with supply of saving. Once the cost of borrowing rises, investment will decline and the gap will be closed. Thus every increase in price level due to increase in money supply is not true inflation, since price level may increase even before full employment due to increase in cost of production, wage rate, operation of law of diminishing return and other bottlenecks in productive process.

b)   Pigou Effect on Inflation

Consumption pattern of people will be affected by the value of their fixed asset. Inflation reduces the real value of their assets. In order to restore the real value of their assets to pure inflation level, people will allocate more of their current income to saving and less to consumption. So at all levels of income, consumption expenditure will decrease which will lower the aggregate demand, with the decrease in excess demand, it will help to close the inflationary gap.

c)   Income Redistribution Effect on Inflation

Fixed income groups are affected by every rise in price level or inflation. Their propensity to consume is high and their level of consumption is expected to fall as inflation redistributions income against them. The downward shift in the consumption function helps to close the inflationary gap originating from excess demand.

d)   Tax and Transfer Payment Effects

With the progressive taxation and system of transfer payments the gap between gross income and disposable income will be more progressively as inflation proceeds. Tax rates rise at a faster rate than income rises with

inflation. Thus, the fraction of income devoted to consumption will decrease and helps to result the inflationary pressure.

e)   Foreign Trade Affects

If there is high degree of inflation in the economy, its exports will decrease while its imports will increase. In a country like Nepal this problem will always be a major factor of high inflation rate until firm majors are taken to increase its exports. Less export and more imports will naturally decrease economic activities and hence the higher rate of inflation liberal export policy as well as curb in illegal cross boarder trading is needed. By adopting these measures and by reducing depending on the imported goods inflationary gap could be bridge to some extent.

f)   Money illusion

Under money illusion, the amount of expenditure on consumption is fixed in terms of real income. With the rise in price level, the person spends the same amount. In phase of rising prices, he consumes less in real term, which will have dampening effect on consumption, and it helps to close the inflationary gap. If the inflationary gap goes on widening on successive investment, the gap is called divergent serious. This type of inflation can prevail when money supply is not fixed. There is no shortage of money for speculative purposes and interest rate will not fall, which accompanied by increase in income. In the absence of money illusion and other effect, consumers may be expected to try to maintain the real consumption they enjoyed at the full employment income as inflation increase money income. The excess demand model assumes an economy, which is at full employment. At a glance, this assumption may not be applicable in the case of underdeveloped countries, where labor is abundant. But a closer look at the economy of the underdeveloped countries will show that economy is working less than full employment. Although labor is abundant, there is the shortage of technology, capital and productive institutions. In such a case, excess supply of labor can be of little use in raising the actual growth rate of the economy. Thus it can be said that with a fair degree of reality the economy of underdeveloped countries is generation at full

employment level of income at the existing level of technology, capital stock and productive institution. Thus, with the increase in money supply, demand for real assets increases which puts direct pressure on the price level.

Figure 2.1

Keynesian Inflationary Gap

GE
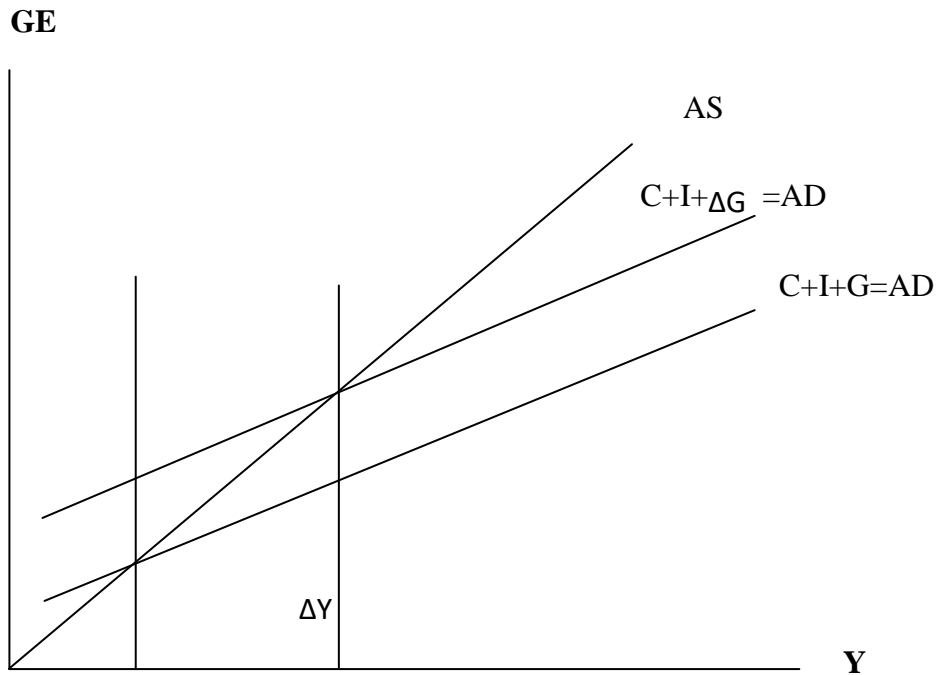
2.1.4 Monetarist View of Inflation

The modern monetarist view on inflation is an improved version of the classical theory of inflation, especially the one based on Fisher's Quantity Theory of Money.

The modern monetarist is therefore sometimes called 'modern Fisherianism'. Like classical economists, the modern monetarists also view that the general level of price rises only and only due to the increase in money supply. Milton Friedman is the leading monetarist who explained inflation terms of excess demand for goods and services. To quote Friedman, "Inflation is always and everywhere a monetary phenomenon" and can be produced only by a more rapid increase in the quantity of money than in output.

Friedman holds that when money supply is increased in the economy then there emerges an excess supply of real money balances with the public over the demand for

money. According to Friedman and other modern quantity theorists, the excess supply of real money balances results in the increase in aggregate demand for goods and services. If there is no proportionate increase in output, then extra money leads to excess demand for goods and services. This causes inflation or rise in prices.

2.1.5 Demand-Pull Theory of Inflation

According to this theory, there is rise in general price level when aggregate demand increases much more rapidly than the aggregate supply, especially when the economy approaches to the full employment level. If aggregate demand rises, the multiplier effect on the increase in aggregate demand becomes disabled due to supply constraint and hence the only way to clear the foods market thorough raising the money price of the goods. The demand-pull inflation caused by monetary and real factors.

Demand Pull Inflation caused by Monetary Factors

Given the money supply and the level of output, there exists a general level of price. Suppose there is reasonable price level, neither inflationary nor deflationary. Under these conditions, the reason for demand-pull inflation is increase in money supply in excess of output is the cause of inflation has been a controversial issue. In reality, however, monetary expansion in excess of increase in real output is one of the most important factor causing demand-pull inflation.

Demand-Pull Inflation caused by Real Factors

•	The real factors or the non-monetary factors that cause demand-pull inflation are increase in government spending given the tax revenue, cut in tax rates without change in the government expenditure, increase in autonomous investment causing upward shift in the investment function, and downward shift in the import function.

2.1.6 Cost-Push Inflation

The cost-push inflation is also known as monopoly inflation, it is due to caused by monopoly power of various monopoly group or society such as labor union, firms in monopolist and oligopolistic market- setting. The cost-push inflation classified on the basis of supply-side factors.

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- **Wage-Push Inflation:**

Wage is part of price. Rise in wages leads to rise in price. Higher wage demand by labor union without increase their productivity leads to risein cost of production and ultimate rise in price level is wage-push or monopoly inflation leads by labor union inflation. However, rise in wage with rise in productivity of labor is not inflation. Increase in money wages causes an equal increase in the cost of production. The increase in cost of production causes the aggregate supply decrease. A decrease in aggregate supply causes increase in the price level. This is called wage-push inflation.

Profit-Push Inflation:

Inflation generated by the monopoly power of monopolistic and oligopolistic firm to raise their price level to enhance the profit margin called profit-push inflation. Such types of inflation are characterized by the imperfect market condition. Nowadays, monopolistic competition and oligopoly dominate almost all manufacturing industries. Therefore, profit-push inflation has a great theoretical relevance.

It is argued that in imperfects markets, prices are largely "administered prices" determined by the management not by the market. The administered prices are adjusted upward in a greater proportion than the rate of increase in input prices or even without increase in input prices. When monopolistic and oligopoly firms increase the "administered price" with a view to increasing their profit margin, it leads to rise prices which takes the form of profit-push inflation.

$$Labour\ union\ wage \uparrow \rightarrow cost \uparrow \rightarrow\ AS \uparrow \rightarrow\ Price \uparrow$$

- **Supply-Push Inflation**

Inflation is not by demand factor but also fall in supply by monopoly power or labor union and monopolistic power firm under imperfect competitive market. Supply shock is a sudden and unexpected decrease in the supply of some major commodities or key industrial inputs. The supply shock inflation occurs generally due to sudden rise in the prices of high-weighted items in the price index number, for instance, food prices due to a crop failure and prices of some key industrial inputs like coal, cement, oil and basic chemicals. The rise in prices may cause by bottlenecks in the domestic

economy or international events causing bottlenecks in the movement of internationally traded goods and causing thereby, shortage of supply and rise in prices of imported industrial inputs.

2.1.7   Rational Expectations Theory of Inflation

Rational expectations theory has been formulated by John Muth and is supported further by new classical economists such as Robert E. Lucas, Thomas J. Sargent. Neil Wallac etc. According to this theory, every individual and company, acting with complete access to the relevant information, forecast inflation in the future without bias. Errors on their forecasts are supposed to result from the components selected randomly.

Economic agents make their expectations rationally based on all past and current relevant information available and not only on past information. However, the expectations are totally independent of each other. If the monetary authority announces a monetary stimulus in advance, people expect that price will rise. There will not be any real effects of fully anticipated monetary policy in the short run. The central bank can affect the real output and employment only if it can find a way to create price surplice.

