CHAPTER - I

INTRODUCTION

1.1 Background of the Study

Inflation means a persistent and appreciable rise in the general price level in the economy over time. A modest level of inflation is considered to be desirable because it creates positive effect on investment, production and employment. Maintaining low and sustainable inflation brings stability to financial systems and encourages sustainable economic growth over the longer run (Fergusson, 2005). However, High and variable Inflation is a worldwide macroeconomic problem that leads to unpredictability in income and expenditure decisions of the different groups of the society; deforms economic growth; reduces savings and investments; and rises cost of capital and exacerbates the income inequality in society (NRB, 2007). High inflation adversely impacts the overall growth of the economy, generating motivations for households and firms to curtail their horizons and to spend resources in handling inflation risk rather than directing on the most productive activities (Iqbal, Nadim & Akbar, 2022). One of the main objectives of both developed and developing economies is, therefore, to attain a moderate level of inflation (Tufail & Batool, 2013). The major factors that determine inflation in the economy are broad money supply, budget deficit, imported prices from international trade, gross domestic product and exchange rate of country's currency.

Money supply has a direct and proportional relation with inflation assuming the level of real output is constant and the velocity of money is constant (Fishers, 1911). This is because when the money supply increases, it puts more money into the hands of both consumers and producers, consequently generates consumption and investment (Amassoma et al., 2018). Furthermore, as the money supply keeps expanding, prices of goods and services tend to rise, particularly when the growth of output reaches full employment. Monetarists, believe that the money supply is the main determinant of economic growth in the short run and the price level over longer periods. Inflation is always and everywhere a monetary phenomenon and it occurs in the economy when the rate of growth of the money supply exceeds the growth rate of the real aggregate output in the economy (Friedman, 1963). Because of the inflationary consequences associated with excessive expansion of money supply, Friedman (1963) asserted that

monetary policy should be done by targeting the growth rate of the money supply to maintain economic and price stability.

Inflation occurs through money supply if the government adopts deficit budget. If the government finances a deficit budget either by printing of money by the contra bank or through the open market operations, both of the measures change the nominal money supply in an economy and therefore change the price level (Duodu et al., 2022). Higher deficit policies may lead to higher inflation even in the absence of monetization by Central banks due to following two reasons (Ackay et al., 1996). First, the government's need to borrow typically raises the overall demand for credit in the economy, causing interest rates to rise and crowding out private investment. As a consequence, the economy's growth rate is likely to decrease, leading to a reduction in the quantity of goods available at a given level of cash holdings and consequently causing an uptick in the price level. Such actions alter the nominal money supply within an economy, consequently leading to changes in the overall price level. The other channel through which deficits can lead to higher inflation when Central Banks do not monetize the debt is the private monetization of deficits. This occurs when the high interest rates induce the financial sector to develop new interest-bearing assets that are almost as liquid as money and are risk free. Thus, the government debt not monetized by the Central Bank is monetized by the private sector and the inflationary effects of higher deficit policies prevail.

Keynes believes that excessive demand causes inflation in an economy. He also further adds that money supply may create inflation but true inflation starts only after full-employment. Moreover, the Keynesians argue also that organized labor pressures on government pushes wages up, and when not matched with output levels creates inflationary pressures. On the other hand, the Structuralists claim that inflation in underdeveloped and developing countries occurs due to structural characteristics of an economy such as structural rigidities, unproductive government interventions, and political interferences in these economies. The fiscal theory of the price level (FTPL), alternatively referred to as the quantity theory of government debt, examines how budget deficits impact the overall price level through mechanisms distinct from those in the monetarist perspective (Duodu et al., 2022).

The attention of researchers and policy makers in different economies have been captured to conduct empirical examinations of the dynamics outlined by these

theories due to the diverse views among these school of thoughts. This is done to ensure that suitable measures or policies are implemented to control inflation effectively. The conflicting propositions made by these theories have consequently motivated numerous researchers to conduct empirical investigations into the causal relationships among money supply, budget deficits, and inflation in both developing and developed countries. Considering this, numerous scholars have conducted comprehensive examinations of the connection between money supply, budget deficits, and inflation in both developing and developed nations, yielding varied outcomes (Neupane, 1992; Khatiwada, 1994; Mathema,1998; Chaudhary and Xiumin, 2018; Kovanen, 2011; Adu & Marbuah, 2011; Nasir et al., 2020; Nguyen, 2015; Duodu et al., 2022 Byanjankar (2020; Pandey, 2005; Poudyal, 2014; IMF, 2014; NRB, 2007).

Statistical data from the Ministry of Finance of Nepal shows that Nepal has persistently faced budget deficits since 1974.The average ratio of budget deficits to GDP from FY 1974/ 75 to 2021/22 remains 6.97 percent. One of the fundamental reasons why budget deficits have increased in recent years is that the Nepalese government wanted to boost the economy by raising expenditures. The highest ratio of budget ratio to GDP was recorded in FY 1982/83 which was 12.25 percent. Adoption of such budget deficit has contributed to rise inflation. The statistical data shows that the average inflation rate of Nepal from FY 1974/75 to 2021/22 has remained 8.11 percent. The lowest rate of inflation was recorded in FY 1975/76 which was -0.69 percentage while the largest rate of inflation was recorded in FY 1991/92 which was 21.05 percent. Moreover, carefully examining at the dynamics of money supply, it can be observed that money supply has continuously increased since FY 1974/75. On an average, the growth rate of money supply has been approximately 18.39 percent since 1974.

The statistical data of Nepal shows that inflation has not been stable since 1974. Inflation may occur in the economy due to various factors. Therefore, the study tests the validity of classical theory, monetarist theory and the fiscal theory of the price level in the context of Nepal. This study analyzes the impact of money supply and deficit budget on inflation in Nepal in both short-run and long-run. The reason for focusing primarily on the long run relationship is because the short run relationship may not be sufficient (though necessary) for effective policy discourse and therefore

could render policies unsuccessful in an economy. This study also finds out the current status of money supply, budget deficit and inflation in Nepal. Autoregressive Distributed Lag Model is used to examine short-run and long-run relationship between money supply, budget deficit and inflation.

1.2 Statement of the Problem

The issue of inflation has consistently captured the attention of numerous researchers in the field of economics as it influences major decisions such as investment, consumption and savings among others (Duodu et al., 2022). Additionally, inflation can lead to the failure of important policies or projects because it disrupts budget allocation, ultimately hindering the economic progress. Considering the adverse consequences of inflation is likely to have on economies as well as the livelihood and welfare of citizens, the dynamics of inflation, money supply and budget deficit have continuously received attention from both theoretically and empirical perspectives (Adom et al., 2018).

In the context of Nepal, successive governments have made efforts to maintain a single digit as well as stable inflation rate with the aim of improving the wellbeing of citizens and boosting savings and investment decisions in the economy. However, these efforts have proven unsuccessful, as the inflation rate in the economy continues to fluctuate and remains near to double digits. The inflation rate of Nepal was 12.6 percent in 2008/09. This rate had decreased and reached to 8.3 percent in 2011/12. This rate had again increased and reached to 9.9 in 2012/13. Again, this rate had decreased to 7.2 percent in 2014/15 and increased to 9.9 in 2015/16. This rate had fall drastically to 4.2 percent in 2016/17 and remained stable until 2018/19. Again, this rate increased to 6.1 percent in 2019/20. In 2021/22, it has remained at 6.3 percent. This clearly shows that inflation has not been stable and hence could badly affect major economic decisions.

Different scholars employ different methods to describe the phenomenon of inflation. Due to the complexity and uncertainty of inflation, different theories have been formed according to the influential factors of inflation (Wang, Wang, & Skare 2022). Price stability is the prime objective of monetary policy. Inflation may occur as a result of increasing budget deficit and money supply in the economy. It is not possible to carry out effective policy without understanding the relationship between inflation, money supply and budget deficit. Therefore, it is necessary to study the relationships

between these variables in order to formulate correct policies regarding in Nepal. In this context, there are some pertinent questions regarding rational of analyzing the relationship between broad money supply, budget deficit and inflation.

a) What is the current status of broad money supply, budget deficit and inflation in Nepal?
b) Is there short-run and long-long significant relationship between money supply and budget deficit with inflation in Nepal?

1.3 Objectives of the Study

The main objective of the study is to analyze the relationship between broad money supply, budget deficit and inflation in Nepal. However, the specific objectives of the study are as follows:

a) To analyze the current status of inflation in Nepal, broad money supply, budget deficit, Real GDP, nominal effective exchange rate, and Indian inflation.
b) To examine the short-run and long-run relationship between broad money supply and budget deficit with inflation in Nepal.

1.4 Hypothesis of the Study

Null Hypothesis (Ho): There is no short-run and long-run significant relationship between money supply and budget deficit with inflation.

Alternative Hypothesis (H1): There is a short-run and long-run significant relationship between money supply and budget deficit with inflation.

1.5 Significance of the Study

Money supply and budget deficit are the important determinants of inflation. Increase in both money supply and budget deficit increases the general price level in an economy. The economist who follows the monetarist school of thought contends that the money supply plays a more significant role in driving inflation. Likewise, budget deficit is the cause of inflation in an economy through money supply. Inflation is a pressing concern in the field of economics due to its potential to significantly impact the overall economy. It poses detrimental effects on both developing and developed economies, and several nations have experienced collapse as a result of hyperinflation. Inflation disrupts the smooth functioning of the economy. This research aims to investigate the connection between the money supply, budget deficit and inflation within the context of Nepal.

This study can contribute to the existing economic literature in the context where theories and existing literatures have given mixed and conflicting results about the relationship between inflation, money supply and budget deficit. Furthermore, from a practical standpoint, the contribution and findings of this study would be supportive to the government and policy makers in terms of helping them to understand the influence of money supply on inflation as well as building policies that will make ensure stability and sustainable development in the country.

1.6 Limitations of the Study

a. The outcome of the study depends upon the validity of secondary data.
b. Only data of 48 years from the fiscal year1974/75 to 2021/22 will be used in the study.
c. Although there are many methods of examining co-integration between variables, this study will only be employed ARDL Bounds test approach to co-integration. Therefore, the conclusions drawn by this study may not be matched with the conclusions drawn by the study which used another methodology.
d. Due to non-availability of monthly and quarterly data, this study uses only annual data which may lead fewer dynamic results than other studies.

1.7 Outline of the Study

The study is divided into five chapters. The first chapter is introductory. This chapter includes background of the study, statement of the problem, objectives of the study, significance of the study and the limitations of the study. The second chapter is review of the literature that includes theoretical, empirical review and research gap. The third chapter is research methodology. It including research design, conceptual framework, nature and sources of data, study period covered, tools and methods of data collection, data organization and processing, tools and methods of data analysis, model specification, description of variables and model and econometric test. The fourth chapter is the body part of the study. This chapter analyzes the trend and empirical analysis of money supply, budget deficit and inflation in Nepal. Moreover, this chapter is divided in to trend analysis and descriptive statistics as well as empirical analysis. Finally, the fifth chapter gives a glimpse of summary of findings, conclusion and recommendations of research findings.

CHAPTER - II

REVIEW OF LITERATURE

This section presents a brief review of theories as well as earlier studies on money supply, budget deficit and inflation nexus. This section is divided into three parts viz. theoretical literature review, empirical literature review and research gap.

2.1 Theoretical Review

Several theories related to the effects of money supply and budget deficit on inflation have emerged in monetary economics. This section has reviewed some of the notable theories of inflation.

2.1.1 Classical Theory

The quantity theory of money developed by Classical and neoclassical economists believe that if money supply is increased in full employment situation where money plays as a means of transaction only, it only increases price level in the economy. The quantity theory of money can be explained by the following equation:

$$MV = PT$$

Where, M is money supply; V is the velocity of money, which is the measure of number of times one unit of money crosses the hands from one transaction to another; P is the general price level; and T represents the real volume of transactions. In classical system, both V and T are assumed to be constant in the short run and hence the above equation of exchange can be rewritten to yield a price equation for the economy as follows:

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

This equation shows that price level is directly proportional to the money supply.

2.1.2 Monetarist Hypothesis

The monetarist theory, akin to the classical theory, relies on the quantity theory of money, which claims that the price level is influenced by the nominal money supply. The monetarists argue that the equality between desired level of real balances and the purchasing power of the money supply at any given level of nominal money supply determines the general price level. Inflation occurs due to the deviation of nominal money supply from the desired real balances at given any price level. The monetarists

further argue that deficit budget is the cause of inflation through money supply. This is because the deficit budget is financed either through printing of money by the central bank or through the open market operations. Both of them changes the money supply in an economy and hence changes in the price level. According to the monetarists, the QTM implies that inflation is always, everywhere a monetary and demand side phenomenon. Inflation is, therefore, always and everywhere a monetary phenomenon (Friedman, 1963).

2.1.3 Fiscal Theory of the Price Level

The fiscal theory of the price level (FTPL) also known as the quantity theory of government debt analyzes how fiscal (budget) deficit feeds through general price level in different mechanism other than that of the monetarist approach. The FTPL considers the government's inter-temporal budget constraint (GBC) as an instrument that links both fiscal and monetary policies. According to the FTPL, the GBC is at equilibrium when the discounted value of the government's future primary surplus (which includes seignior age as a revenue source) is greater than (equal to) the current nominal value of the government (public) debt, which considers the monetary base. The proponents opine that the discount rate is measured by the ratio of real interest rate to the growth rate of the economy. The FTPL assumes that the future path of revenues and primary expenditures is determined exogenously by fiscal authority. The theory further argues that, at a given discount rate, the price level will rise to equilibrate the GBC condition anytime the discounted value of primary surplus is lower than the value of nominal public debt. Therefore, price is the only adjustment variable to maintain equilibrium condition in the GBC.