2.2   Empirical Review

The investigated empirical literature of different regions over different time periods gives conflicting results among the influences of different variables on inflation

2.2.1 Review of International Literature

Khatun and Ahamad (2012) Investigated major determining factors of inflationary trends In Bangladesh during the period FY1981 to FY2009. An unrestricted errorcorrection Model based on the Autoregressive Distributed Lag (ARDL) bounds F-test has been employed to find out the short-run and long-run elasticity of the determinants of inflation. The empirical results revealed that domestic rice production affects inflation negatively in the short-run to a significant extent. Conversely, domestic petroleum price and broad money (M2) supply have a low but positive impact on inflationary trends. The study suggested that increased domestic rice

production and effective fiscal-monetary integration are the crucial policy options to curb the inflationary pressure in Bangladesh.

McCandless and Weber (1995) looked at inflation in 110 countries during a 30-year period. The study concluded that inflation and monetary aggregates are positively correlated in the long run. However, as the time horizon shortens, the correlation falls.

Campillo and Miron (1996) Examine the determinants of inflation across 62 countries over the period 1973 - 1994 by considering the distaste for inflation, optimal tax considerations, time consistency issues, distortionary non-inflationary policies and other factors as important determinants of inflation. Inflation rate is measured by the Consumer Price Index (CPI). The authors' have adopted Ordinary Least Squares (OLS) technique with standard error, estimated by White (1980) procedure. They found economic fundamentals like economic openness and optimal tax considerations are relatively important determinants of inflation whereas institutional arrangements like central bank independence or exchange rate mechanisms are relatively less important.

Qayyam (2006) investigated the relation between money, inflation and growth in Pakistan and tested the validity of monetarist stance that inflation is a monetary phenomenon by using data from F.Y. 1960 to 2005. This study found that there is positive association between money growth and inflation in Pakistan. Based on the research question that to investigate the linkage between money supply, income and growth; researcher used the linear form of quantity theory of money. The study found that money growth this year affects rate of inflation in the next year in addition study found money supply is the key factor that affects the inflation. Money supply growth has 90 percent explanatory power. The research revealed that there is proportional relationship between money supply over the output growth and the velocity growth and hence the research also conform that monetarist proposition that, money supply is the main factor that contributes towards the inflation in Pakistan.

Lim and Sek (2015) conducted research on an examination on the determinants of inflation for the period from 1970 to 2011. An error correction model based on the autoregressive distributed lag (ARDL) modeling has been used to explain the short

run and long run impacts of each variable on inflation. The result revealed that GDP growth and imports of goods and services have the significant long run impact on inflation in low inflation countries. Result also indicated that money supply, national expenditure and GDP growth are the determinants of inflation which impose long run impact on inflation in high inflation countries. In the short run likewise, none of the variables is found to be significant determinants in high inflation countries. However, money supply, imports of goods and services and GDP growth has significant relationship with inflation in low inflation countries.

Hossin (2015) has explored the relationship between inflation and economic growth in the context of Bangladesh. The study used the annual data set of real GDP and GDP Deflator for the period of 1961 to 2013. The researcher applied the cointegration test, error correlation models and Granger Causality test to analyze the relationship between inflation and growth. The result suggested that there exists a statistically significant long-run negative relationship between inflation and economic growth. Similarly, there exists a statistically significant long –run positive causality running from GDP to GDP Deflator. In addition, the study suggested that economic growth affects inflation positively but when increase in the rate of inflation goes beyond the threshold inflation level then inflation affects economic growth negatively.

Nwachukwu (2014) examined the "Error Correction Model Analysis of Determinants of Inflation in Nigeria", for the Period 1970- 2013, employing Error Correction technique of econometric analysis. The variables used were GDP, exchange rate, inflation rate, domestic credit growth rate, money supply, government expenditure.

The test of both the unit root and co-integration revealed that there is a long relationship between the variables while the Granger causality test revealed a unidirectional relation between the variables and inflation. However, the VECM test revealed that inflation, GDP and exchange rate are negatively related and positively related to broad money supply (M2) and domestic credit. It was recommended that the Central Bank of Nigeria should balance its control instruments to achieve macroeconomic stabilization and development, money supply should be controlled to ensure high employment, and interest rate should be liberalized to control price.

Hussain and Malik (2011) examined nexus between inflation and economic growth in the context of Pakistan economy. They used the annual data for the period of 19602006 and applied causality test and the Error Correlation Model (ECM) to examine the relationship between inflation and growth. The study found that the uni-directional causality between inflation and growth i.e. inflation is causing growth but not vice versa. Similarly, inflation is positively related with economic growth in Pakistan and vice versa. Finally, they found that 9 percent threshold level for Pakistan above which inflation starts the lower economic growth. The study suggested that Pakistan must need inflation in single digit for economic growth.

Patnaik (2010) aimed at empirically identifying the determinants of Inflation in India. She concluded that inflation in India is majorly demand pull inflation. This is because both the money supply and the index of industrial production (IIP) represent the existing demand in the economy. However, the supply side factors which come via the imports also influence the inflation in the short run. Moreover, the short run duration impact of the imports shows that the external factors are not the major factors relationship between the variables between CPI, IIP, Reserve Money(RM), and import price.

Munene and Misati (2015) estimated second round effects and pass through of food prices to inflation In Kenya. Based on monthly data covering the period 1997 to 2012, the paper attempts to fill the gap by examining the relationship between food prices and inflation using gap models and Phillips curve approaches.

The study found that there is a presence of second round effects from food prices to inflation while estimations of the Phillips curve suggest a domestic food price-pass through of 0.49 to overall inflation and 0.38 to nonfood-non fuel inflation. The world food prices pass-through to overall inflation and non-food non-fuel inflation are estimated at 0.09 and 0.08 respectively. The study recommended usage of headline inflation to estimate trend of inflation and while monetary policy is very critical in anchoring inflationary expectations, there is mutual gain from a supportive fiscal policy in addressing supply side shocks and also suggested that core measure of inflation that excludes food inflation may not be appropriate in estimating underlying inflationary pressure.

Ratnasiri (2006) examined the main determinants of inflation in Sri Lanka over the period 1980-2005 using Vector Autoregressive analysis. The variables undertaken for the purpose were money supply, rice price, exchange rates and Colombo consumer price index.

The result indicated that money supply growth and rice price increases are the main determinants of inflation in Sri Lanka in the long run. In contrast, it is evident that exchange rate depreciation and output gap have no statistically significant effect on inflation. In the short run, rice price is the most important variable as it is a totally endogenous variable. However, money growth and exchange rate are not so important variables as they are weakly exogenous in the adjustment process. Output gap does not have a statistically significant effect on inflation in both the long run and the short run. The study concluded that the identification of determinants of inflation and forecasting accurate inflation are vital for the economic agents and facilitates the central bank to conduct its monetary policy efficiently and effectively. The estimation results pointed to two policy considerations. First, money supply is to be maintained at desired level and also if the supply of rice can be raised the inflation will come down.

Rami (2010) examined the relationship between money, price and output using pair wise Granger causality test on annual data of the Indian economy covering a period from 1951 to 2005. Lag length is selected using standard critera-LR, FPE,AIC,SC and HQ through VAR estimation.

The study revealed that the relationship between money, price and output is one of the most debated issues among different schools of thought of economics particularly between the Monetarists and Keynesians. The Monetarists argue that money influences the prices and the output, whereas the Keynesians argue that money does not influence the same. Direction of causality among these three and selection of appropriate lag length are widely debated issues in the literature. The results strongly support the monetarists view and partially supports the Keynesian view. However, these relationships are sensitive to the lag length selections.

Aydin (2017 has investigated the influence of inflation on economic growth for the Organization of Islamic Cooperation (D-8 countries: Bangladesh, Egypt, Indonesia,

Iran, Malaysia, Nigeria, Pakistan and Turkey) by using the data from 1971- 2014. The data set was created by calculating the five-year averages of the variables used in the study in order to make the use of the GMM estimator valid and ensure its consistence. The study used the dynamic panel threshold model to estimate the optimal level of inflation for D-8 countries. In this study, the researcher used real GDP per capita growth as independent variable and inflation rate as core explanatory variable. Similarly, the lagged value of GDP per capita, the gross capital formation as a share of GDP (investment), population growth rate (dpop), initial income level (initial) measured as the log of GDP per capita of the previous period, openness measured as the annual growth rate of export and annual percentage change in terms of trade (dtot) were used as other control variables.

The study shows that there is non-linear relationship between growth rate and inflation. Further, study found that the threshold level of inflation for these countries is 12.88 percent

Where inflation rate above this threshold level negatively influences economic growth and an inflation rate under this threshold level positively influences economic growth. Similarly, this study does not found any causality relationship between inflation and economic growth. It just shows the existence of relationship. This study suggested that political and economic decision-makers in these economies should not disregard the concept of threshold within the framework of monetary policy while determining the target inflation rate.

Loi and Abou-Zaid (2016) have examined the threshold level of inflation in the US by using the data set for the period of 1960-2011. They used real GDP growth as the dependent variable where as inflation was the core explanatory variable. Investment growth, gross fixed capital formation, population acceleration, growth of openness of the economy, money supply growth were used as other control variables. They employed ADF tests for stationary of the variables and found that all variables are stationary in first difference. Similarly, this study performed Granger causality test and result shows that only inflation does Granger cause to real GDP. The study used Threshold model which was developed by (Khan & Senhadji, 2001) to estimate threshold level of inflation and found that the threshold level of inflation in the US is between 0 to 1.5 percent quarterly. Above that threshold level, inflation has

significant negative effect on real GDP growth, while below the threshold level, the effect of inflation on real GDP growth is positive. Similarly, to check the sensitivity of the model this study also employed Two-Stage Least Square (2SLS) method. The result of 2SLS shows that inflation rate above 1.5 percent hampers economic growth. So they conclude by combining the result of OLS and 2SLS, the threshold level of inflation in the US is 0 to 1.5 percent.

Mallik and CHowdhury (2001) examined the relationship between inflation and GDP growth for four South Asian countries including Bangladesh, India, Pakistan and Sri Lanka. The study used the annual data collected from IMF International Financial Statistics (IFS). They used the cointegration and error correlation models and found the major two results. First, there exist a long-run positive relationship between inflation and economic growth for all four countries. Second, the sensitivity of growth to changes inflation rate is smaller than that of inflation to changes in growth rates. They suggested that moderate inflation is helpful for economic growth but faster economic growth feeds into inflation.

2.2.2 Review of National Literature

Byanjanakr (2020) examined the determinants of inflation in Nepal using time series data from 1975-2018 by applying the ARDL approach to cointegration the price level is dependent variable and Indian inflation, money supply (M2), government deficit, nominal exchange rate and crude oil price are independent variables. The study found that Indian inflation is the most significant factor influencing the Nepalese inflation. Similarly, the exchange and government deficit have positive impact on prices in both the long-run and short-run. The Study suggested that government deficit causes an increase in money supply, which exerts pressure on price. The study made recommendation to establish mechanism for monitoring price development in Indian market.

Paudyal (2014) Examined the determinants of inflation in Nepal using time series data from 1975-2011 by applying Wickens-Breush single equation error correction model. The variables considered are budget deficits, Indian prices, broad money supply, exchange rate and real GDP. The study found that all variables considered are significant in long run implying that these variables are the determinants of inflation

in Nepal. However, only budget deficit, money supply and Indian prices cause inflation in the short run. The results are consistent with monetarists' hypothesis of money matters and inflationary gap theory of Keynesian as well as supply constraints approach to inflation.

Chaudhary and Xiumin (2018) examined analysis of the determinants of inflation in Nepal using time series data from 1975-2016 by applying ordinary least square multiple regression model. The variables considered for the study is limited to the use of broad money supply, real GDP, Indian prices. The study suggested that all variables considered are significant in long run implying that these variables are the determinants of inflation in Nepal. The results are consistent with monetary theory. The money supply and Indian prices cause inflation in the long-run based on an Ordinary Least Squares regression model.

Koirala (2008) Invested inflation expectations in Nepal using 33 annual observations of actual inflation from 1973 to 2006. The study stated that there is a significant positive relationship between inflation and inflation expectations in Nepal, one percent increase in inflation expectations has 0.83 percent impact on contemporaneous inflation. The forecast ability of inflation proxies by one period lagged inflation. The forecast of the model has been examined on the basis of minimum root squared error (RMSE).

It was suggested that it is desirable for the policy makers to consider the impact of inflation expectations while formulating monetary policy anchor inflationary expectations of economic agents.

Pandey (2005) revealed that domestic prices are influenced by both the monetary and structural factors. Reviewing the price movement during the period 1973-2004 by using Error Correction model (ECM) for the study, it was revealed that out of 33 years in the review, 12 years witnessed the double digit inflation. Only in one year (1975/76), inflation was found to be negative.

The empirical findings confirmed that Indian Prices, money supply and exchange rate changes are the most significant determinants of inflation in Nepal. Moreover,

inflation in Nepal has long run relationship with money supply, Indian WPI, government expenditure, real GDP, and exchange rate. It was suggested that in order to control inflation in Nepal, Nepal needs to adopt a flexible exchange regime, monetary policy needs to set a single goal of price stability, and follow effective supply management system.

Neupane (1992) examined the monetarist and structuralism hypothesis to evaluate the causes of inflation in Nepal. The regression result based on monetarist approach provided a fair explanation of inflationary process. Based on this model, one year lagged money supply and cost of holding real balances are the important explanatory variables to explain the causes of inflation in Nepal. Besides, the results of the structuralism approach suggested that a shortfall in commodity producing sectors, increasing import prices and government budget deficit and slow growth of agricultural and industrial production inflationary expectations.

The findings suggested that monetary policy is an important instrument to control inflation. A policy of increasing money supply in line with growth of per capita GDP will help control inflation and provided a much broader perspective of the complexities of the inflationary process in Nepal.

Gyanwaly (2012) examined the direction of causality between money, price and income in Asian countries namely- Nepal, India, Sri Lanka, Myanmar and Korea using the annual data of the period 1964-2011. Bivariate Granger causality test was performed for both non co-integrated and co-integrated variables using conventional Granger F test and ECM models respectively.

The study concluded money supply is an endogenous variable in all the countries, though the extent of endogeneity in term of price and income variable slightly differs from one to another. Money causes both price and income and is receiving the feedback effects either from price or income or both.

Pant (1988) tried to analyze inflationary trends of some Asian countries including Nepal taking the periods of 1955-1985 using OLS method, and DW test. The rate of inflation has been taken as the dependent variable whereas money supply, real income, imports, exports, expected change in price were taken as independent

variable. Since, the data on exports and import price indices were not available, the unit value of export and unit value of import of India were considered as proxy for.

The empirical findings suggested that money supply, real income, export and expected change in prices have positive relationship with the rate of inflation whereas import has negative relationship with the rate of inflation.

Pradhan (1977) expressed the view that money supply is one of the important determinants of price. By increasing the money income with the public, it influences the demand for goods and services. If foods demanded are wholly domestic goods and no substitutes are available from outside the territory i.e. if the country has a very rigid import control regime, then of course money will be a very significant factor in determining the price level.

However, Nepal is an open economy with virtually no restrictions on the movement on most of the products across the border. At the same time substitute to almost all domestic product are easily available from India. Thus, the rise in the prices of domestic product would quickly invite substitutes of the goods from India restricting the rising trend of domestic prices. The excessive money supply affects more on the balance of payments as Nepalese economy is intimately linked with the Indian economy.

NRB (2017) has explored the optimal level of inflation for Nepal based on the data of the period from 1978- 2016. This study used real GDP per capita growth is a dependent variable and inflation, inflation squared. Saving to GDP, life expectancy at birth, trade openness, exchange rate overvaluation and lagged real GDP per capita are the explanatory variables. The results suggest that there exists a threshold effect of inflation. The Ordinary Least Squares method estimates the turning point of inflation to be 6.25 percent while that of the Hansen (2000) method shows the threshold level to be 6.40 percent. The maximum impact on growth associated with the turning point, and at the mean levels of other explanatory variables is quite high at 4.59 percent. The results suggest that Nepal should adopt an inflation target range around the computed optimal inflation rate to lower the inflation expectation and enhance economic growth.

IMF (2014) estimated the determinants of Nepalese inflation on the monthly series of Nepal's CPI, broad money, a nominal effective exchange rate (NEER), and Indian CPI using OLS. The coefficient of broad money supply and Indian inflation was 0.12 and

0.45 percent respectively; indicating a 1 percent increase in broad money supply will cause Nepalese inflation to rise by 0.12 percent whereas such an increase in Indian CPI will increase Nepalese inflation by 0.45 percent.

2.3   Research Gap

This study has attempted to carry out distinctly from other previous studies in terms of sample size and methodology. The study covers the data of 46 years. Thus, it believes that this study is different from earlier studies of Nepalese context. The importance of this study may be viewed from its contribution to fill the gap between the previous studies and also finding of this study can add value to the existing body of the literature

CHAPTER: III
RESEARCH METHODOLOGY

3.1   Study Design

The descriptive statistics including mean, median, standard deviation etc. of the variables are calculated and presented in table. The study analyzed the trend of inflation by using table and graphs. Similarly, the study used econometric research design as per the need of fulfilling of the objective of this paper. The Augumented Dickey Fuller (ADF) test has employed to test the stationary of the variables, OLS method is used to test the long run relationship between NCPI and other independent variables, Engle-Granger Cointegration test is used to examine the cointegration among the variables, Error Correction Model (ECM) is used to estimate the short run relationsip between NCPI and other explanatory variables.

3.2   Conceptual Frameworks

After the review of above previous related study in the review of literature chapter and established theory. The study concluded to design and adopt the following frameworks to examine the relationship among the inflation, Indian Inflation, exchange rate and Government expenditure in Nepal and used secondary annual time series data from 1975 to 2020, sourced from Central Bank of Nepal (NRB).

This section aimed at giving a description between inflation,

Figure: 3.2

Conceptual Frameworks
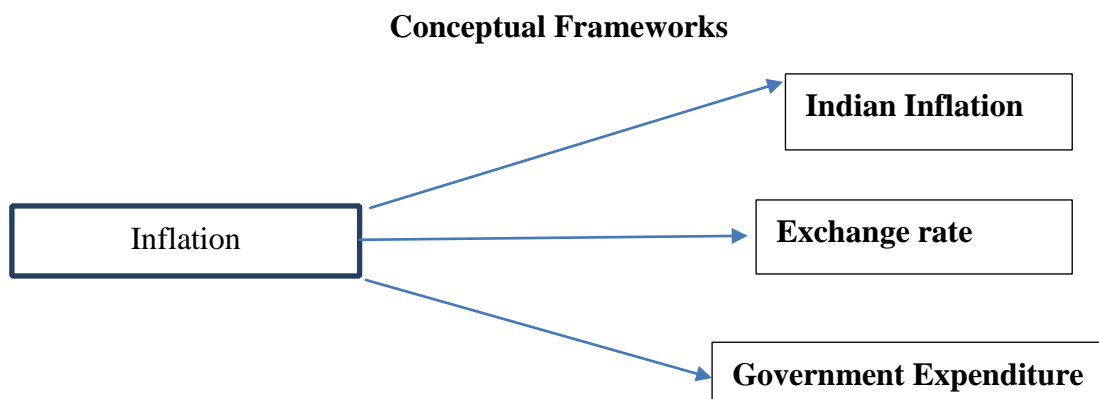
Dependent variable

The study considerd National Urban Consumer Price Index (CPI) for the measurement of inflation in Nepal and the same rate of inflation have been taken as the dependent variable.

Independent Variables

A.   Indian Consumer price index (ICPI)

Indian inflation includes the rate of inflation in India calculated on the basis of Indian CPI.

B.   Government expenditure (GE)

Government expenditure is consists of the purchase of the goods and services by the government which includes public consumption and public investment, and transfer of payments consists of consists of income transfer (pension, social benefit) and capital transfer. It will be taken as independent variable in a regression model.