To understand how the price level is affected by fiscal policy, Woodford (1995) suggests that a positive and exogenous price shock reduces the value of government debt (liabilities) owed to private individuals who have purchased or invested in government securities which in turn lowers their wealth as well as demand for goods. The FTPL theory postulates that, when this happens, the individual's expectations with respect to the sustainability of fiscal policy will generate similar wealth-effect. If the market recognizes a negative perception about the sustainability of public finances (when discounted value of government primary surplus deviate from the nominal value of government liabilities), such negative perception will trigger an increase in the level of price to a higher level required to equalize the GBC. This higher price

lowers the value of private assets, which generates the abovementioned wealth-effect. Therefore, higher government debt (liabilities) generates higher distortion, and hence, higher prices are required to restore the GBC. The implication is that budget deficit causing long run inflation with money supply playing no role may establish a strong backing for the FTPL as indicated by Lozano-Espitia and Lozano-Espitia (2008).

2.1.4 Keynesian Approach

The Keynesian approach to determination of inflation is subjected to excessive demand dominations, which assumes that the economy is at full employment. Keynes argues that firms generate more profit at a fixed nominal wages when there exists excess demand at full employment level. As result, firms demand for labour increases with the aim of meeting the growing demand in the economy, which in turn leads to higher wages paid by firms. As documented by Kotwal (1987) and Frisch (1989)), the higher wages increase the general price level as cost of production increases and hence inflation arise.

2.1.5 Demand-pull Theory of Inflation

According to this theory, when aggregate demand increases the available supply cannot meet the increased demand. So, the price of goods and services will rise and demand-pull inflation occurs. According to this theory, inflation is generated by pressure of excess demand of goods and services for the available supply in the economy, especially when the economy approaches to the full employment level. If aggregate demand rises, the multiplier effect of the increase in aggregate demand becomes disabled due to supply constraint and hence the only way to clear the goods market is through raising the money prices of the goods.

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

- Depreciation or devaluation of the exchange rate: This increases the price of imports and reduces the foreign price of economy's exports. If consumers buy fewer imports while foreigners buy more exports; or if export is more elastic than imports, the aggregate demand in the economy will rise. If the economy is already at full employment or there is supply bottleneck, it is hard to increase output and so prices are pulled upwards.

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

2.1.6 Cost-push Theories of Inflation

- It occurs when aggregate supply falls either from the increase in cost of production, fall in production or monopoly powers. It is also known as supply side inflation. Due to increase in costs of production, the aggregate supply decreases and ultimately price level rises. Cost-push inflation can be shown using the aggregate demand and aggregate supply curves. In this case, it is not the aggregate demand that increases; it is the aggregate supply curve that shifts to the left as a result of the increase in the cost of production. The cost of production can be increased if there is wage rate increment from the trade union power in greater proportion compared to the increase in the marginal productivity of the labour.
- Profits: Firms having more power and ability to raise prices, independently to demand, can make more profit and result cost-push inflation. This is most likely to occur, when markets become more concentrated and move towards monopoly or perhaps oligopoly.
- Wages: The trade unions may be able to push wages up without increasing the productivity of labors. Firms, then, are forced to increase their prices to pay the higher claims and maintain their profitability.
- Imported inflation: In a global economy, firms import a significant proportion of their raw materials or semi-finished products. If the cost of these imports increases for reasons out of domestic control, then once again firms will be forced to increase prices to pay the higher raw material costs.
- Exchange rate changes - If there is depreciation in the exchange rate, then exports will become cheaper abroad, but imports will appear to be more expensive. Firms will be

paying more for their overseas raw materials leading to increase prices of domestic economy.

- Commodity price changes - If there are price increases on world commodity markets, firms will be faced with higher costs if they use these as raw materials. Important markets would include the oil market and metals markets.
- External shocks - This could be either for natural reasons or because a particular group or country will gain more economic power. An example of the first was the Kobe earthquake in Japan, which disrupted world production of semi-conductors for a while. An example of the second was the case of OPEC which forced up the price of oil four-fold in the early 1970s.
- Exhaustion of natural resources: As resources run out, their price will inevitably gradually rise. This will increase firms' costs and may push up prices until they find an alternative source of raw materials (if they can). For example, in many countries such problem has been caused by erosion of land when forests have been cleared. The land quickly became useless for agriculture.
- Taxes: Increase in indirect taxes (taxes on expenditure) increases the cost of living and push up the prices of products in the shops.

2.1.7 Real Business Theory of Inflation

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

Unlike in adaptive expectation principle, people do not consistently make the same prospect. Economic agents form their macroeconomic expectations “rationally” based on all past and current relevant information available, and not only on past information. The expectations are, however, totally random, or independent of each other. The RE approach to the business cycle and prices generated a vertical PC both for the short- and the long run. If the monetary authority announces a monetary stimulus in advance, people expect that prices rise.

Fully anticipated monetary policy cannot have any real effects even in the short-run. Thus, the central bank can affect the real output and employment only if it can find a

way to create a price surprise. Otherwise, forward-looking expectation adjustments of economic agents will fail the pre-announced policy. Likewise, if a disinflation policy is announced in advance, it cannot reduce prices if people do not believe that the government will really carry it out. That is price expectations are closely related to the policy credibility and reputation for successful implementation.

2.1.8 Structuralist Theory

The *structuralist* approach to inflation is one of the major versions of the cost-push theories of inflation. The structuralist inflation models (developed in the 1960s) explain inflation with the productivity differences between the industrial and agricultural sectors. In general, the traditional sector responds to monetary (or aggregate-demand) shocks with a lag. This lag is accompanied by a partial increase in industrial output and employment in the short run, which in turn increases wages and hence the demand for agricultural products. This increase implicates a change in relative prices in favor of foodstuffs. Higher agricultural prices lead to higher wage demands in this sector. Increasing wages increase the demand for industrial products, and the mechanism continues to work. In this model, aggregate supply chronically lags behind aggregate demand as a result of the temporary output rigidities in one of the sectors. Therefore, the structuralist model is accepted as a cost-push theory. The structuralist argues that by the very nature of their economies, LDCs are prone to inflation as most of them are characterized by structural rigidities, unproductive government interventions, and political interferences in these economies. While the Keynesians argue also that organized labor pressures on government pushes wages up, and when not matched with output levels creates inflationary pressures; and most of these LDCs are net importers of energy and most industrial imputes and other basic necessities of life.

2.1.9 New Political Economy Theory of Inflation

The theories as mentioned above mainly focus on macroeconomic determinants of inflation (e.g., monetary and real shocks, and inertia in inflation) and simply ignore the role of non- economic factors such as institutions, political process and culture in process of inflation. They also overlook the possibility that sustained government deficits may be partially or fully endogenized by considering the effects of the political process and possible lobbying activities on government budgets, and thus, on inflation. Political forces, not the social planner, choose economic policy in the real

world. Economic policy is the result of a decision process that balances conflicting interests so that a collective choice may emerge (Drazen, 2000). It, therefore, provides fresh perspectives on the relations between timing of elections, policymaker performance, political instability, policy credibility and reputation, central bank independence and the inflation process itself.

2.2 Empirical Review

Various studies have been carried out for many countries using various sample periods and econometric approaches and methods. This section is devoted to exploring some key studies that have been carried out over the past decades. This section is divided into two pats. The first part is related to the international context whereas the second part presents national context.

2.2.1 International Context

Sowa (1994) examined the relationship between fiscal deficits, output growth and inflation targets for the period 1965 to 1991 using the error correction model (ECM) as estimation technique. The results revealed that nominal money (M0) and real income have a significant positive impact on inflation, whereas exchange rate tend to have a positive significant impact on inflation. The study further indicated that, for periods with consistent fiscal deficit or policy (inconsistent fiscal deficit), inflation tends to be within target (above target).

Ghartey (2001) investigated macroeconomic instability and inflationary financing nexus using quarterly time series data covering the period 1970 to 1992. Employing the pair-wise Granger causality test and vector error correction model (VECM) for the analysis, the study showed that monetary base and currency ratio cause inflation and real output growth and inflation also cause exchange rate growth. Real output growth is revealed to have a bi- directional causal relationship with money supply growth, monetary base, currency ratio, budget deficit as a percentage of GDP, and inflation. Similarly, using annual time series data spanning 1983 to 1999, Bawumia and

Abradu-Otoo (2003) explored the relationship between monetary growth, exchange rates and inflation. The results from the error correction model showed that money supply (M2+) and exchange rate have a significant positive relationship with inflation,

whereas the effect of real income on inflation is revealed to be negative and significant.

Using the ordinary least squares and generalized method of moments estimation techniques, Kovanen (2011) investigated whether money matter for inflation using quarterly time series data spanning 1990 to 2009. The study revealed that inflation gap and real output gap have a positive and significant effect on inflation. Real money gap and nominal money gap are also found to have insignificant negative effect on inflation in both estimation techniques. Currency depreciation is also found to have significant negative (significant positive) effect on inflation in four quarters (eight quarters) in both the OLS and GMM estimators.

Eita et al., (2021) examined the impact of fiscal deficit on inflation in Namibia. The paper employed Autoregressive Distributed Lag Model (ARDL) and Granger causality approach using quarterly data for the period 2002 - 2017. Empirical results showed evidence of a long run positive effect of fiscal deficit on inflation in Namibia. This suggests that fiscal deficit has a direct effect on inflation in Namibia. The study also found a unidirectional causality running from fiscal deficit to inflation in Namibia. The study confirmed that South Africa's prices have positive effect on inflation in Namibia.

Ssebulime & Edward (2019) investigated the relationship between budget deficit and inflation in Uganda for the period 1980 – 2016. The results revealed that the relationship between the two variables is positive. The results suggest that budget deficit is a driver of inflation in Uganda.

Duodu et al, (2022) investigated the long run dynamics of money supply, budget deficit and inflation in Ghana using quarterly data from 1999Q1 to 2019Q4 and employing Granger causality test and the vector error correction model (VECM) for the analysis. The study found that budget deficit has a significant positive effect on inflation whereas money supply affects inflation negatively.

Nasir et al. (2020a) examined inflation expectations in the face of oil shocks for New Zealand and United Kingdom from the period January 1984 to June 2018. The results from the non-linear autoregressive distributed lag (NARDL) model indicated that real effective exchange rate has a significant negative relationship with inflation expectations in both the short- and long-run for both countries. The results further

revealed that inflation, real effective exchange rate, money supply, output growth, unemployment and fiscal deficit/ surplus have significant implications for inflation expectations for the two countries. Nasir et al. (2020b) investigated the exchange rate pass-through and management of inflation expectations for Czech Republic using the NARDL. The outcome of the study showed that real effective exchange rate has a significant negative relationship with inflation expectations in both the short- and long-run. However, the relationship between inflation expectations and oil price shocks is positive but insignificant in both periods. Fiscal stance and money supply are also revealed to have insignificant negative relationship with inflation expectations in both periods.

Alam et al, (2022) investigated the impact of selected macro-economic variables like real effective exchange rate (REER), GDP, inflation (INF), the volume of trade (TR) and money supply (M2) on-budget deficit (BD) in Bangladesh over the period of 1980–2018. By using secondary data, the paper uses the Vector Error Correction Model (VECM) and Granger Causality test. Johansen's cointegration test is used to examine the long-run relationship among the variables under study. Johansen's cointegration test result shows that there exists a positive long-run relationship of selected macroeconomic variables (real effective exchange rate, inflation, the volume of trade and money supply) with the budget deficit, whereas GDP has a negative one. The short-run results from the VECM show that GDP, inflation and money supply have a negative relationship with the budget deficit. The Granger Causality test results reveal unidirectional causal relationships running from BD to REER; TR to BD; M2 to BD; GDP to REER; M2 to REER; INF to GDP; GDP to TR; M2 to GDP and bidirectional causal relationship between GDP and BD; TR and REER; M2 and TR. Nguyen (2015) studied the effect of fiscal deficit and money supply (M2) on inflation in selected economies (Bangladesh, Cambodia, Indonesia, Malaysia, Pakistan, Philippines, Sri Lanka, Thailand and Vietnam) of Asia using time series data from the period 1985 to 2012 and applying the pooled mean group (PMG) estimation-based error correction model and the panel differenced GMM estimation techniques. The result of the study showed that fiscal deficit and money supply (M2) have a significant positive effect on inflation in long run whereas, in short run, money supply has significant negative effect on inflation, and the effect of fiscal deficit is insignificant.

Using annual time series data from 1960 to 2009 and employing the autoregressive distributed lag (ARDL) model, Adu and Marbuah (2011) examined the determinants of inflation. The study showed that money supply has a significant positive influence on inflation in both the long and short run. The relationship between fiscal deficit and inflation is revealed to be insignificant in the long run but positive and significant in the short run. Exchange rate is found to exert significant negative effect in the long run. The study further showed that, while interest rate impacted positively on inflation, real output is found to have a significant negative effect on inflation in both the long- and short-run.

Lakshmanasamy (2022) examined the causal relationship between inflation and macroeconomic variables - interest rate, exchange rate, money supply, GDP and fiscal deficit - in India over the period 1986 to 2020 applying the vector correction (VECM) estimation method. The macro variables are stationary at first difference and a cointegrating and causal relationship exists between the wholesale price index and interest rate, exchange rate, GDP, broad money and gross fiscal deficit. The VECM estimates reveal that money supply and GDP are the most important macro variables in explaining the variation in inflation. The estimated error correction term shows that the short-run disequilibrium is corrected by about 20% every period towards the long-run equilibrium. The impulse response results show that inflation responds positively to money supply from the start to the 9th period.

Istiqomah & Mafruhah (2022) analyzed the relationship between budget deficits and economic growth based on Keynesian, Neoclassical, and Ricardian Equivalent theories, and to explain the relationship between inflation, poverty, world crude oil prices, and government consumption on economic growth. Time-series data in Indonesia from 1981 to 2019 were analyzed using the Domowitz-El Badawi ECM and VAR methods. The results show that the Ricardian Equivalence is proven to have occured in the short-term in Indonesia, while in the long-term, budget deficit shows a positive impact on economic growth in Indonesia and supports the Keynesian perspective. In the short term, only inflation and government consumption show an impact on economic development: while inflation has a negative effect. In the long run, budget deficit, inflation, poverty, and world oil prices all affect economic growth, while government consumption does not.

Kaur (2021) examined the important macroeconomic determinants of inflation in India and investigated whether the proposition of a positive effect of fiscal deficits on inflation can be verified in the particular case of the Indian economy using quarterly data from Q1: 1996–1997 to Q1: 2016-2017 and employing ARDL Bounds approach to cointegration. The study found that gross fiscal deficit and money supply had negative impact on inflation in India. Moreover, the study also found that crude oil prices and exchange rate were important determinants of inflation in India.

2.2.2 National Context

Using OLS technique Neupane (1992) examined both monetarist (closed economy) and structuralist approaches to the inflation process in Nepal over the period 1965 to 1988. Percentage change in CPI was used as the dependent variable and percentage change in current money supply, money supply lagged by one and two years, percentage change in GDP, and the expected cost of holding money, percentage change in output in commodity producing sectors lagged by one year, percentage change in the import price index lagged by one year and percentage change in government budget deficit were taken as the explanatory variables. The study found that monetary policy is an important instrument to control inflation. the study also found that an increase in money supply in line with the growth of per capita GDP could help to control inflation.

(ISD, 1994) used an eclectic approach of the monetarist and structuralist views to identify major determinants of inflation in Nepal. money supply and real output, Indian wholesale price exchange rate, lagged effect of money supply and government expenditure were taken as additional explanatory variable. The study found that money supply, international prices (particularly Indian prices), exchange rate, real output, government expenditure and expectation factors as major sources of inflation in Nepal. Similarly, infrastructural bottlenecks, imperfect market condition and market oriented economic policies are also instrumental for inflation escalation. ISD (1994) found that Nepalese inflation increases by more than 8 percent if Indian inflation increase by 10 percent.

Khatiwada (1994) examined the inflation process in Nepal utilizing basis the quantity theory of money. Initially, results showed low explanatory power and suggested that there were other missing variables in the equation. When open economy variables,

such as Indian inflation and the exchange rate, were included this showed significant increase in the explanatory power of the equation. The study had also included structural variables such as per-capita output and government expenditures, but those did not have a significant effect being "swamped" by the monetary variables. The study finds that *IPI* is consistently significant and suggests that inflation in Nepal is influenced by open economy forces.

Mathema (1998) has used an expectation augmented Phillips Curve approach to examine whether the nominal wage increases are the most significant sources of cost push inflation. Annual CPI inflation (P), real GDP growth (GDPR), change in money supply (narrowly defined; M), change in wages (W), change in imported price (PI) and change in price expectation (PE)11 are the variables where excess demand proxies for unemployment. The data for the study period is 1978/79 and 1995/96. OLS and unit root tests are performed for stationarity test of the variables chosen. The author finds the importance of several wage variables for influencing domestic inflation but surprisingly does not find significant effect of imported prices. The author attributes this to "absorption of the effect of WPII (whole sale prices of India) by the money wages of laborers in the homeland" (Mathema, 1998, p. 16). Granger Bivariate Causality Test finds unilateral causation from the rate of inflation to wages of agricultural and masonry labour while industrial wages cause inflation in Nepal.

Pandey (2005) utilized an excess demand model of inflation and has applied OLS, stationarity test, co-integration technique and error correction modeling to study the determinants of inflation in Nepal. The study has identified money supply (both narrow and broad), real GDP, government expenditure, Indian inflation and exchange rate as explanatory variables influencing inflation, over the period 1973 to 2004. Although bivariate regression between price and the average money revealed significant relationship, the low explanatory power of the equation suggested inclusion of more variables. The author could not find any change in the explanatory power of the model while including public expenditure as well as real GDP, a supply side variable. In an open economy monetarist model, Indian prices and exchange rate with Indian rupees and US dollar are included; however, the explanatory power of the model is limited to 47 percent only. The study had then used the ECM to avoid the problem of loosing long-run information on data to reveal both short-term relationship and adjustment toward long run equilibrium.

Chaudhary and Xiumin (2018) examine the impacts of macroeconomic variables on the inflation in Nepal during 1975-2016. The variables considered for the study are limited to the use of real broad money supply, real GDP, Indian prices. The results suggest that all variables considered are significant in the long-run implying that these variables are the determinants of inflation in Nepal. The results are consistent with the monetary theory. The results concluded that the money supply (0.197) and Indian prices (1.074) cause inflation in the long-run based on an Ordinary Least Squares regression model.

Poudyal (2014) examined short term and long-term effects of the macroeconomic variables on the inflation in Nepal during 1975-2011. The variables considered are budget deficits, Indian prices, real broad money supply, exchange rate, and real GDP. The regression results from the Wickens-Breusch Single Equation Error Correction model suggest that all variables considered are significant in the 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.

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.

NRB (2007) estimated the impact of narrow money supply and Indian inflation in Nepal’s inflation applying cointegration and error correction model on annual data from 1978 to 2006. The result revealed a significant short-run impact of M1 but did not find a long-run impact on inflation. Further, the findings suggest that a one percent increase in Indian price level changes Nepal’s inflation by 1.09 percent in the short-run.

Byanjankar (2020) Examine the relationship between money supply and inflation by using time series data from 1975 to 2018. The study use CPI as dependent variable and money supply, Indian CPI, government deficit, crude oil price, RGDP and nominal effective exchange rate as independent variable. By using ARDL model study find out the insignificant relation between money supply and inflation in both

short run and long run. The result shows that in long run Indian inflation rate, real income and exchange rate are major determinant of inflation in Nepal.

2.3 Research Gap

The conflicting propositions by the aforementioned theories and evidence from past studies by authors and policy makers on Nepal and other parts of the world have revealed mixed and conflicting results regarding the impact of budget deficit and money supply on inflation. Therefore, it is crucial to conduct further research on the topic to ensure the validity of previous results. Indeed, the motivation behind this research stems from the desire to contribute to the existing pool of knowledge by empirically reevaluating how the money supply and budget deficit impacts inflation in Nepal. Its goal is to enhance my understanding of the various interpretations found in the literature, which have examined the relationship between money supply, budget deficit and inflation in Nepal from both practical and theoretical perspectives.

CHAPTER - III

RESEARCH METHODOLOGY

This section is divided into nine parts. The first part presents research design used in the study. Similarly, the second, third, fourth and fifth pars presents sample period covered in the study, sources of data, conceptual framework and specifications of variables respectively. Tools and methods of data collection, data organization and processing, model specification and methods of analysis are presented in sixth, seventh, eighth and ninth chapters respectively.

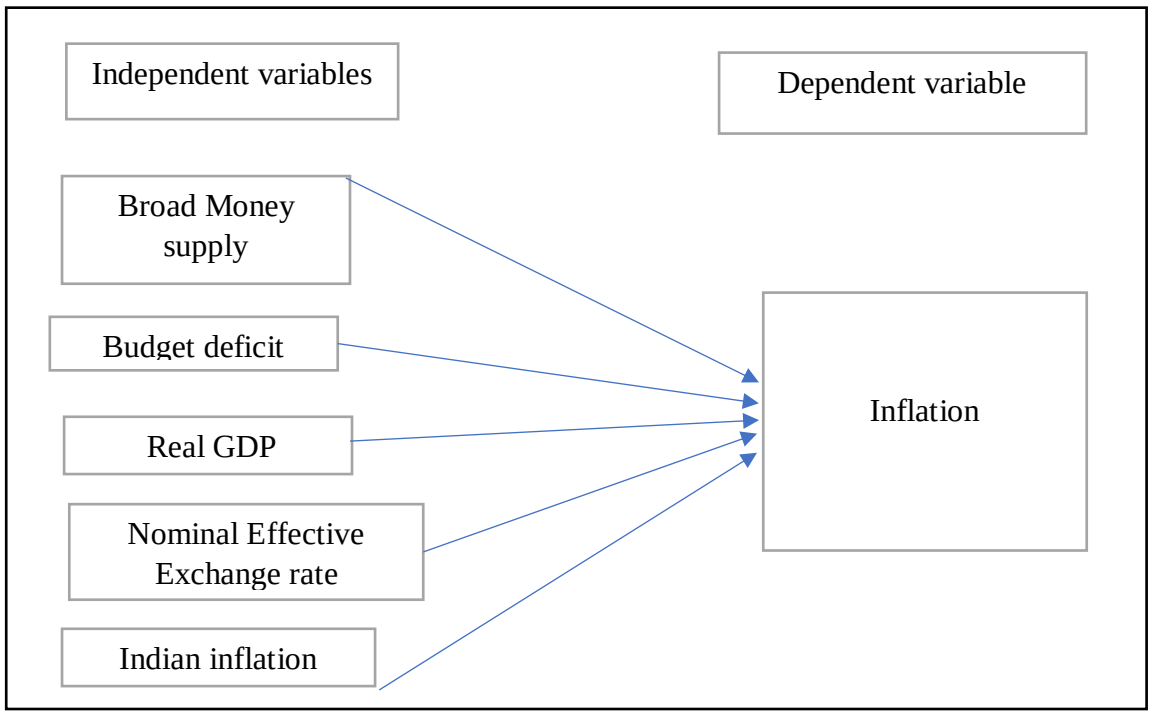
3.1 Research Design

The study is based on time series data and quantitative in nature. Therefore, descriptive and inferential research designs have been used in order to address the objective of the study. The descriptive research design was used in order to find out the trends of money supply, budget deficit and inflation in Nepal whereas, inferential research design was employed to examine the short-run and long-run relationship between the variables used in the study.

3.2 Conceptual Framework

Inflation can be defined as the persistent and appreciable rise in the price level of goods and services in an economy. It is measured as the percentage change in the general price level of goods and services. The quantity theory of money states that inflation in the economy entirely depends on money supply. Inflation can be set in motion when budget deficits are financed by the monetary authority, like the Central Bank. This can happen through means such as seigniorage, which involves the central bank creating money, or by supporting government expenditures through open market operations, which involve acquiring interest-bearing government securities. The conceptual framework has been shown in the following figure.

Figure 3.1: Conceptual Framework



Source: Researcher's Creation

This study has taken inflation as a dependent variable whereas money supply and budget deficit as independent variables. Real GDP, Indian inflation and exchange rate are also considered as control variables in the model.

3.3 Nature and Sources of Data

Since this study is based on secondary data, this study uses quantitative data. Data were obtained from the following sources:

- Various current macroeconomic and financial situation published by NRB
- Various economic surveys published by Ministry of Finance of Nepal
- World development indicators (WDI, 2022)

3.4 Study Period Covered

Annual time series data on money supply, budget deficit and inflation from 1974/75 to 2021/22 have been used to address the objective of the study. This is because of the non-availability data before 1974/75.

3.5 Tools and Method of Data Collection

Secondary data have been used to address the objectives of this study. Due to non-availability of data before 1974/75, this study has taken the data since 1974. The web sites of Nepal Rastra Bank, Ministry of Finance of Nepal and World Bank have been

used as the tools and methods of data collection. Additionally, the published articles and unpublished thesis were also used to collect the required data for the study.

3.6 Data Organization and Processing

After collecting raw data from various sources, these data are arranged in a table using Microsoft excel for applying different statistical tests and methods. Real GDP, consumer price index of Nepal, consumer price index of India and nominal effective exchange rate are expressed at base year 2010/11. All these variables are converted into natural logarithm form using Microsoft excel. The following formula is used to calculate nominal effective exchange rate:

$$\text{NEER} = \sum_{i=1}^{n} TWi\ X\ NERi$$

Where,

TW_i= Trade weight of country i

$NEER_i$ = Nominal effective exchange rate of country i

3.7 Tools and Methods of Data Analysis

3.7.1 Trend and Descriptive Analysis

To find out the trend of money supply, budget deficit and inflation in Nepal, simply figures have been drawn in rupees and percent using Microsoft excel. Mean, median, maximum, minimum, standard deviation, skewness, kurtosis and pair-wise correlation have been calculated using EViews 12 version.

3.7.2 Empirical Analysis

To examine the long-run and short-run relationship between money supply, budget deficit and inflation in Nepal, autoregressive distributed lag (ARDL) model has been used. EViews 12 version software has been employed to run ARDL model.

3.8 Model Specification

Based on Duodu et al. (2022), the study has specified the following functional form:

$$LnNCPI_t = f\ (LnM2_t, LnBD_t, LnRGDP_t, LnNEER_t, LnICPI_t) \ldots\ldots\ldots\ldots (1)$$

Where, $NCPI_t$, $M2_t$, BD_t, $RGDP_t$, $NEER_t$, and $ICPI_t$ represents Nepalese consumer price index, broad money supply, budget deficit, real gross domestic product, nominal effective exchange rate, Indian consumer price index and t denotes time trend. Ln denotes natural log form (See: Appendix – II).