C.   Exchange rate (EXR)

An exchange rate is the rate at which one currency can be exchanged for another between nations or economic zones. It is used to determine the value of various currencies in relation to each other and is important in determining trade and capital flow dynamics

3.3   Nature of sources of Data

The main sources of information are their published documents, NRB and its published documents, experts' views, newspapers; others published and unpublished documents, various issues of Economic Survey which is published by Ministry of Finance, quartile economic bulletin of Nepal Rastra Bank (NRB), amd the website of World Bank.

Table 3.1

Source of Data

Variables Description	Unit	Sources
Consumer Price Index Nepal	Index number	QEB, NRB
Consumer price Index India	In million	World Bank
Government Expenditure	In million	Economic survey
Exchange Rate	US dollar	QEB, NRB

3.4   Organization, Management and processing of the Data

Data will be managed as per the need of the study. Presentation and the analysis of the available data is the major task of the study. All the nominal data taken are transformed into log form by taking natural log, besides, after the test of stationary of the variables, the data will be further transformed into different form of the data.

3.5   Tools and Method of Data Analysis

The study used both descriptive and analytical approach of data analysis. Under descriptive analysis of the data different graphs, tables and figures will be used to analyze trend of inflation in Nepal and weighted average of CPI in Nepal. Similarly under analytical analysis, various econometric tools such as ADF unit root test, Granger causality test, Breusch-Godfrey LM test for serial correlation and OLS method are applied to analyse the data to find determinants of inflation in Nepal. The study used the E-views, "Econometric Views" software for data analysis and examines the determinants of inflation in Nepal.

Unit Root Test

This empirical analysis is based on time series data, assumes that the underlying time series should be stationary. Time series data is said to be stationary if it's mean. Variance and covariance do not vary over time. But it is now a well-known fact that most of the macroeconomics time series are non-stationary (Dickey & Fuller, 1979) (Gujarati, 1995) If we apply the regression model in non-stationary data it gives a spurious relationship which makes hypothetical test results unreliable. Hence, to avoid a spurious relationship, detecting the stationary or non- stationary of time series is crucial. There are several methods to tests stationary such as graphical analysis, the

Correlogram test, and unit root test. However, this study only discusses the unit root test using the Augmented Dickey Fuller test.

Augmented Dickey Fuller Test (ADF) This test was developed by Dickey and Fuller in 1970 and named after them as DickeyFuller test. The Augmented Dickey- Fuller Test as follows:

The equation for no intercept and no trend is,

$$\Delta Yt = \gamma i Yt-1 + \sum ci\ ki=1\ \Delta Y_{t-i} + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{(a)}$$

The equation for only intercept and no trend is,

$$\Delta Yt = \beta_0 + \gamma i Y_{t-1} + \sum ci\ k\ i=1\ \Delta Y_{t-i} + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{(b)}$$

The equation for both intercept and trend is,

$$\Delta Yt = \beta_0 + \gamma i Y_{t-1} + \alpha t + \sum ci\ ki=1\ \Delta Y_{t-i} + e_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{(c)}$$

Where ΔY_t = First difference. If the series is stationary without any differencing, it is said to be I (0) or integrated with order 0. Similarly, if the series is stationary after a first difference is said to be I(1) or integrated of order 1.

Engle- Granger Cointegration Test

This test is used to perform the cointegration between the variables when the variables are non- stationary at level but stationary at first difference. Engle and Granger (1987) suggested a cointegration test, which consists of estimating the cointegration regression by OLS, obtaining the residual U_t and applying the unit root test for U_t.

If the value of R^2 is greater than d-w statistics, then the value of coefficients of regression equation are spurious. However, the coefficients of the regression model are super consistent if U_t is stationary at level.

To test the Engle-Granger Cointegration, first of all this study derive the following long run model by using OLS method:

$$\Delta Y_t = \beta_0 + \beta_{it} X_{it} + U_t \ \ldots \text{(i)}$$

The OLS model that represents the model (i) in full extend is presented in equation (ii).

$$\Delta LnNCPI_t = \beta_{0\,+}\beta_1\Delta LnICPI_t + \beta_3\Delta LnGE_t + \beta_4\Delta LnEXR_t + U_t \ \text{... (ii)}$$

Further, we have applied Engle and Granger (1987) two-step procedure for cointegration analysis. In the first step, we estimate the long-run equilibrium equation; the cointegration holds if the error term of the long-run equation is stationary.

$$Y_t = \beta_0 + \beta_i X_{it} + U_t \ \text{... (iii)}$$

Equation (iii) is the long-run equation. Equation (iii) has been represented in full extend in equation (iv).

$$LnNCPI_t = \beta_0 + \beta_1 LnICPI_t + \beta_3 GE_t + \beta_4 EXR_t + U_t \ \text{... (iv)}$$

Equation (iv) is long-run equilibrium equation and cointegration holds if error term (U_t) is stationary (Gujarati, 2004).

After deriving equation (iv), Error Correlation Term is calculated as given below:

$$ECMt = Ut = Ln\text{NCPI} - (\beta_0 + \beta_1 Ln\text{ICPI} + \beta_2 Ln\text{GE} + \beta_3 Ln\text{EXR})_{\ldots\ldots} \ \text{(v)}$$

After calculating the values of ECM for different periods then this study tested the stationary of ECM. If the error correlation term or residual is stationary at level then the variables in equation (1) are cointegrated and exist a long-run relationships among them. Similarly, stationary test of ECM is also used to test whether the long-run model is spurious or not. The symptom of spurious regression if R-squared value is greater than DurbinWatson statistics. But the model is not spurious when the residual (ECM) is stationary at level even R-squared is greater than Durbin-Watson Statistics.

Error Correction Model (ECM)

The Granger representation theorem states that if variables X and Y are cointegrated, then the relationship between the two can be expressed as ECM (Gujarati, 2004). So, when all variables are stationary only after first difference and cointegrated to each other then we estimate the error correction model to account for the short-run dynamics of the growth model and estimate the speed of adjustment short-run

disequilibrium to long-run equilibrium. In the second step, we estimate the Error Correction Model.

$$\Delta Y_{t =} {}_{it}\Delta X + ECM_{t-1} + V_t \dots \dots \dots \text{(vi)}$$

Equation (VI) is the short-run equation. Equation (VI) has been presented to the full extent in equation (vii).

$$\Delta LnNCPI = \beta_0 + \beta_1 \Delta LnICPI + \beta_3 \Delta LnGE + \beta_4 \Delta LnEXR + ECM_{t-1} + V_t \dots \text{.(vii)}$$

In equation (VI), ' ' is the adjustment coefficient and it must be negative and significant for the system to restore short-run disequilibrium. It measures the speed of adjustment towards the long-run equilibrium.

Where,

$\Delta LnNCPI$ = first difference of Natural log of Consumer Price Index of Nepal

$\Delta LnICPI$ = first difference of Natural log of Consumer Price Index of India

$\Delta LnGE$ = first difference natural log of Government Expenditure

$\Delta LnEXR$ = first difference of natural log of exchange rate ECM_{t-1}

is one period lag residual of equation (1).

$\beta 0$ = Constant $\beta 1$, $\beta 2$, $\beta 3$, $\beta 4$ and   are the short run coefficients. V

= error term

In this section, the study analyzed the impact of CPI of India, Exchange rate and Government Expenditure on the CPI of Nepal by using Engle and Granger (1987) two-step procedure to find out the variables having a short-run and long-run impact on the price level in Nepal. The study used the log form of all the variables for the regression purpose.

LM Test for Autocorrelation

The lag correlation of the residual series is called autocorrelation. To check the autocorrelation, the LM test has used. The existence of autocorrelation depends upon the p-value. If the p-value is greater than 5 percent ($p > 0.05$) then there is no serial autocorrelation of the model.

Calculation of weighted average of CPI in Nepal

CPI is the average of the price indices of the consumer goods and services in the economy. The calculation of CPI has to pass over the following steps:

Step 1: Determining the Basket of Goods and Services.

Step 2: Selection of price collection centers.

Step 3: Selecting the outlets and price collection methods.

Step 4: Selecting the method of averaging the price indices.

3.6   Study Period

The study will use time series data. The data span from 1975 to 2020 covering 46 years. The data is of low frequency as the economic survey maintains only annual data.

3.7   Model Specification:

The weighted structure of CPI of Nepal is calculated by using following formula-:

$$CPI = (Food\ CPI)^{w1} \times (non\text{-}food\ CPI)^{w2}$$

Where,

W1 is the weight of food and beverage

W2 is the weight of non-good and services

These weights have been assigned according to the Household Budget Survey by NRB in 2014/15. NRB collects prices of 494 commodities from 60 market centers from all over Nepal in weekly basis.

The model for determinants of inflation becomes

$$NCPI = f(ICPI,\ EXR,\ GE) \dots \dots \dots (1)$$

Where,

NCPI: shows consumer price index of Nepal

ICPI: shows consumer price index of India

GE: shows government expenditure EXR: shows exchange rate

Equation 1 in level form taking natural log on both sides

$$LnNCPI = \beta_{0+}\beta_1\Delta LnICPI + \beta_3\Delta LnGE + \beta_4\Delta EXR + U \ldots \ldots \ldots (2)$$

Equation 2 in first difference form

$$\Delta LnNCPI_t = \beta_{0+}\beta_1\Delta LnICPI_t + \beta_2\Delta LnGE_t + \beta_3\Delta EXR_t + V_t \ldots \ldots \ldots (3)$$

Where,

    NCPI = Inflation in Nepal

    ICPI = Inflation in India

    GE = Government Expenditure

    EXR = Exchange rate

    Δ = First difference

    L = First lag of error term

    $\beta_1, \beta_2, \beta_3,$ Regression parameters and V_t is stochastic error term.

This empirical analysis is based on time series data, assumes that the underlying time series should be stationary. Time series data is said to be stationary if it's mean. Variance and covariance do not vary over time. But it is now a well-known fact that most of the macroeconomics time series are non-stationary (Dickey-Fuller, 1979, Gujarati, 1995). If we apply the regression model in non-stationary data it gives a spurious relationship which makes hypothetical test results unreliable. Hence, to avoid a spurious relationship, detecting the stationary or non- stationary of time series is crucial. There are several methods to tests stationary such as graphical analysis, the Correlogram test, and unit root test. However, this study only discusses the unit root test using the Augmented Dickey Fuller test.