The econometric models of equation (1) can be written as:

$$LnNCPI_t = \alpha_0 + \beta_1 LnM2_t, + \beta_2 LnBD_t + \beta_3 LnRGDP_t + \beta_4 LnNEER_t + \beta_5 LnCPI_t + \varepsilon_t \quad \ldots\ldots (2)$$

α_0 and εt are the constant and the stochastic error terms, respectively, such that the error term is normally distributed with a mean of zero and a constant variance [$\varepsilon t \sim N(0, \sigma^2]$. Again, the β's (1, 2, 3, . . ., 5) are the respective coefficients of the variables to be estimated, and ln denotes the natural logarithm.

3.9 Description of Variables

a) Inflation: The proxy of national consumer price inflation is consumer price index of Nepal and it is denoted by NCPI. It is expressed at 2010/11 prices and transformed into natural logarithm form. Data on NCPI is taken from various current macroeconomic and financial situation published by NRB

b) Broad Money Supply: The broad money supply is denoted by M2 and natural logarithm form M2 is taken for the purpose of this study. The value of M2 is taken in Rs. Million. Data on money supply was taken from various current macroeconomic and financial situation published by NRB. It is expected that money supply is positively related to inflation.

c) Budget Deficit: Budget deficit is defined as total tax revenue minus total expenditure. Budget deficit is denoted by BD and natural logarithm form BD is taken for the purpose of this study. The value of BD is taken in Rs. Million. Data on BD is taken from various economic surveys published by Ministry of Finance of Nepal. It is expected that BD and inflation are positively related.

d) Real GDP: It is expressed at 2010/11 prices and transformed into natural logarithm form. Data on RGDP is taken from various economic surveys published by Ministry of Finance of Nepal.

e) Nominal Effective Exchange Rate: the proxy of exchange rate is nominal effective exchange rate which is denoted by NEER. It is expressed at 2010/11 prices and transformed into natural logarithm form. Data on NEER is taken from various current macroeconomic and financial situation published by NRB

f) Indian Inflation: The proxy of Indian inflation is consumer price index of India and it is denoted by ICPI. It is expressed at 2010/11 prices and transformed into natural logarithm form. Data on ICPI was taken world development indictors.

Is short, the description of variables can also be shown with the help of given Table 3.1.

Table 3.1: Descriptions of Variables

Variables	Measurement / Proxy	Notation	Source	Unit	Expected sign
Inflation (Dependent Variable)	Nepalese consumer price index	NCPI	Nepal Rastra Bank	natural logarithm form, base year 2010/11	-
Money supply (First Core Independent Variable)	Broad money Supply	M2	Nepal Rastra Bank	natural logarithm form (Rs. million)	Positive
Budget deficit (Second Core Dependent Variable)	Total tax revenue minus total expenditure	BD	Economic survey of Nepal	natural logarithm form (Rs. million)	Positive
Gross domestic product (First Control dependent Variable)	Real gross domestic product	RGDP	Economic survey of Nepal	natural logarithm form, base year 2010/11 (Rs. million)	Positive
Exchange rate (Second Control dependent Variable)	Nominal effective exchange rate	NEER	Nepal Rastra Bank	natural logarithm form, base year 2010/11	Positive / Negative
Indian inflation (Third Control dependent Variable)	Indian consumer price index	ICPI	Word Development	natural logarithm form, base year 2010/11	Positive

Source: Various Publications

3.10 Model and Econometric Test

This section presents stationarity test of variables used in the study, autoregressive distributed lag (ARDL) to co-integration analysis, error correction model, diagnostic test and stability test of the model.

3.10.1 Stationary Test (Unit Root Test)

ADF and P-P unit root tests have been used to test stationarity of variables used in the study although there are many method of testing stationarity of variables

3.10.2 Autoregressive Distributed Lag (ARDL) to Co-integration Analysis

There are three techniques that have been used to examine the co-integration among the variables. First one is an Engle and Granger (E-G) Test. This is a bivariate technique implying that multivariate analysis is excluded under this co-integration test. This means this technique is used to examine the cointigration between only one independent variable and one dependent variable. Second one is Johansen Cointegration Test which is a system-based approach to co-integration. This is more

efficient than the E-G approach, as it offers multiple cointegrating vectors. Unlike E-G, the Johansen approach reduces omitted lagged variables bias by including the lag in the estimation. However, this approach is also criticized, as it is highly sensitive to the number of lags selected Gonzalo. Moreover, interpretation often becomes difficult when more than one co-integrating vector exists in the model. In the case of mixed orders of integration in the regressors, the validity of both the E-G and Johansen techniques have been challenged. Thus, these techniques are only valid in cases with the same order of integration. Third one is an Autoregressive Distributed Lag (ARDL) Bound Test. According to this test; it does not need all the variables under study to be integrated of the same orders and can be applied even if underlying variables are integrated of order zero or one or fractionally integrated in comparison with traditional co-integration methods (Pesaran et al., 2001). Furthermore, ARDL test is relatively efficient in the case of small sample data size and gives unbiased estimates of the long model (Harris and Sollis, 2003).

This study employed the ARDL technique proposed by Pesaran at al. (2001).The first step of autoregressive distributed lag (ARDL) bound test is to examine the stationarity of variables to see the order of co-integration. The main assumption of ARDL bounds test is that the variables should be I(0) or I(1). If there is I(2), the ARDL bound test is not suitable because the result so obtained can be spurious (Pesaran and shine, 1999).Therefore, before applying this test, Augmented Dickey Fuller test (ADF) by Dickey and Fuller (1979) has been used to determine the order of integration of all variables.

After testing the stationarity of variables, the ARDL bounds test of co-integration developed by Pesaran and Shine (1999) and Pesaran et al., (2000) was employed to examine the cointegration for long-run relationships among the variables of interest. Following the ARDL approach proposed by Pesaran and Shin (1999), the ARDL model used in this study is the following:

$$\Delta \text{LNCPI}_t = \alpha + \sum_{i=0}^{p}(\Upsilon_{1i}\Delta \text{LnN}CPI_{t-i}) + \sum_{i=0}^{q}(\Upsilon_{2i}\Delta \text{LnM2}_{t-i}) + \sum_{i=0}^{r}\Big(\Upsilon_{3i}\Delta \text{Ln}BD_{t-i}) + \sum_{i=0}^{s}(\Upsilon_{4i}\Delta \text{Ln}RGDP_{t-i}) + \sum_{i=0}^{t}(\Upsilon_{5i}\Delta \text{Ln}NEER_{t-i}) + \sum_{i=0}^{u}(\Upsilon_{6i}\Delta \text{Ln}BD_{t-i})\Big) + \beta_1 \text{Ln CPI}_{t-1} + \beta_2 \text{LnM2}_{t-1} + \beta_3 \text{LnBD}_{t-1} + + \beta_4 \text{LnRGDP}_{t-1} + \beta_5 \text{LnNEER}_{t-1} + \beta_6 \text{LnICPI}_{t-1} + \varepsilon t \quad \text{……...….3}$$

Where, β_1, β_2, β_3, β_4, β_5, and β_6 are long-term coefficients and Υ_{1i}, Υ_{2i} , Υ_{3i} Υ_{4i}, Υ_{5i} *and* Υ_{6i} represents short-run dynamics and ε_t = represents a random disturbance term.

H0: $\beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = 0$ (there is no cointegration)

H1: $\beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq 0$ (there is cointegration)

The F-test will be employed to test co-integration among the variables. If the computed F-value was less than the F-value for the lower bound, then the null hypothesis cannot be rejected. If the computed F-value exceeded the F-value for the upper bound, then the null hypothesis of no co-integration was rejected, otherwise the test was inconclusive. (Pesaran et al. 2001). To select the lag values p, q and r in Equation (1), model selection criteria, such as AIC, SIC, Hannan-Quinn information criteria, Adjusted R-squared will be used (See: E Views analysis in Appendix – IV).

3.10.3 Error Correction Model

There must have an error correction representation wherein an error correction term (ECT) is incorporated in the model, if a set of variables is co-integrated (Engle and Granger 1987). The short-run dynamics of the variables was described by employing the Error Correction Model (ECM). The ECM representation was specified as follows:

$$\Delta CPI_t = \alpha + \sum_{i=0}^{p}(\mu_{1i}\Delta \ln CPI_{t-i}) + \sum_{i=0}^{q}(\mu_{2i}\Delta \ln M2_{t-i}) + \sum_{i=0}^{r}(\mu_{3i}\Delta \ln BD_{t-i}) + \sum_{i=0}^{s}(\mu_{4i}\Delta LnRGDP_{t-i}) + \sum_{i=0}^{t}(\mu_{5i}\Delta LnNEER_{t-i}) + \sum_{i=0}^{u}(\mu_{6i}\Delta LnICPI_{t-i}) + \mu_7 ECT_{t-1} + \nu_t \quad \ldots\ldots\ldots\ldots\ldots (4)$$

Where μ_{1i}, μ_{2i} …. μ_{6i} are the short-run dynamic coefficients of the model's convergence to the equilibrium and μ_7 is the speed of adjustment parameter, indicating how quickly the series can come back to its long-run equilibrium. The sign of the coefficient must be negative and significant.

3.10.4 Diagnostic Tests

This study has employed three diagnostic tests after ARDL bound in order to identify whether the models were correctly specified or not.

a. Breusch- Godfrey Serial Correlation Test

This test has been carried out whether the model has serial correlation or not.

Null Hypothesis (H0): There is no serial correlation in the model

Alternative hypothesis (H1): There is serial correlation in the model

In this condition, null hypothesis is desirable. Therefore, P-value should be greater than 5 percent in order to accept the null hypothesis of no serial correlation in the model.

b. Breusch-Pagan –Godfrey Test

This test will be employed in order to test whether the model has heteroskedasticity or not.

Null Hypothesis (H0): There is no heteroskedasticity in the model

Alternative hypothesis (H1): There is heteroskedasticity in the model

In this condition, null hypothesis is desirable. Therefore, P-value should be greater than 5 percent in order to accept the null hypothesis of no heteroskedasticity in the model.

c. Jarque- Bera Test

This test has been employed in order to test whether the model has normality or not.

Null Hypothesis (H0): There is normality in the model

Alternative hypothesis (H1): There is no normality in the model

In this condition, null hypothesis is desirable. Therefore, P-value should be greater than 5 percent in order to accept the null hypothesis of normality in the model.

3.10.5 Stability Test

The stability test of the model as well as coefficients has carried using two tests as follows:

a. Cumulative Sum of Recursive Residuals (CUSUM)

The stability test of the model will be carried out by plotting cumulative sum of recursive residuals (CUSUM). According to this test, the residuals should lie within the critical bounds at the 5 percent significance level.

b. Cumulative Sum of Squares of Residuals (CUSUMQ)

The stability test of the individual parameter will be carried out by plotting the cumulative sum of squares of residuals (CUSUMQ). According to this test, the residuals should lie within the critical bounds at the 5% significance level.

CHAPTER - IV

DATA PRESENTATION AND ANALYSIS

This section has discussed the trend analysis, descriptive statistics and empirical results of the study. This section is divided into two parts. The first part of this section presents the trend analysis and descriptive statistics of the variable used in the study while the second part presents the results of empirical analysis.

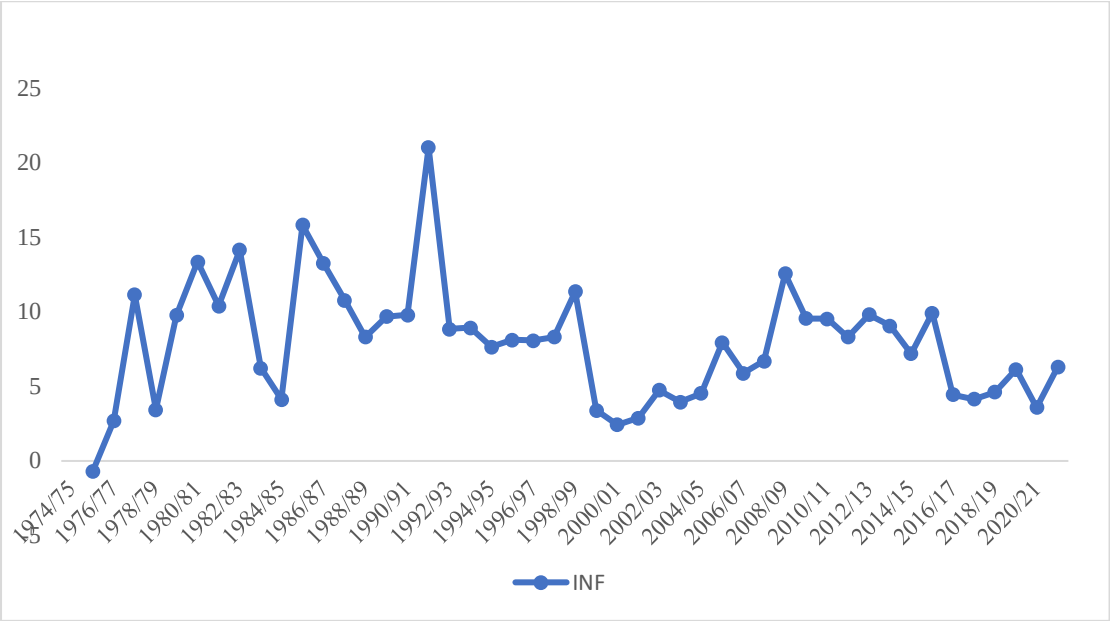
4.1 Trend Analysis

This section has divided into four parts. The first, second and third parts present the trend of inflation, budget deficit and money supply respectively while the fourth part is the comparison between the broad money supply, budget deficit with inflation in Nepal.