Engle- Granger Cointegration Test

This test is used to perform the cointegration between the variables when the variables are non- stationary at level but stationary at first difference. Engle and Granger (1987) suggested a cointegration test, which consists of estimating the cointegration regression by OLS, obtaining the residual Ut and applying the unit root test for Ut.

Error Correction Model (ECM)

When all variables are stationary only after first difference and cointegrated to each other then we estimate the error correction model to account for the short-run dynamics of the growth model and estimate the speed of adjustment short-run disequilibrium to long-run equilibrium.

3.8   Variables Specification

This study analyzed the relationship between different variables using the different statistical and econometric tools. The variables that have been used in the study are as follows:

Dependent variable

The study considerd National consumer Price Index (CPI) for the measurement of inflation in Nepal and the same rate of inflation will be taken as the dependent variable.

a.   **Consumer Price Index:** The weighted average of prices of the basket of consumer goods and services is known as consumer price index.

Independent Variables

b.   **Indian Consumer price index (ICPI):** The CPI is calculated with reference to a base year, which is used as a benchmark. The price change pertains to that year.

c.   **Government expenditure (GE):** Government expenditure is consists of the purchase of the goods and services by the government which includes public consumption and public investment, and transfer of payments consists of consists of income transfer (pension, social benefit) and capital transfer. It will be taken as independent variable in a regression model.

d.   **Exchange rate (EXR):** An exchange rate is the rate at which one currency can be exchanged for another between nations or economic zones. It is used to determine the value of various currencies in relation to each other and is important in determining trade and capital flow dynamics.

CHAPTER IV
PRESENTATION AND ANALYSIS OF DATA

4.1   Weighted CPI of Nepal

CPI is the average of the price indices of the consumer goods and services in the economy. The calculation of CPI in reality has to pass over the following steps:

Step 1: Determining the Basket of Goods and Services: first step in the calculation of CPI is what goods and services are selected as representative goods and services. Consumer consumes thousands of goods and services in the economy but it is not feasible and relevant to track the prices of all of them in practical. Thus, the first step is to determine " Which goods and services are to be included in the CPI?". The representative item is called CPI basket. The CPI basket is determined on the basis of consumer expenditure survey which provides the relative importance of the goods and services in the consumer budget.

Generally, two criteria are applied: the expenditure share and frequency of purchase. The CPI basket of Nepal consists of 496 goods and services. Those goods and services have been selected on the basis of the expenditure weights obtained from the fifth household budget survey.

Table: 4.1

The CPI basket of Nepal consists of 496 goods and services.

Case of Nepal

Group Name	Goods	Services	Total
Food and Non-Alcoholic Beverages	162		162
Alcoholic Beverage, Tobacoo	14		14
Clothing and Footwear	67	8	75
Housing, Water, Electricity, Gas	5	5	10
Furnishing, Household Equipment	67	1	68
Health	21	11	32
Transport	7	10	17
Communication	3	5	8
Recreation and Culture	28	5	33
Education	0	28	28
Restaurants and Hotels	0	16	16
Miscellaneous Goods and Services	28	5	33
Grand Total	**402**	**94**	**496**

Table 4.1 shows that out of 496 good and services, 402 are goods and 94 are services.

Step 2: Selection of price collection centers: After fixing the CPI basket, next step is selection of price collection centers. It is important because prices cannot be collected from every outlet operating in the economy. While operating selection of the price collection areas, the most important criteria are the size of economic activity in those centers. The most used criteria is the expenditure share of the centers. This implies that the remote parts of the country where the barter system prevails and the volume of consumer purchase is negligible can be discarded. In reality, there are too many market centers from people buy goods and services. In such a case, a representative number of the centers are selected as the price collection centers.

In case of Nepal, altogether 60 price collection centers have been selected.

Table 4.2:

Price Collection Centers in Case of Nepal

Market Type	Selected
Rural	29
Urban	31
Grand Total	**60**

In Nepal there are 60 price collection centers, where 29 are from Rural areas and 31 from urban area.

Table 4.3:

Price Collection Centers in terms Ecological Belt

Ecobelt	Selected
Mountain	5
Hills	32
Terai	23
Grand Total	**60**

Table 4.3 shows the price collection centers in case of Nepal In terms of ecological belt. There are 5 price collection centers in mountain region, 32 are from hillsy region. Similarly 23 are from terrain region in Nepal.

Step 3: Selecting the outlets and price collection methods: the next task is to select the outlets (shops) from where to take the price levels. The outlets or shops should be of normal category where average people buy goods and services. That shouldn't be large department store where elite people buy or shouldn't be street type of market where only poor people go. The next criteria are that the selected outlets (shops) should sell the goods and services included in the CPI Basket. After fixing the outlets, price collection mechanism is determined that is how much price of the single commodity is collected, frequency of data collection and number of quotations to be taken for each goods and services.

Prices of some goods and services can be collected weekly and others may be done on a monthly basis or even longer span of time. It depends on the speed of change and degree of volatility in prices. To reduce biases, prices of the same good are collected from more than one outlet.

Prices of a good is collected from three different outlets in a price collection center on a weekly monthly or quarterly basis

Table 4.4

Price collection centers

Types	No. of items
Monthly	141
Quarterly	287
Weekly	68
Grand Total	**496**

Out of 496 items included in a CPI basket, 141 items are collected in monthly basis, 287 items are collected in quarterly basis and 68 items are collected in weekly basis.

Step 4: Selecting the method of averaging the price indices: the most important part is the stage of averaging the price indices to get the CPI index. There may be multiple stages of aggregation depending on the groups and sub groups of commodities as well as the geographical areas of the country for which different CPI indices are to be produced.

Indices at the upper level are calculated as the asymmetrical weighted averages of the lower level indices by using either Laspeyre's index formula or other indices/

The Laspeyre's formula is given as:

$$L_{01=} \sum_{i=1}^{n} WiPi$$

Where,

Wi = expenditure weights Pi = Price indices

A better one is the weighted geometric Laspeyre's index which can be expressed as:

$$LP(I) = \prod_{i=1}^{n} (pi)^{wi}$$

Where P_i s are the lower level price indices and w_is are their respective expenditure weights.

Table 4.5

National Consumer Price Index (2014/15=100) Annual Average

Groups & Sub Groups	Weight %	2016/17 1	2017/18 2	2018/19 3	2019/20 4
Overall Index	100	114.83	119.59	125.14	132.84
Food and Beverage	43.91	113.03	116.13	119.72	129.49
Cereal grains and their products	11.33	111.09	113.83	119.91	124.69
Pulses and Legumes	1.84	125.36	95.23	89.09	98.12
Vegetable	5.52	107.50	119.74	116.32	143.03
Meat and Fish	6.75	112.37	114.87	120.02	129.53
Milk products and Eggs	5.24	113.95	121.90	124.91	131.92
Ghee and Oil	2.95	112.34	115.06	122.36	127.51
Fruit	2.08	110.56	114.73	121.86	135.90
Sugar and Sugar products	1.74	123.16	122.33	118.24	124.13
Spices	1.21	119.93	114.02	120.37	137.22
Non-alcoholic drinks	1.24	108.50	111.71	115.96	120.91
Alcoholic drinks	0.68	126.14	135.78	150.56	165.60
Tobacco products	0.41	111.55	117.54	129.78	142.99
Restaurant and Hotel	2.92	117.08	122.77	128.73	134.83
Non-food and Services	56.09	116.27	122.38	129.55	135.52
Clothes and Footwear	7.19	124.68	132.08	141.00	148.69
Housing and Utilities	20.30	122.00	130.32	140.33	146.98
Furnishing and Household equipment	4.30	112.94	117.16	123.85	129.47
Health	3.47	105.30	107.65	110.06	114.88
Transportation	5.34	100.92	102.86	109.30	111.00
Communication	2.82	104.86	105.38	103.81	105.64
Recreation and Culture	2.46	107.47	111.90	116.91	119.41
Education	7.41	120.90	130.62	137.15	144.36
Miscellaneous goods and services	2.81	113.83	118.07	124.42	138.54

Source: QEB, NRB

Table 4.6

CPI Kathmandu Valley (3 Districts)

Groups & Sub groups	Weight	2016/17	2017/18	2018/19	2019/2020
Overall Index	100	115.01	118.75	124.52	133.19
Food and Beverage	39.77	114.97	118.65	122.53	132.49
Non-food and Services	60.23	115.04	118.82	125.85	133.65

Source: QEB, NRB

Table 4.7

CPI: Terai (19 Districts)

Groups & Sub groups	Weight	2016/17	2017/18	2018/19	2019/2020
Overall Index	100	113.37	118.35	123.39	131.15
Food and Beverage	44.14	111.40	114.27	116.83	127.03
Non-food and Services	55.86	114.95	121.69	128.83	134.49

Source: QEB, NRB

Table 4.8

CPI Hill (25 Districts)

Groups & Sub groups	Weight	2016/17	2017/18	2018/19	2019/2020
Overall Index	100	117.46	122.85	128.99	135.57
Food and Beverage	44.88	114.16	116.70	121.75	130.96
Non-food and Services	53.12	120.48	128.55	135.74	139.78

Source: QEB, NRB

Table 4.9

CPI: Mountain (5 district)

Groups & Sub groups	Weight	2016/17	2017/18	2018/19	2019/2020
Overall Index	100	113.20	119.83	125.71	131.88
Food and Beverage	59.53	111.42	116.96	120.68	127.42
Non-food and Services	40.47	115.87	124.17	133.51	138.73

Source: QEB, NRB

4.2   Descriptive Statistics of the Variables

The descriptive statistics of consumer price index of Nepal (NCPI), Consumer price index of India (ICPI), Government Expenditure (GE) and Exchange rate (EXR) included mean, median, maximum value, minimum value, standard deviation, skewness, kurtosis and standard error are presented following table 4.1.

Table 4.10:

Descriptive Statistics of the Variables for the period 1975-2020

Variables	NCPI	ICPI	GE	EXR
Mean	41.24348	61.35148	186179.7	55.49348
Median	30.30000	46.99669	53421.00	61.09000
Maximum	132.8000	184.3288	1110457	116.8300
Minimum	4.10000	7.410622	1513.700	10.55000
Standard Dev	37.68024	53.18051	302420.8	33.25271
Skewness	1.020334	0.916032	2.077618	0.076090
Kurtosis	2.898104	2.598511	6.299565	1.779787
Observation	46	46	46	46

Table 4.10 shows that the mean value of NCPI is 41.24348 percent with standard deviation 37.68024. Its maximum and minimum values are Rs. 132.8000 and Rs.

4.100000 million Respectively. Similarly, the average Indian consumer price index is 61.35148 percent with standard deviation 53.18051. Its maximum value is 184.3288 and minimum value is 7.410622. Likewise, the mean value of government expenditure and exchange rate are Rs. 186179.7 and 55.49348 respectively. The maximum value of GE and EXR are Rs. 1110457 and 116.8300 million respectively. The minimum values of these variables are Rs 1513.700 and 10.55000 million respectively. The values of standard deviation indicate that most of the variables are highly volatile during the study periods of 46 years. Skewness of the variables shows that all the five variables NCPI, ICPI, GE and EXR are positively skewed.

4.3   Relationship between Dependent and Independent Variables

4.3.1   Trend Pattern of Nepalese CPI and Exchange Rate

Figure: 4.1

Trend Pattern of Nepalese CPI and Exchange Rate
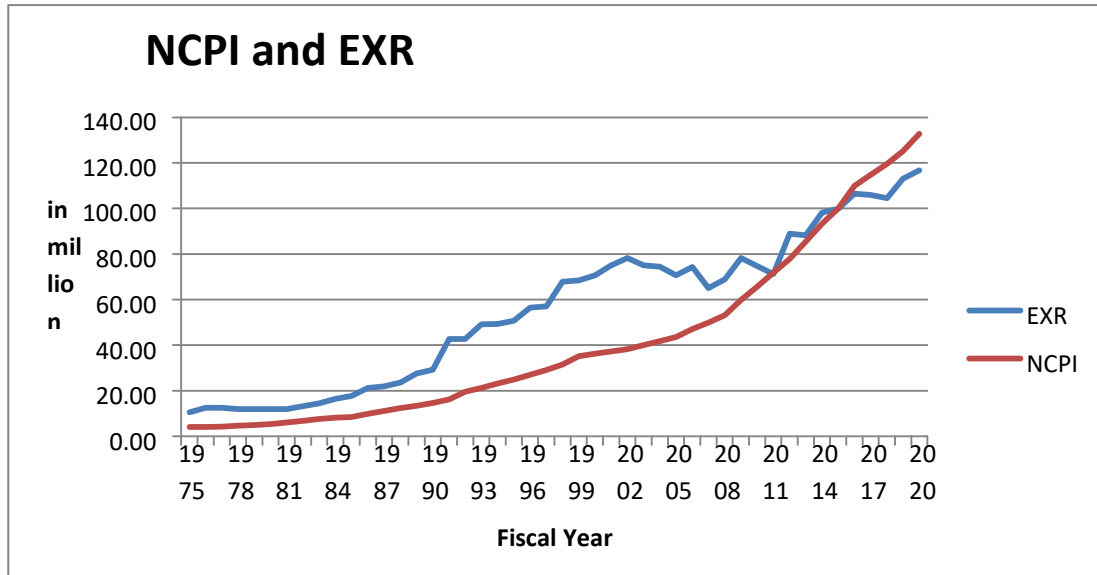
Source: Author's derivation based on the data of Quarterly Economic Bulletin, NRB

The line graph illustrates the relationship between Nepalese CPI and Exchange rate from 1975 to 2019. Both the variables remained steady from 1975 to 1983 then EXR started gradual increase thorough the period. In the meanwhile, NCPI shows increasing trend which was lower than EXR until 2015 and higher in the end of the period.

4.3.2 Relationship between Nepalese CPI and Indian CPI

Figure: 4.2

Relationship between NCPI and ICPI
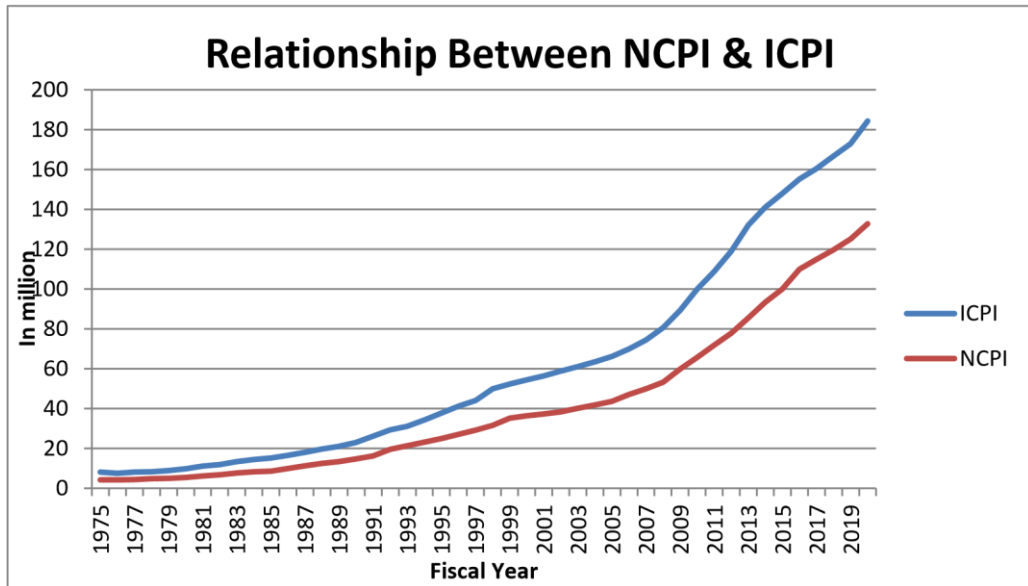
Source: Author's derivation based on the data of NRB and World Bank

Figure 4.3.2 shows that there is positive and significant relationship between Indian and Nepalese CPI throughout the data period.

Figure 4.3
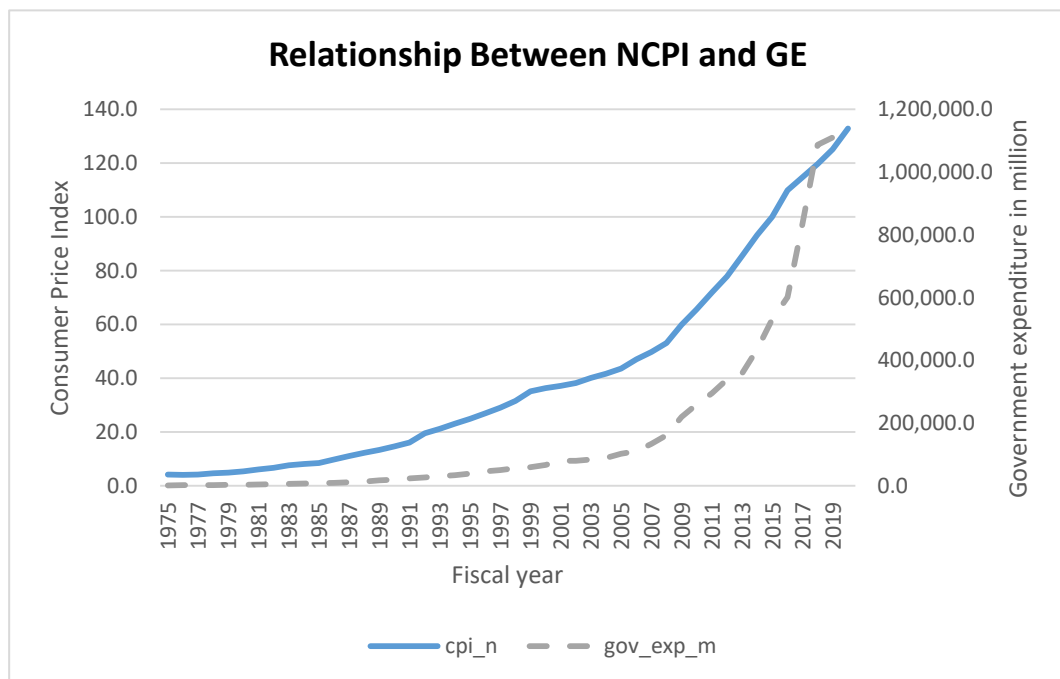

Source: Author's derivation based on the data of NRB and Economic Surveys

Figure 4.3 shows the relationship between Nepalese CPI and Government Expenditure. NCPI remains constant in the beginning until 1993. After the period both the variables remained increased sharply after 1993 to the end of the period.

4.4   Stationary test of variables

The time series data should be stationary. If the time series data are non-stationary it may provide the spurious result. The percent study used Augmented Dickey Fuller (ADF) test to test the stationary of the variables at level and first difference. The result of ADF test is presented in following table 4.2

Table 4.11:

Result of Augumented Dickey Fuller unit Root test

Variables	Constant		Remarks
	t-statistics	P-value	
LnNCPI	-1.702840	0.4229	
LnICPI	-2.211218	0.2053	
LnEXR	-1.245212	0.6463	
LnGE	-1.084520	0.7139	
ΔLnNCPI	-4.973648	0.0002 ***	I(1)
ΔLnICPI	-6.346358	0.0000 ***	I(1)
ΔLnEXR	-7.380275	0.0000 ***	I(1)
ΔLNGE	-4.702838	0.0004***	I(1)

Source: Author's own calculation from E-views

Note: */**/*** Significant at 10%, 5% and 1% level of significance respectively; the critical value at 1 percent is -3.596

The result of the ADF test statistics of concerned variables used in this study. If the variables are stationary in level then that variables are known as I(0) and if variables are stationary only after first difference then it is called I(1). The result of ADF test shows that all variables are non-stationary at level but stationary only after first difference. All variables LnNCPI, LnICPI, LnGE and LnEXR are stationary at first difference so this study applies Engle Granger approach to test the long-run cointegration of the variables.