4.1.1 Trend Analysis of Inflation in Nepal

Inflation means a persistent and appreciable rise in general price level. when the annual rate of inflation is up to 3 percent, it is said to be creeping inflation. It has no negative impact on the economy. It creates positive effect on investment, production and employment. when the annual rate of inflation is in -he range of 3 to 10 percent, it is said to be walking inflation. It is the warning signal for the government to control before turns into running inflation. when the annual rate of inflation is in the range of 10 to 50 percent, it is said to be running inflation. It affects poor and middle classes group adversely. When price level rises more than more than 50 percent, it is called hyperinflation. Hyperinflation reduces purchasing power, discourages of saving and investment, rises of cost of borrowing, encourages speculative investment, raises the cost of development projects and reduces competitiveness in the economy. The trend analysis of percentage change in inflation in Nepal can be shown in the Figure 4.1.

Figure 4.1: Trend Analysis of Inflation in Nepal



Source: Appendix II

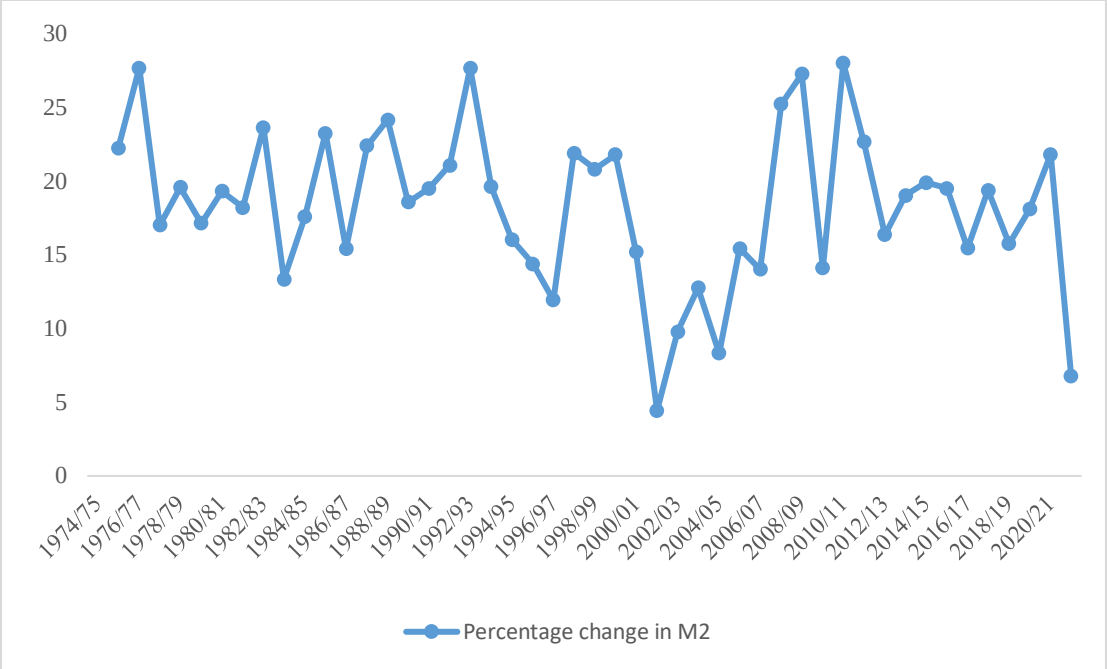
The Figure 4.1 shows that trend of inflation in Nepal from 1974/75 to 2021/22 has been shown in appendix II. As shown in the figure, the inflation rate of Nepal was -0.69 percent in 1974/75. The highest inflation rate was recorded in 1991/92 which was 21.05 precent. The average rate of inflation from 1974 to 2021 is around 8 percent. The inflation rate of Nepal has not been stable and this rate is near to two digits. Although the Nepal Rastra Bank has formulated monetary policy every year with prime objective of controlling inflation, there are many other factors besides monetary factors such as infrastructure bottlenecks, market imperfections, supply side shocks international regions which are fueling inflation in Nepal.

4.1.2 Trend Analysis of Broad Money Supply in Nepal

Money supply refers to the total stock of money at a point of time in an economy (total quantity of money held by public in spendable form at a point of time). Money supply consists of notes and currency held by the public, demand deposits maintained at the banks by the public. Narrow Money Supply (M1) consists of currency held by public (non-banking public) and demand deposit held by the commercial banking system. In case of Nepal, DD consists of the current account deposits maintained at class A, B, & C banks. Similarly, Broad Money Supply (M2) consists of narrow money supply and time deposits consists of the deposits maintained at saving account, call account and margin account and fixed deposit accounts. Time deposits are less

liquid as they have restrictions for withdrawal before the maturity. The trend analysis of percentage change in money supply can be shown in the Figure 4.2.

Figure 4.2: Trend Analysis of Broad Money Supply in Nepal



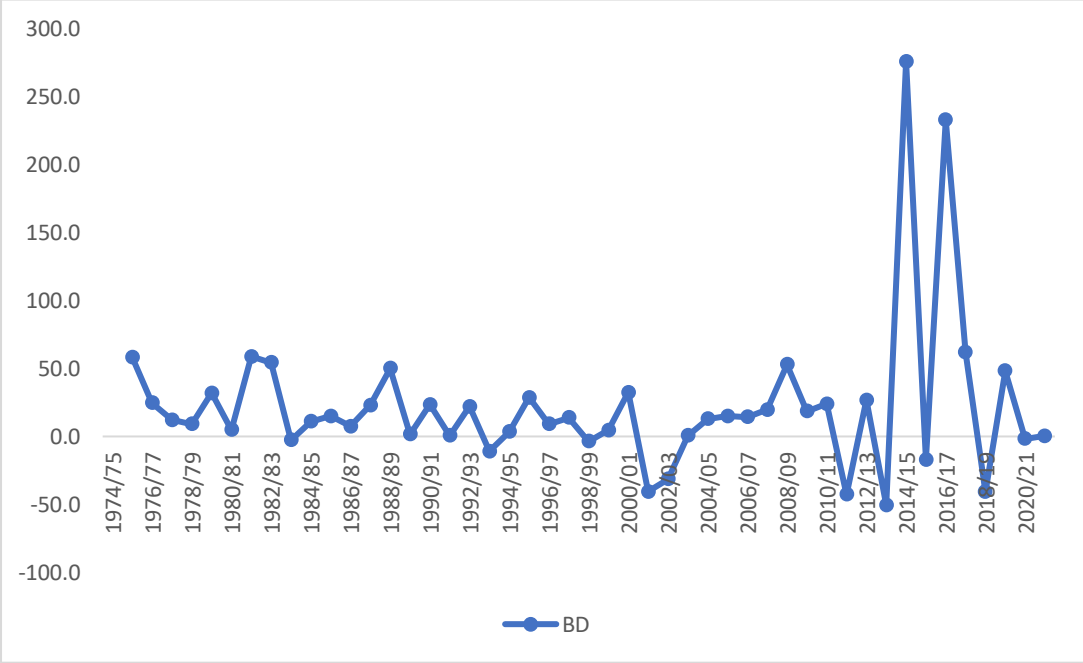
Source: Appendix II.

The Figure 4.2 shows that the highest percentage change in money supply was recorded in fiscal years in 1976, 1992 and 2010/11 which was around 28 percent while the lowest wad recorded in 2001 which was 4 percent followed by 2021/22 which was 7 percent. The average growth rate of money supply from 1974/75 to 2021/22 is around 16 percent. The trend of money supply growth has not been stable. It ranges from four percent to 28 percent rate of broad money supply.

4.1.3 Trend Analysis of Budget Deficit in Nepal

A budget is a financial document of the government that consists of estimated expenditures and proposed revenues for a coming fiscal year. When government keeps its total expenditure equals to its total revenue, then it is called balanced budgetary policy whereas when government keeps its total expenditure less than its total revenue, then it is called surplus budget policy similarly, when government spends more than its total revenue, then it is called deficit budget policy. The trend analysis of percentage change in budget deficit can be shown in the Figure 4.3.

Figure 4.3: Trend Analysis of Budget Deficit in Nepal



Source: Appendix II

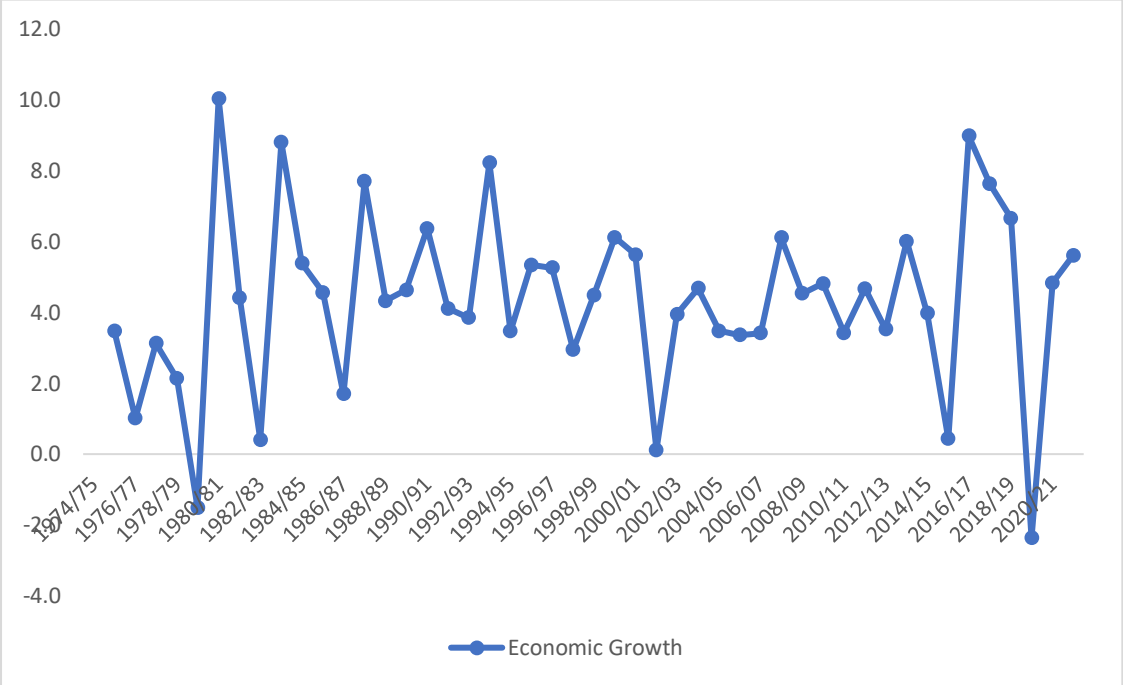
The Figure 4.3 shows that the percentage change in money supply was 58 percent in 1974/75. The highest level of percentage change in budget deficit was recorded in fiscal year 2016/17. It was due to the fact that Nepal had experienced devastating earthquake in 2015/16 and had to spend large amount of money for reconstruction of physical infrastructures taking loan externally. On the other hand, the lowest level of percentage change in budget deficit was realized in fiscal year 2019/20. This is because all economic activities were slow down due to Covid pandemic and government couldn't collect revenue for its spending. The figure also shows that Nepal has adopted budget deficit over study period. This is due to the fact that Nepal is a poor developing country and the revenue collected from tax and non-tax is not enough to spent on infrastructures. Nepal is, therefore, pursuing deficit budget every year as a tool to refinancing development projects.

4.1.4 Trend Analysis of Real GDP in Nepal

Economic growth refers to the change in real output in an economy over time. It is measured as a change in real GDP in the economy over time. The trend analysis of economic growth in Nepal has been shown in figure 4.4. As shown in figure, the highest level of economic growth rate was realized in fiscal year 1980/80 which was 10 percent. Nepal had realized negative growth rate in fiscal years 1979/80 and

2019/20. Nepal has realized negative growth of 2.4 percent due to covid pandemic outbreak. This is because all economic activities were stopped due to lock-down. As a result, negative growth rate was recorded in Nepal. The figure 4.4 also shows that after 2019 when effect of Covid decrease, economic growth rate of Nepal had increased slowly and reached 5.6 in fiscal year 2021/22.

Figure 4.4: Trend Analysis of Percentage change in Real GDP in Nepal



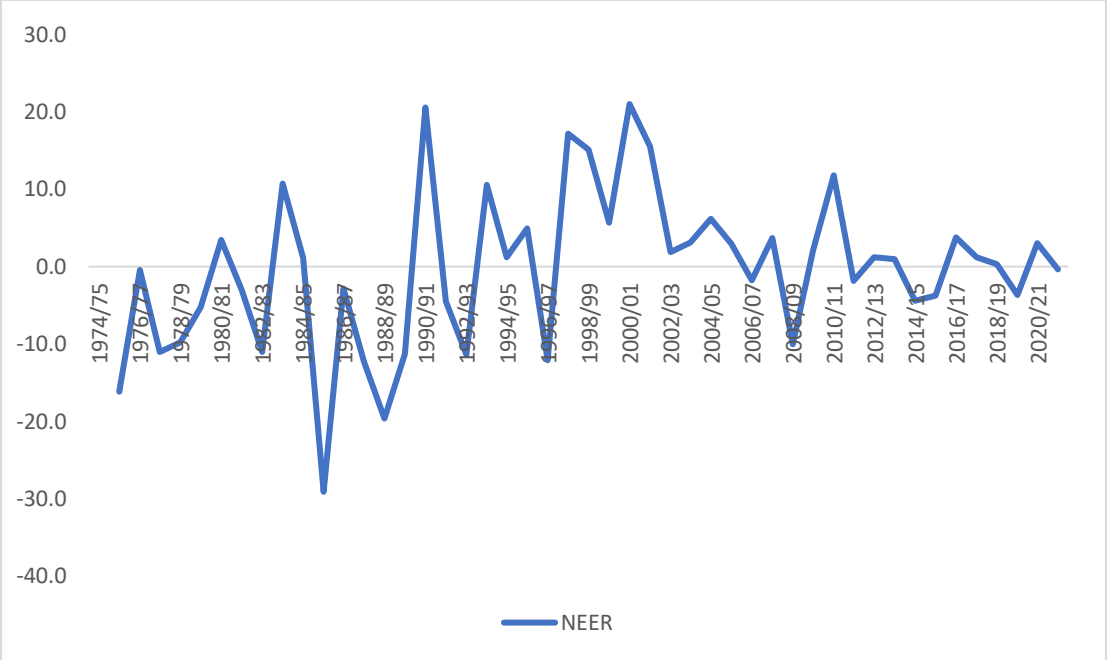
Source: Appendix II

Looking at the Figure 4.4, it can be seen that the average growth rate of Nepal for the sample period is only 4.3 percent. This shows that the economic growth rate of Nepal is very low. The figure 4.4 also shows that the economic growth rate has not been stable over the sample period.

4.1.5 Trend Analysis of Nominal Effective Exchange Rate in Nepal

Exchange rate is defined as the price of one country's currency in term of another country's currency. Exchange rate is also an important determinant of inflation.

Figure 4.5: Trend Analysis of NEER



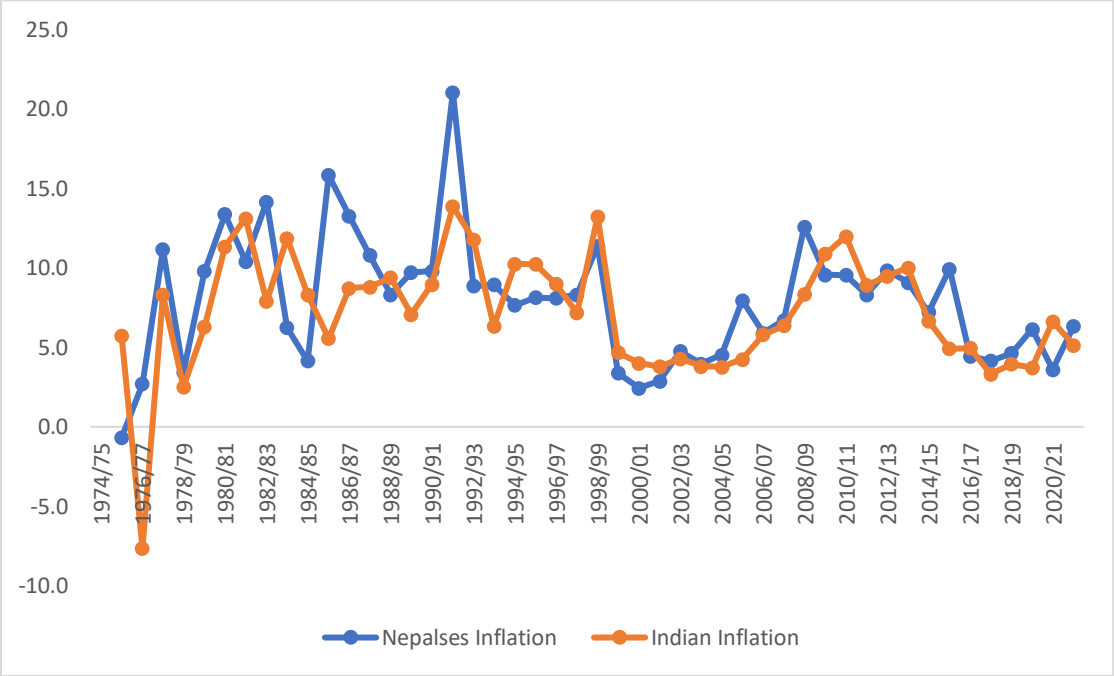
Source: Appendix II

The trend of nominal effective exchange is shown in figure 4.5. Aa shown in figure, the nominal effective exchange rate of Nepal is not stable for the sample period.

4.1.6 Trend Analysis of Nepalese inflation and Indian Inflation

Nepal is a land-locked country located between India to the east, south, and west and the China to the north. Nepal has around two third trade with India. Nepal mostly exports low-value agricultural products to India and imports high-value manufactured products from India. Moreover, Nepalese currency is pegged to the Indian rupee and hence Nepalese currency becomes weak as Indian currency becomes weak. Furthermore, Nepal and India share an open boarder. Due to aforementioned reasons, if inflation occurs in India, it is easily transmitted in Nepal through trade.

Figure 4.6: Trend Analysis of Nepalese inflation and Indian Inflation



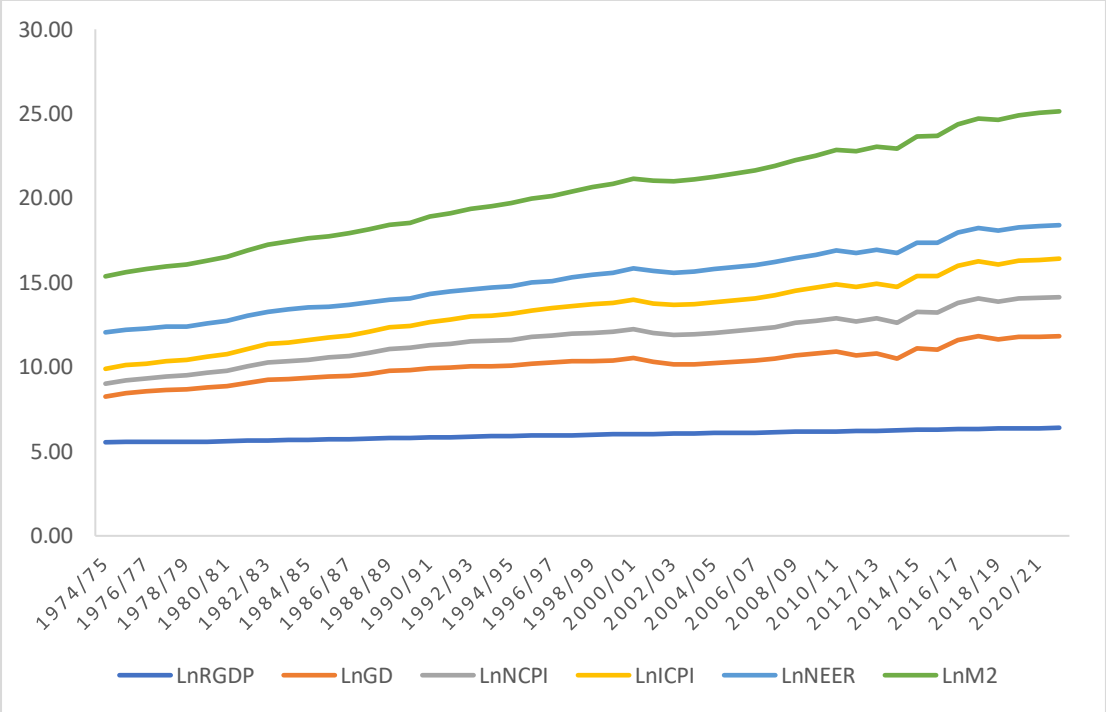
Source: Appendix II

The trend analysis of Nepalese inflation and Indian inflation have been shown in figure 4.6. It can be seen from figure 4.4 that inflation of Nepal and India have been moving in same direction for the sample period which indicates that Nepalese inflation and Indian inflation are positively correlated i.e., Indian inflation is main determinant of Nepalese inflation. For example, the highest rate of inflation was recorded in Nepal in 1991 which was 21.05 percent. In the same year, the inflation rate of India was also highest which was 13. 87 percent. The figure also shows that Indian inflation and Nepalese inflation have not been stable over the years.

4.1.7 Comparison between Broad Money Supply, Budget Deficit, Real GDP, Nominal Effective Exchange Rate and Indian Inflation with Inflation in Nepal

The trends of money supply inflation (NCPI) , (M2), budget deficit (BD), RGDP, NEER and ICPI over the study period are shown in the figure 4.7.

Figure 4.7: Comparison between NCPI, M2, BD, RGDP, NEER & ICPI



Source: Appendix II

It is observed that RGDP, BD & M2 have a steady upward trend over the study period. However, ICPI, NCPI & NEER, have been fluctuating over the years, but shows an upward trend.

4.2 Empirical Analysis

This section presents descriptive statistics, stationary test, bound test result, estimated long run coefficients, estimated short-run coefficients and diagnostic test and stability test.

4.2.1 Descriptive Statistics

The summary of the descriptive statistics in terms of mean, standard deviation, skewness, kurtosis, Jarque-Bera and linear correlation are reported in Table 4.1

Table 4.1: Summary of Descriptive Statistics

Variables	LnNCPI	LnM2	LnBD	LnRGDP	LnNEER	LnICPI
Mean	3.36	11.69	9.85	13.47	4.35	3.86
Median	3.8	11.84	10.03	13.45	4.52	3.84
Maximum	5.31	15.52	12.79	14.45	4.9	5.2
Minimum	1.57	7.6	6.2	12.63	3.67	2.00
Std. Dev.	1.11	2.23	1.71	0.54	0.33	1.03
Skewness	-0.21	-0.05	-0.26	0.11	-0.68	-0.14
Kurtosis	1.84	1.86	2.27	1.79	2.23	1.76
J-B	3.02	2.60	1.62	3.02	4.92	3.20
Probability	0.22	0.27	0.44	0.22	0.08	0.20
Pair-Wise Correlation						
LnNCPI	1	-	-	-	-	-
LnM2	0.99	1	-	-	-	-
LnBD	0.98	0.98	1	-	-	-
LnRGDP	0.79	0.77	0.77	1	-	-
LnNEER	0.06	0.11	0.01	0.02	1	-
LnICPI	0.99	0.99	0.98	0.79	0.10	1

Source: Author's own calculation using E Views 12.

From Table 4.1, it is observed that money supply (M2), budget deficit (BD) and inflation (NCPI) have mean (standard deviation) values of 11.6 (2.23), 9.85 (1.71) and 3.36 (1.11) respectively. The maximum (minimum) values for money supply (M2), budget deficit (BD) and inflation (NCPI) are 15.79 (7.6), 12.79 (6.2) and 5.31 (1.57), respectively. In all, it is observed that the sample variables do not deviate much from their respective mean values as indicated by the standard deviation values. Furthermore, the values for the Skewness, Kurtosis and the Jarque-Bera show that the data is normally distributed. Turning to the linear correlation, it is observed that money supply (M2) and budget deficit (BD) have a strong positive correlation with inflation.

4.2.2 Stationary Test (Unit Root Test)

The results from the ADF and P-P unit root tests are reported in table 4.2

Table 4.2: Stationary Test (Unit Root Test)

Variables	ADF Test		P-P Test	
	I(0)	I(1)	I(0)	I(1)
LnNCPI	-1.19	-5.38*	-1.04	-5.36*
LnM2	-2.08	-4.87*	-2.12	-4.92*
LnBD	-3.43***	-5.06*	-3.14***	-8.14*
LnRGDP	-0.92	-6.81*	-0.97	-6.89*
LnNEER	-2.07	-6.13*	-2.19	-6.24*
LnICPI	-1.54	-4.69*	-1.17	-4.73*

Source: Author's Calculation using EViews 12.
Note: (*), (**) & (***) show 1%, 5% and 10% level of significance respectively.

From the results, both tests confirm budget deficit is stationary at its level data [I(0)] and first difference [I(1)]. However, money supply (M2), NCPI, NEER and ICPI are all stationary at the first difference [*I* (1)]. This implies that some series are stationary at I(0) and some are at I(1). Due to the presence of mixed orders of integration (I(0), I(1)), an appropriate method of analyzing the long run relationship between variables is Autoregressive Distributed Lagged (ARDL) bounds test (Pesaran et al., 2000). Therefore, this study used ARDL bound test approach to examine the cointegrating relationship among variables under study. Following the confirmation of stationarity properties of the variables, the study proceeds with the Autoregressive Distributive Lag model of cointegration.

4.2.3 Bound Test Results

The calculated F- statistics, the lower bound critical value I(0) and upper bound critical value I(1) are presented in the Table 4.3. Calculated F-statistics is compared with the Pesaran et al. (2001) critical value.

Table 4.3: Bound Test Results

Variables	F-Statistics	Co-integration	Lag Optimal
F (LnNCPI , LnM2, LnBD, LnRGDP, LnNEER, LnICPI)	11.42*	Co-integration	(1, 0, 1, 0, 0, 1)
	Critical value	**Lower bound I(0)**	**Upper bound I(1)**
	1%	3.5	4.8
	5%	2.6	3.7
	10%	2.2	3.2

Source: Author's Calculation using EViews 12.

Note: (*), (**) & (***) show 1%, 5% and 10% level of significance respectively.

The calculated F-statistic is 11.42 which is greater than upper bound critical values at 1, 5 and 10 percent level of significance. This implies that the null hypothesis of no co-integration among the variables is rejected. Therefore, there is cointegration between inflation, money supply and budget deficit in long-run i.e., these variables move in the same direction in long-run.

4.2.4 Estimated Long-run Coefficients

The estimated long-run coefficients are presented in table 4.4. The coefficients of money supply (M2), real gross domestic product (RGDP), Indian inflation (ICPT) and exchange rate (NEER) are positive and statistically significant as expected.

Table 4.4: Estimated long-run coefficients

Dependent Variable: LnNCPI			
Variable	**Coefficient**	**Standard Error**	**T- Statistics**
LnM2	0.22*	0.05	3.81
LnBD	0.004	0.02	0.20
LnRGDP	0.05*	0.01	2.77
LnNEER	0.14*	0.02	7.04
LnICPI	0.54*	0.12	4.49
C	-1.15*	0.34	-3.39

Source: Author's Calculation using EViews 12.