4.5. Engle-Granger Cointegration Test and Error Correction Model

According to Engle – Granger cointegration test the long run cointegration of the variables are tested by testing the stationary of the residual term or error correlation term in the long run model. So before testing the stationary of residual term, the long run model has derived by using OLS method as below in table 4.3

Table 4.12:

Regression Result of long run model by Using OLS Method.

Dependent (NCPI)	Coefficient	Std. Error	t-statistics	Prob.
LnICPI	0.707715 ***	0.050623	13.98020	0.0000
LnEXR	0.165367 ***	0.020579	8.035701	0.0000
LnGE	0.128782 ***	0.022368	5.757524	0.0000
C	-1.382665	0.096020	-14.39974	0.0000
Diagnostic tests				
R-squared	0.999520	**S.D. dependent var**		1.079054
Adjusted R-squared	0.999485	**Akaike info criterion**		-4.498785
S.E. of regression	0.024482	**Schwarz criterion**		-4.339773
Log likelihood	107.4721	**Durbin-Watson stat**		1.887488
F-statistic	29124.73			
Autocorrelation				
Breusch-Godfrey Serial Correlation LM Test				**0.277**

Source: Author's own calculation using eviews10 Note:

* p<.1, ** p<.05, *** p<.01, ^{ns} p>.1

Figure 4.4

CUSUM Test of OLS
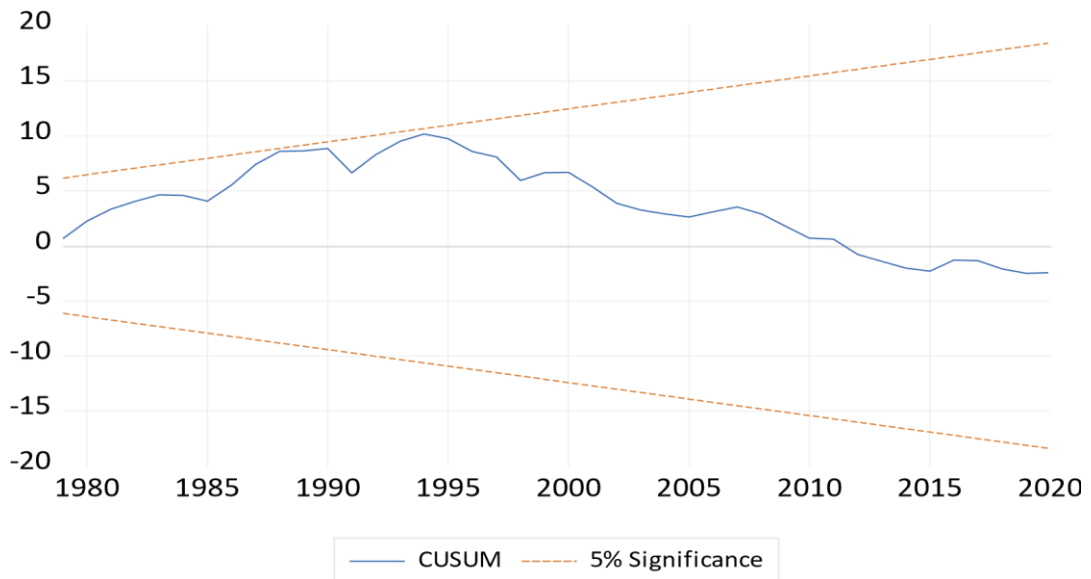
Source: Author's own derivation using eviews10

Table 4.12 displays the regression results from the OLS model along with the diagnostic tests. All the variables, Indian CPI, GE and EXR are significant at 1 percent level of significance. Since time series data suffers from serial correlation, the study uses both D-W test and Breusch-Godfrey Serial Correlation LM Test, both of these tests signify the absence of serial correlation. Further, the CUSUM Test clearly indicates stability in the equation during the sample period at 5 percent significance.

Table 4.13

ADF test of Residual

Variable	Constant		Remarks
	t-statistics	P-value	
ECM	-6.204787 ***	0.0000	

Source: Author's calculation through E-views.

The result of stationary test of the residual indicate that the absolute value of Augmented Dickey-Fuller test statistics 6.204787 is greater than the absolute value of Engle-Granger critical value 5.017 at 1 percent level of significance (see appendix VII) i.e. ECM is stationary at level. Thus, being residual term is stationary at level

form so this concludes that there exist cointegration among the variables and the long run model will not be spurious.

Table 4.12 shows the long run model and the coefficient gives the long run coefficient. The result implies that the Indian consumer price index, Government and exchange rate have significant positive role in increasing Consumer price index of Nepal in long run.

The elasticity for Indian CPI is estimated at 0.707 and it depicts that one percent point increase in ICPI increase the NCPI by 0.71 percent. This effect is significant at 1 percent level.

Similarly, the coefficient of exchange rate is 0.166 and significant at 1 percent level. It indicates that when exchange rate increases by 1 percent then Nepalese CPI increases by 0.166 percent with the assumption that other variables are constant.

Likewise, Government expenditure coefficient is 0.13 percent and significant at 1 percent level. This means that when the government expenditure increases by 1 percent then Nepalese CPI at factor cost will increase by 0.13 percent in long-run.

In table 4.12 the value of R-Squared is 0.9995. It means in long run, 99.95 percent of total variation in NCPI is explained by explanatory variables and 0.99 percent is due to error. Similarly, the probability value of F-statistic is less than 1 percent which shows that there is overall significant of long run model.

The Durbin- Watson statistic is 1.88 by using this value; it is difficult to conclude about the autocorrelation. So this study used Breusch-Godfrey Serial Correlation LM test to test the serial. The result of serial correlation shows that the observed Rsquared is 0.629407 with probability Chi-Squared 0.7300 (see appendix IV). This probability is more than 5 percent so the long run OLS model is free from autocorrelation.

To test the short-run relationship between NCPI and other explanatory variables the study used the Error Correction Model. The result of Error Correction Model I is presented in table 4.14.

Table 4.14

Regression result of short run Error Correction Model I: DNCPI as Dependent Variable.

Dependent D(NCPI)	Coefficient	Std. Error	t-statistics	Prob.
DLnICPI	0.696003 ***	0.094377	7.374684	0.0000
DLnGE	0.130086 ***	0.047360	2.746783	0.0090
DLnEXR	0.041926 ns	0.040147	1.044331	0.3026
ECM(-1)	-0.822863 ***	0.156613	-5.254121	0.0000
C	0.007114	0.010202	0.697318	0.4896
Diagnostic tests				
R-squared	0.665785	S.D. dependent var		0.037003
Adjusted R-squared	0.632364	Akaike info criterion		-4.651839
S.E. of regression	0.022436	Schwarz criterion		-4.451098
Log likelihood	109.6664	Durbin-Watson stat		1.810609
F-statistic Prob(F-statistic) =0.0000	19.92087			
Autocorrelation				
Breusch-Godfrey Serial Correlation LM Test				**1.015342**

Source: Author's own calculation using eviews10

Note: * p<.1, ** p<.05, *** p<.01, ^{ns} p>.1

Table 4.14 is the short run error correction model and the coefficient of short run model shows the short run coefficient of the variables with respect to DNCPI. In the short run, Indian consumer price index and government expenditure have positive and significant effect on consumer price index of Nepal. Where, exchange rate has no significant effect on Nepalese consumer price index in short run.

The coefficient of Indian consumer index (DLnICPI) is 0.696 which shows that there is positive relationship between Indian CPI and Nepalese CPI. The short-run impact of ICPI is 0.696. The coefficient of GE gives the short-run impact of GE is 0.13 percent in Nepalese CPI.

As can be seen from the above table 4.14 the result of error correction model indicates that the coefficient of the speed of adjustment (ECM_{t-1}) is 0.8228 with t-statistic -5.25 and corresponding probability 0.0000. This coefficient is found to have the correct sign and statistically significant at 1 percent level explaining the fact that NCPI and explanatory variables are converging in the long-run.

The value of R-squared is 0.6657. This means in short run, 66.57 percent of total variation in NCPI is explained by explanatory variable and remaining 33.43 percent is due to error. Likewise, the probability value of F-statistic is less than 1 percent that shows that there is overall significant of short run model.

The Durbin- Watson test statistic value is 1.81 and result of LM test shows that the observed R-squared is 2.282769 with probability Chi-square 0.3194 (see appendix IV). This both result indicates the short run ECM model is free from autocorrelation.

Coefficient of ECM states that 82% disequilibrium of last year is corrected by this year.

Table 4.15

Regression result of short run Error Correction Model II: DNCPI as Dependent Variable

Dependent D(NCPI)	Coefficient	Std. Error	t-statistics	Prob.
DLnICPI	0.669272 ***	0.134942	4.959717	0.0000
DLnGE	0.96146 **	0.050921	1.888132	0.0667
DLnEXR (-1)	0.034602 ns	0.044521	0.777220	0.4418
ECM(-1)	-0.744734 ***	0.169567	-4.391969	0.0001
DLnM2	0.149681 *	0.089623	1.670123	0.1031
C	-0.011195	0.014548	-0.769499	0.4464
Diagnostic tests				
R-squared	0.650352	**S.D. dependent var**		0.035127
Adjusted R-squared	0.604346	**Akaike info criterion**		-4.660771
S.E. of regression	0.022095	**Schwarz criterion**		-4.417472
Log likelihood	108.5370	**Durbin-Watson stat**		1.583274
F-statistic **Prob (F-statistic)** **=0.0000**	14.13616			

Source: Author's own calculation using eviews10
*Note: * p<.1, ** p<.05, *** p<.01, ns p>.1*

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Table 4.15 is the short run error correction model and the coefficient of short run model shows the short run coefficient of the variables with respect to DNCPI. In the short run, Indian consumer price index, government expenditure and money supply have positive and significant effect on consumer price index of Nepal. Where, exchange rate has no significant effect on Nepalese consumer price index in short run.