Note: (*), (**) & (***) show 1%, 5% and 10% level of significance respectively.

The long-run elasticity of M2 is 0.22 which indicates that money supply is positively related to inflation and inflation increases by 0.22 percent as money supply increases by 1 percent. Similarly, long-run elasticity of RGDP is 0.05 percent which implies

that an increase in RGDP by one precent increases inflation by 0.05 percent. Moreover, the long-run coefficient of Indian inflation (ICPI) is 0.54 which shows that Nepalese inflation increases by 0.54 percent as Indian inflation (ICPI) increases by 1 percent. The positive and statistically significant long-run coefficient of exchange rate (NEER) suggests that the devaluation of currency by 1 percent increases inflation by 0.14 percent. However, budget deficit is positive as expected but statistically insignificant.

4.2.5 Estimated Short-run Coefficients and Diagnostic Tests

Table 4.5 reports the short-run coefficient estimates obtained from the ECM version of the ARDL model.

Table 4.5: Estimated Short-run Coefficients and Diagnostic Tests

Dependent variable: LnNCPI			
Variables	**Coefficients**	**Standard Error**	**T- Statistics**
D(LnBD)	0.18	0.01	1.49
D(LnICPI)	0.63*	0.05	11.72
ECM (-1)	-0.77	0.08	9.6
Diagnostic Tests			
Serial Correlation	F(2, 36) = 2.27 [0.11]		
Normality	0.45[0.79]		
Heteroscedasticity	F(8, 38) = 1.12[0.31]		
R^2	0.99		
Adj. R^2	0.99		
F- Stat.	1594*		
DW- Stat.	1.77		

Source: Author's Calculation using EViews 12.
Note: (*), (**) & (***) show 1%, 5% and 10% level of significance respectively.

As expected, Indian CPI has a positive impact on Nepalese CPI in the short run. The short-run elasticity of Indian CPI is 0.63 and is significant 1 percent. This shows that a 1 percent increase in Indian CPI results in a 0.63 percent increase in Nepalese CPI. However, as in the long-run, budget deficit (BD) is positive but statistically insignificant. The ECM coefficient is - 0.77 and is statistically significant at a 1 percent level of significance. This shows that short-run disequilibrium on the system converges to equilibrium at a speed of 77 percent per annum.

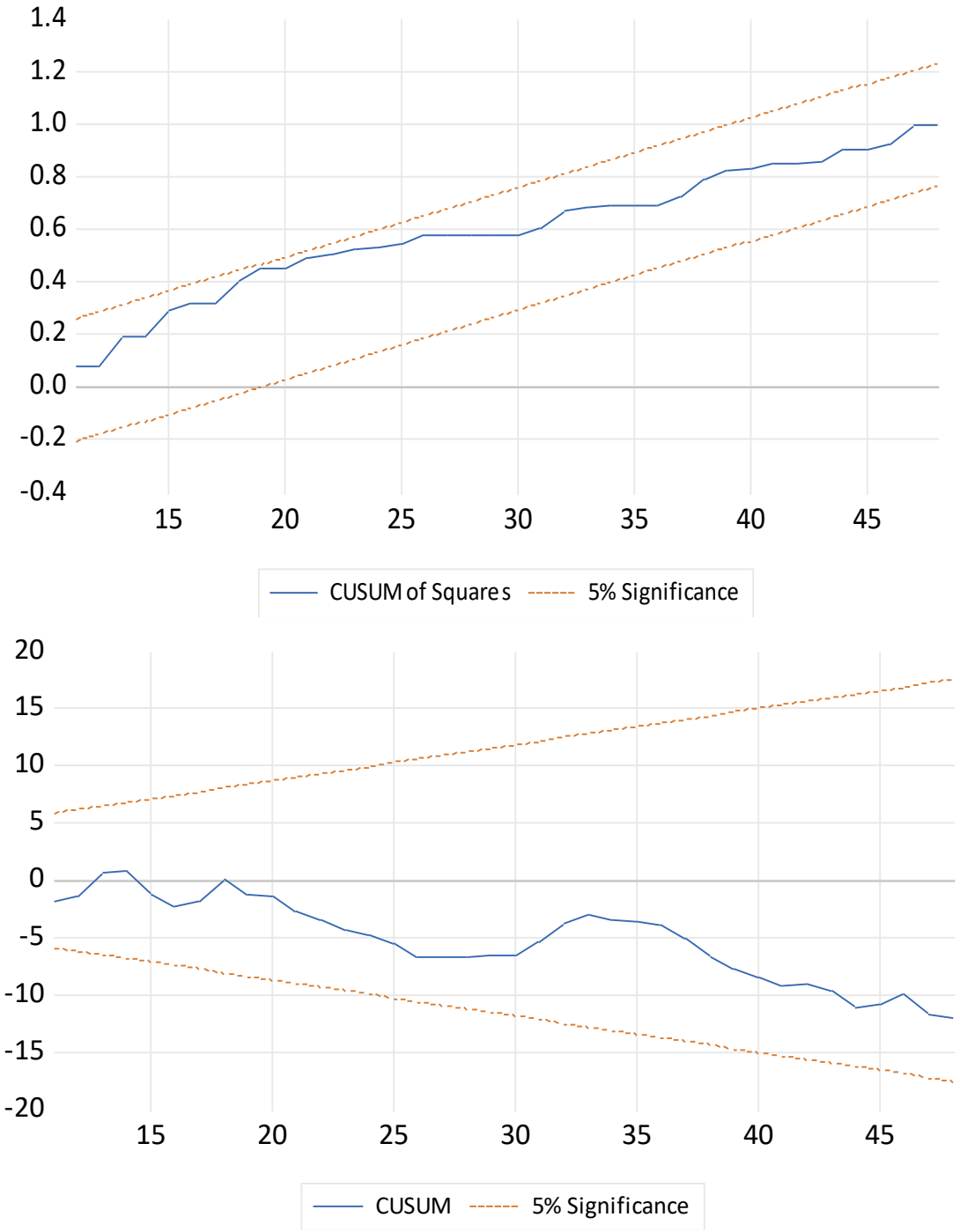
The study also carried out all diagnostic tests such as Breusch-Godfrey serial correlation test for serial correlation, Breusch-Pagan – Godfrey test for heteroskedasticity test and Jarque-Berra test for normality. The result of Breusch-Godfrey serial correlation test showed that there is no serial correlation because p value is greater than 5 percent and this accepts the null hypothesis of no serial correlation. The result of Breusch-Pagan –Godfrey test of heteroskedasticity showed that there is no heteroskedasticity because p value is greater than 5 percent and this accepts the null hypothesis of no heteroskedasticity. The result of Jarque –Bera test of normality showed that there is normality in residuals because p value Jarque –Bera test is greater than 5 percent which accepted the null hypothesis of there is normality in residuals. The results of diagnostic tests indicated that the model was correctly specified. The results of diagnostic tests show that there is no serial correlation, no heterscedasticity and there is normality in residuals. The results of R squares and F-statistics showed that the model is well fitted.

4.2.5 Stability Test

The stability test of the model as well as individual parameters were carried out by plotting cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares of residuals (CUSUMQ). The results of CUSM and CUSUMQ for model 1 and 2 are shown in Figures 4.8.

In both models, the residuals are within the critical bounds at the 5 percent significance level which indicated that the model was correctly specified and stable.

Figure 4.8: Plot of CUSUM and CUSUMQ



Source: Author's Calculation

Note: The straight line represents critical bounds at 5 percent level of significance.

In both models, the residuals are within the critical bounds at the percent significance level which indicated that the model was correctly specified and stable.

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Appendices

Appendix I: Nominal Variables Used in the Table (Rs. in million)

Fiscal Years	NCPI	M2	BD	RGDP at 2010 price	NEER	ICPI
1974/75	5.81	2064.4	507	348744.4	144.94	8
1975/76	5.77	2524	801	360839.8	121.48	8
1976/77	5.92	3223	999	364485.3	120.96	7
1977/78	6.58	3772.1	1122	375885.4	107.62	8
1978/79	6.81	4511.4	1223	383892.8	97.09	8
1979/80	7.48	5285.3	1614	378119.0	91.98	9
1980/81	8.48	6307.7	1692	416048.9	95.17	10
1981/82	9.36	7458	2685	434402.8	92.29	11
1982/83	10.69	9222.4	4144	436172.9	82.09	12
1983/84	11.35	10455.2	4031	474545.3	90.93	13
1984/85	11.82	12296.6	4478	500084.8	91.98	14
1985/86	13.70	15159	5153	522917.4	65.21	15
1986/87	15.51	17498.2	5538	531805.7	63.38	17
1987/88	17.19	21422.6	6815	572736.9	55.60	18
1988/89	18.62	26605.1	10228	597523.2	44.66	20
1989/90	20.42	31552.4	10381	625218.7	39.62	21
1990/91	22.43	37712.5	12819	665022.8	47.78	23
1991/92	27.15	45670.5	12906	692342.5	45.61	26
1992/93	29.56	58322.5	15749	718975.2	40.43	29
1993/94	32.20	69777.1	14017	778069.4	44.69	31
1994/95	34.67	80984.7	14485	805056.4	45.22	34
1995/96	37.49	92652.2	18649	848027.2	47.45	38
1996/97	40.52	103721	20350	892641.6	41.72	41
1997/98	43.89	126463	23180	918903.8	48.90	44
1998/99	48.89	152800	22328	960104.9	56.30	50
1999/00	50.55	186121	23383	1018820.2	59.48	52
2000/01	51.78	214454	30942	1076163.8	71.99	54
2001/02	53.27	223988	18339	1077456.9	83.14	56
2002/03	55.80	245911	12577	1119963.7	84.67	59

2003/04	58.01	277306	12663	1172407.2	87.28	61
2004/05	60.65	300440	14295	1213196.4	92.70	63
2005/06	65.48	346824	16428	1254015.0	95.47	66
2006/07	69.34	395518	18763	1296797.8	93.82	70
2007/08	73.99	495377	22476	1375962.0	97.28	74
2008/09	83.30	630521	34356	1438336.2	87.48	81
2009/10	91.27	719599	40732	1507612.3	89.43	89
2010/11	100.00	921320	50506	1559200.0	100.00	100
2011/12	108.32	1130302	28905	1632040.5	98.16	109
2012/13	118.97	1315376	36672	1689572.4	99.33	119
2013/14	129.78	1565967	18170	1791140.8	100.25	131
2014/15	139.14	1877802	68307	1862357.5	95.84	140
2015/16	152.97	2244579	56682	1870423.6	92.22	147
2016/17	159.77	2591702	188695	2038336.7	95.71	154
2017/18	166.41	3094467	305499	2193706.4	96.88	159
2018/19	174.12	3582138	180505	2339742.7	97.17	165
2019/20	184.83	4230970	267450	2284299.7	93.58	172
2020/21	191.48	5154853	262690	2394800.0	96.39	183
2021/22	203.59	5505401	263666	2529200.0	96.05	192

Source: Various publications.

Appendix II: Percentage Change in the Variables Used in the Study (Rs. in million)

Fiscal Years	NCPI	M2	BD	RGDP	NEER	ICPI
1974/75	-	-	-	-	-	-
1975/76	-0.7	22.3	58.1	3.5	-16.2	5.75
1976/77	2.7	27.7	24.6	1.0	-0.4	-7.63
1977/78	11.2	17.0	12.3	3.1	-11.0	8.31
1978/79	3.4	19.6	9.0	2.1	-9.8	2.52
1979/80	9.8	17.2	32.0	-1.5	-5.3	6.28
1980/81	13.4	19.3	4.9	10.0	3.5	11.35
1981/82	10.4	18.2	58.7	4.4	-3.0	13.11
1982/83	14.2	23.7	54.3	0.4	-11.0	7.89
1983/84	6.2	13.4	-2.7	8.8	10.8	11.87
1984/85	4.1	17.6	11.1	5.4	1.2	8.32
1985/86	15.8	23.3	15.1	4.6	-29.1	5.56
1986/87	13.3	15.4	7.5	1.7	-2.8	8.73
1987/88	10.8	22.4	23.0	7.7	-12.3	8.80
1988/89	8.3	24.2	50.1	4.3	-19.7	9.38
1989/90	9.7	18.6	1.5	4.6	-11.3	7.07
1990/91	9.8	19.5	23.5	6.4	20.6	8.97
1991/92	21.1	21.1	0.7	4.1	-4.5	13.87
1992/93	8.9	27.7	22.0	3.8	-11.4	11.79
1993/94	8.9	19.6	-11.0	8.2	10.5	6.33
1994/95	7.7	16.1	3.3	3.5	1.2	10.25
1995/96	8.1	14.4	28.8	5.3	4.9	10.22
1996/97	8.1	11.9	9.1	5.3	-12.1	8.98
1997/98	8.3	21.9	13.9	2.9	17.2	7.16
1998/99	11.4	20.8	-3.7	4.5	15.1	13.23
1999/00	3.4	21.8	4.7	6.1	5.7	4.67
2000/01	2.4	15.2	32.3	5.6	21.0	4.01
2001/02	2.9	4.4	-40.7	0.1	15.5	3.78
2002/03	4.7	9.8	-31.4	3.9	1.8	4.30
2003/04	4.0	12.8	0.7	4.7	3.1	3.81
2004/05	4.5	8.3	12.9	3.5	6.2	3.77
2005/06	8.0	15.4	14.9	3.4	3.0	4.25
2006/07	5.9	14.0	14.2	3.4	-1.7	5.80

2007/08	6.7	25.2	19.8	6.1	3.7	6.37
2008/09	12.6	27.3	52.9	4.5	-10.1	8.35
2009/10	9.6	14.1	18.6	4.8	2.2	10.88
2010/11	9.6	28.0	24.0	3.4	11.8	11.99
2011/12	8.3	22.7	-42.8	4.7	-1.8	8.91
2012/13	9.8	16.4	26.9	3.5	1.2	9.48
2013/14	9.1	19.1	-50.5	6.0	0.9	10.02
2014/15	7.2	19.9	275.9	4.0	-4.4	6.67
2015/16	9.9	19.5	-17.0	0.4	-3.8	4.91
2016/17	4.4	15.5	232.9	9.0	3.8	4.95
2017/18	4.2	19.4	61.9	7.6	1.2	3.33
2018/19	4.6	15.8	-40.9	6.7	0.3	3.94
2019/20	6.2	18.1	48.2	-2.4	-3.7	3.73
2020/21	3.6	21.8	-1.8	4.8	3.0	6.62
2021/22	6.3	6.8	0.4	5.6	-0.3	5.13

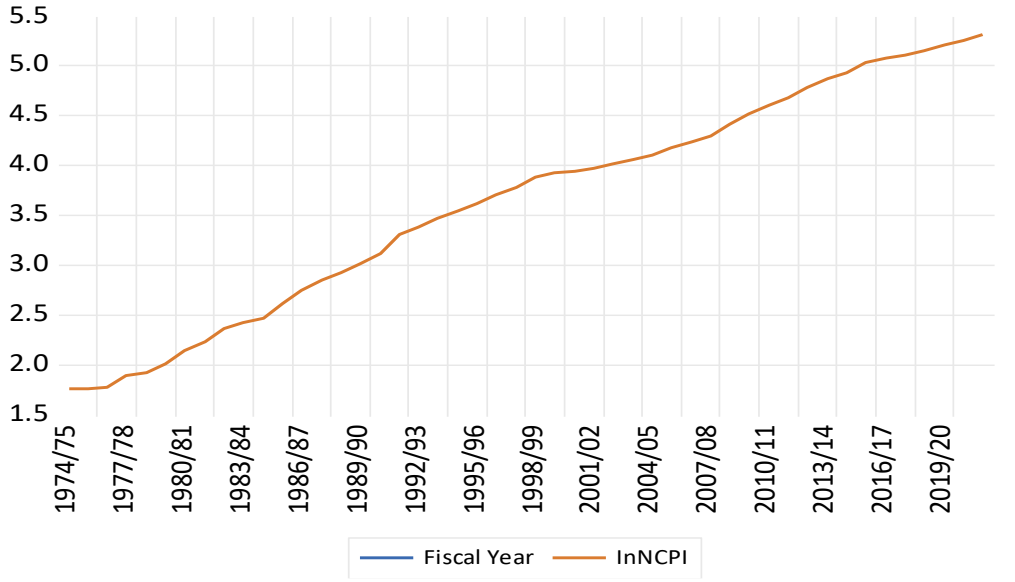
Source: Author's calculation from the Appendix I

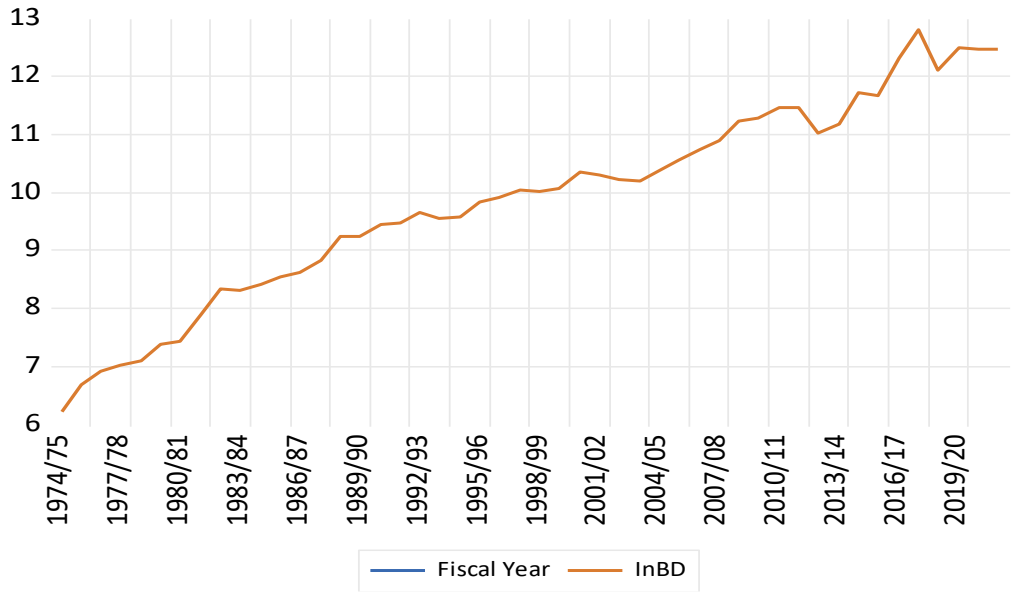
Appendix III: Log form of Variables used in the Study / Model

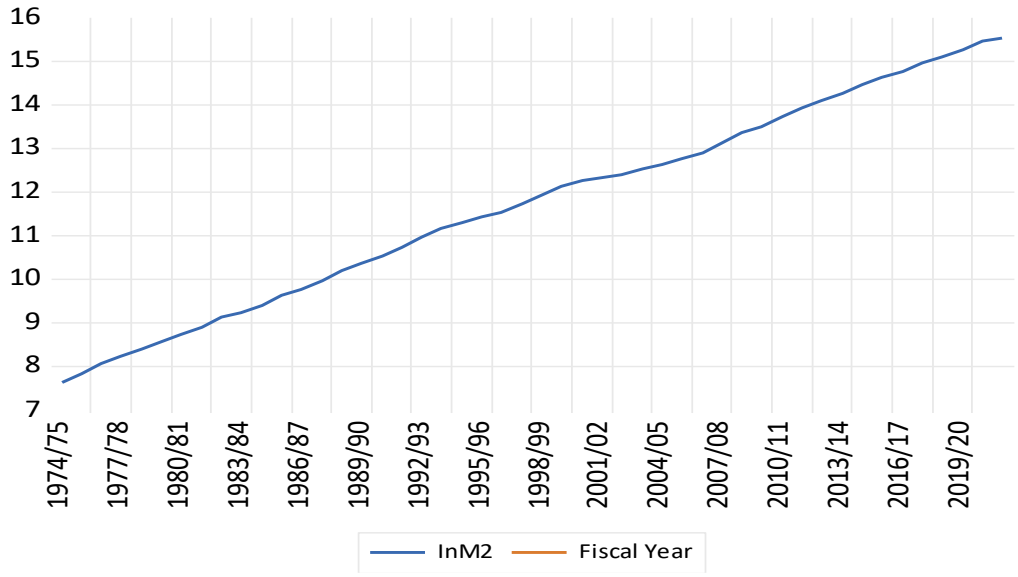
Fiscal Years	LnNCPI	LnM2	LnBD	LnRGDP	LnNEER	LnICPI
1974/75	0.76	3.31	2.70	5.54	2.16	0.88
1975/76	0.76	3.40	2.90	5.56	2.08	0.90
1976/77	0.77	3.51	3.00	5.56	2.08	0.87
1977/78	0.82	3.58	3.05	5.58	2.03	0.90
1978/79	0.83	3.65	3.09	5.58	1.99	0.92
1979/80	0.87	3.72	3.21	5.58	1.96	0.94
1980/81	0.93	3.80	3.23	5.62	1.98	0.99
1981/82	0.97	3.87	3.43	5.64	1.97	1.04
1982/83	1.03	3.96	3.62	5.64	1.91	1.07
1983/84	1.06	4.02	3.61	5.68	1.96	1.12
1984/85	1.07	4.09	3.65	5.70	1.96	1.16
1985/86	1.14	4.18	3.71	5.72	1.81	1.18
1986/87	1.19	4.24	3.74	5.73	1.80	1.22
1987/88	1.24	4.33	3.83	5.76	1.75	1.25
1988/89	1.27	4.42	4.01	5.78	1.65	1.29
1989/90	1.31	4.50	4.02	5.80	1.60	1.32
1990/91	1.35	4.58	4.11	5.82	1.68	1.36
1991/92	1.43	4.66	4.11	5.84	1.66	1.42
1992/93	1.47	4.77	4.20	5.86	1.61	1.47
1993/94	1.51	4.84	4.15	5.89	1.65	1.49
1994/95	1.54	4.91	4.16	5.91	1.66	1.53
1995/96	1.57	4.97	4.27	5.93	1.68	1.58
1996/97	1.61	5.02	4.31	5.95	1.62	1.61
1997/98	1.64	5.10	4.37	5.96	1.69	1.64
1998/99	1.69	5.18	4.35	5.98	1.75	1.70
1999/00	1.70	5.27	4.37	6.01	1.77	1.72
2000/01	1.71	5.33	4.49	6.03	1.86	1.74
2001/02	1.73	5.35	4.26	6.03	1.92	1.75
2002/03	1.75	5.39	4.10	6.05	1.93	1.77

2003/04	1.76	5.44	4.10	6.07	1.94	1.79
2004/05	1.78	5.48	4.16	6.08	1.97	1.80
2005/06	1.82	5.54	4.22	6.10	1.98	1.82
2006/07	1.84	5.60	4.27	6.11	1.97	1.84
2007/08	1.87	5.69	4.35	6.14	1.99	1.87
2008/09	1.92	5.80	4.54	6.16	1.94	1.91
2009/10	1.96	5.86	4.61	6.18	1.95	1.95
2010/11	2.00	5.96	4.70	6.19	2.00	2.00
2011/12	2.03	6.05	4.46	6.21	1.99	2.04
2012/13	2.08	6.12	4.56	6.23	2.00	2.08
2013/14	2.11	6.19	4.26	6.25	2.00	2.12
2014/15	2.14	6.27	4.83	6.27	1.98	2.15
2015/16	2.18	6.35	4.75	6.27	1.96	2.17
2016/17	2.20	6.41	5.28	6.31	1.98	2.19
2017/18	2.22	6.49	5.49	6.34	1.99	2.20
2018/19	2.24	6.55	5.26	6.37	1.99	2.22
2019/20	2.27	6.63	5.43	6.36	1.97	2.23
2020/21	2.28	6.71	5.42	6.38	1.98	2.26
2021/22	2.31	6.74	5.42	6.40	1.98	2.28

Appendix IV: Graph of M2, BD & NCPI







Appendix V: F-bound Test Result and Estimated Long-run Coefficients

ARDL Long Run Form and Bounds Test
Dependent Variable: D(INNCPI)
Selected Model: ARDL(1, 0, 1, 0, 0, 1)
Case 2: Restricted Constant and No Trend
Date: 09/20/23 Time: 15:41
Sample: 1 48
Included observations: 47

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.892053	0.217621	-4.099116	0.0002
INNCPI(-1)*	-0.770144	0.150060	-5.132227	0.0000
INM2**	0.173465	0.035915	4.829825	0.0000
INBD(-1)	0.003706	0.018125	0.204453	0.8391
INRGDP**	0.041684	0.012448	3.348640	0.0018
INNEER**	-0.109232	0.020296	-5.381904	0.0000
INICPI(-1)	0.418949	0.160383	2.612173	0.0128
D(INBD)	-0.018112	0.017175	-1.054568	0.2983
D(INICPI)	0.631853	0.136748	4.620570	0.0000

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INM2	0.225237	0.059041	3.814948	0.0005
INBD	0.004812	0.023381	0.205790	0.8381
INRGDP	0.054124	0.019495	2.776265	0.0085
INNEER	0.141833	0.020138	7.043010	0.0000
INICPI	0.543987	0.120935	4.498188	0.0001
C	-1.158293	0.341495	-3.391829	0.0016

EC = INNCPI - (0.2252*INM2 + 0.0048*INBD + 0.0541*INRGDP + 0.1418 *INNEER + 0.5440*INICPI - 1.1583)

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
		Asymptotic: n=1000		
F-statistic	11.42780	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15
Actual Sample Size	47	Finite Sample: n=50		
		10%	2.259	3.264
		5%	2.67	3.781
		1%	3.593	4.981
		Finite Sample: n=45		
		10%	2.276	3.297
		5%	2.694	3.829
		1%	3.674	5.019

Appendix VI: Estimated Short-run Coefficients

ARDL Error Correction Regression
Dependent Variable: D(INNCPI)
Selected Model: ARDL(1, 0, 1, 0, 0, 1)
Case 2: Restricted Constant and No Trend
Date: 09/20/23 Time: 16:11
Sample: 1 48
Included observations: 47

ECM Regression
Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(INBD)	-0.018112	0.012082	-1.499026	0.1421
D(INICPI)	0.631853	0.053894	11.72402	0.0000
CointEq(-1)*	-0.770144	0.080022	-9.624207	0.0000

R-squared	0.738803	Mean dependent var	0.075683
Adjusted R-squared	0.726931	S.D. dependent var	0.036753
S.E. of regression	0.019206	Akaike info criterion	-5.005514
Sum squared resid	0.016230	Schwarz criterion	-4.887420
Log likelihood	120.6296	Hannan-Quinn criter.	-4.961074
Durbin-Watson stat	1.775727		

* p-value incompatible with t-Bounds distribution.

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	11.42780	10%	2.08	3
k	5	5%	2.39	3.38
		2.5%	2.7	3.73
		1%	3.06	4.15