The coefficient of Indian consumer index (DLnICPI) is 0.669 which shows that there is positive relationship between Indian CPI and Nepalese CPI. The short-run impact of ICPI is 0.669.

The coefficient of Government Expenditure (DLnGE) is 0.96 which shows that there is positive relationship between Indian GE and Nepalese CPI. The short-run impact of GE is 0.96 percent.

Money Supply (DLnM2) is significant at 10 % level in short run.

As can be seen from the above table 4.15 the result of error correction model indicates that the coefficient of the speed of adjustment (ECM_{t-1}) is 0.744 with t-statistic -4.39 and corresponding probability 0.0001. This coefficient is found to have the correct sign and statistically significant at 1 percent level explaining the fact that NCPI and explanatory variables are converging in the long-run.

In the table 4.15, the value of R-squared is 0.6503. This means in short run, 65.03 percent of total variation in NCPI is explained by explanatory variable and remaining percent is due to error. Likewise, the probability value of F-statistic is less than 1 percent that shows that there is overall significant of short run model.

The Durbin- Watson test statistic value is 1.58. Coefficient of ECM states that 74% disequilibrium of last year is corrected by this year.

Short run Error Correction Model III has been attached in appendix VI which shows that M2 and ICPI are significant at 5% and 1% level of significance respectively. GE and EXR are insignificant in short run.

CHAPTER: V
MAJOR FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1   Major Finding

The main objective of this study was to examine the fluctuation of inflation in Nepal, to show the weighted structure of CPI in Nepal and to analyze the determinants of inflation. To fulfill this objective, this study used the dataset of 46 years over periods 1975-2020. To examine the fluctuation of inflation in Nepal, this study used trend line, table and graphs. The ADF test was applied to test the stationary of the time series data and Engle-Granger cointegration test was performed to test the cointegration among the variables. The long-run model was estimated by using OLS method. Similarly, ECM model was applied for the short run dynamism of the model. Finally, serial correlation LM test was performed. The major findings of the study are listed as given below:

- The trend of inflation is highly fluctuated during the study periods. The maximum level of inflation was 132.8 million in FY 1920 and its minimum value was 4.1 in FY 1975.

- The weighted structure of CPI of Nepal is calculated by using following formula-:

$$CPI = (Food\ CPI)^{w1} \times (non\text{-}food\ CPI)^{w2}$$

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

- The Engle-Granger cointegration test indicates that variables are cointegrated and long run OLS model is free from spurious regression.

- The long-run OLS model shows that Indian inflation and government expenditure have positive and significant effect on Nepalese inflation. For instance, one percent increase in Indian consumer price index, government expenditure and exchange rate leads to 0.70 percent 0.12 percent and 0.16 percent increase in NCPI.

- The result of ECM model indicate that in short run, Indian consumer price index and government expenditure have positive and significant effect on Nepal consumer price index. When one percent increase in Indian consumer price index and government expenditure leads to 0.69 and 0.13 percent increase in Nepal consumer price index respectively. While exchange rate has no significant effect on Nepal consumer price index in short runs.
- The coefficient of ECM (-1) is negative and significant at 1 percent level indicates that NCPI and other explanatory variables are converging into long-run equilibrium.

5.2   Conclusion

The main aim of this study was to establish the relationship among inflation, Indian inflation, Exchange rate and Government Expenditure by reviewing relevant studies using Nepal as the reference country. It is clear that the growth of Indian inflation, the growth rate of exchange and government expenditure are the main determinants of inflation in Nepal. This study suggests that prices in Nepal are highly dependent on Indian prices because of a weaker supply of domestic production supplemented by the increased imported goods from India. Inflation control is not an easy task for country like Nepal which shares open border with big country and is heavily dependent on the imported goods for the daily consumption and materials for other development purposes. In this context, dominant factor for inflation is supply shock generated outside the country. Thus, inflation control becomes more challenging and complicated for the monetary authorities since the monetary and fiscal policies framed to control the inflation seem to have lesser implications. However, it does not imply that there is no room for such policy implications at all.

5.3   Recommendations

From the above finding and conclusion of the study, this study recommended the following points.
- This empirical study suggests that, given the open border with India and liberalized trade regime, there exists higher prospect of Indian domination on the domestic prices in Nepal.

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Result of Long Run Cointegration Relation

Dependent Variable: LNNCPI

Method: Least Squares

Date: 08/20/21   Time: 11:53

Sample: 1975 2020

Included observations: 46

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNICPI	0.707715	0.050623	13.98020	0.0000
LNGE	0.128782	0.022368	5.757524	0.0000
LNEXR	0.165367	0.020579	8.035701	0.0000
C	-1.382665	0.096020	-14.39974	0.0000

R-squared	0.999520	Mean depen dent var	3.231978
Adjusted R-squared	0.999485	S.D. dependent var	1.079054
S.E. of regression	0.024482	Akaike info criterion	-4.498785
Sum squared resid	0.025174	Schwarz criterion	-4.339773
Log likelihood	107.4721	Hannan-Quinn criter.	-4.439218
F-statistic	29124.73	Durbin-Watson stat	1.887488
Prob(F-statistic)	0.000000		

Source: Author's calculation through E-views 10

ADF Test of Residual

Null Hypothesis: ERROR has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=9)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.204787	0.0000
Test critical values: 1% level	-3.584743	
5% level	-2.928142	
10% level	-2.602225	

*MacKinnon (1996) one-sided p -values.

Result of regression of ECM model I

Dependent Variable: D(LNNCPI)

Method: Least Squares

Date: 09/29/21   Time: 20:17

Sample (adjusted): 1976 2020

Included observations: 45 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNICPI)	0.696003	0.094377	7.374684	0.0000
D(LNGE)	0.130086	0.047360	2.746783	0.0090
D(LNEXR)	0.041926	0.040147	1.044331	0.3026
ERROR(-1)	-0.822863	0.156613	-5.254121	0.0000
C	0.007114	0.010202	0.697318	0.4896
R-squared	0.665785	Mean depen dent var		0.076892
Adjusted R-squared	0.632364	S.D. dependent var		0.037003
S.E. of regression	0.022436	Akaike info criterion		-4.651839
Sum squared resid	0.020135	Schwarz criterion		-4.451098
Log likelihood	109.6664	Hannan-Quinn criter.		-4.577005
F-statistic	19.92087	Durbin-Watson stat		1.810609
Prob(F-statistic)	0.000000			

Source: Author's calculation through E-Views 10

LM test of autocorrelation of cointegrated series Breusch-Godfrey Serial Correlation LM Test:

Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.277451	Prob. F(2,40)	0.7592
Obs*R-squared	0.629407	Prob. Chi-Square(2)	0.7300

LM test of autocorrelaton of ECM Model

Breusch-Godfrey Serial Correlation LM Test:

Null hypothesis: No serial correlation at up to 2 lags

F-statistic	1.015342	Prob. F(2,38)	0.3719
Obs*R-squared	2.282769	Prob. Chi-Square(2)	0.3194

Source: Author's calculation through E-Views 10

Result of regression of ECM model II

Dependent Variable: D(LNNCPI)

Method: Least Squares

Date: 01/05/22   Time: 13:11

Sample (adjusted): 1977 2020

Included observations: 44 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNICPI)	0.669272	0.134942	4.959717	0.0000
D(LNEXR(-1))	0.034602	0.044521	0.777220	0.4418
D(LNGE)	0.096146	0.050921	1.888132	0.0667
ERROR(-1)	-0.744734	0.169567	-4.391969	0.0001
D(LNM2)	0.149681	0.089623	1.670123	0.1031
C	-0.011195	0.014548	-0.769499	0.4464

R-squared	0.650352	Mean dependent var	0.078797
Adjusted R-squared	0.604346	S.D. dependent var	0.035127
S.E. of regression	0.022095	Akaike info criterion	-4.660771
Sum squared resid	0.018552	Schwarz criterion	-4.417472
Log likelihood	108.5370	Hannan-Quinn criter.	-4.570544
F-statistic	14.13616	Durbin-Watson stat	1.583274
Prob(F-statistic)	0.000000		

Source: Author's calculation through E-Views 10

Result of regression of ECM model III

Dependent Variable: D(LNNCPI)

Method: Least Squares

Date: 01/05/22   Time: 13:19

Sample (adjusted): 1977 2020

Included observations: 44 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNICPI)	0.684432	0.138593	4.938442	0.0000
D(LNEXR)	0.016173	0.045665	0.354168	0.7252
D(LNGE(-1))	0.019486	0.049094	0.396910	0.6937
ERROR(-1)	-0.716028	0.152920	-4.682370	0.0000
D(LNM2)	0.194874	0.090743	2.147544	0.0382
C	-0.007928	0.016012	-0.495103	0.6234

R-squared	0.613223	Mean dependent var		0.078797
Adjusted R-squared	0.562331	S.D. dependent var		0.035127
S.E. of regression	0.023239	Akaike info criterion		-4.559848
Sum squared resid	0.020522	Schwarz criterion		-4.316549
Log likelihood	106.3167	Hannan-Quinn criter.		-4.469621
F-statistic	12.04955	Durbin-Watson stat		1.477674
Prob(F-statistic)	0.000001			

Source: Author's calculation through E-Views 10

APPENDIX: VII

Critical Values for the Engle-Granger Cointegration Test

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

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

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

Research Matrix

SN	Objectives	Indicators	Sources of Data	Tools And Data Analysis
1	To examine the fluctuation of inflation in Nepal	Indian CPI, Government expenditure, Exchange rate	Secondary	Descriptive
2	To show the weighted structure of CPI in Nepal.	weight of food and beverage and non-food and services	Secondary	Geometric Weight
3	To analyze the determinants of inflation.	ICPI, GE,EXR	Secondary	unit root test, Engle Granger test cointegraion, ECM and OLS