



Macroeconomic Analysis of Inflation's Impact on Unemployment and Economic Growth and their Relationship in India

(1990-2023)

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ABSTRACT

According to the Global Hunger Index 2022, which places India at a respectable 107th place, the stark fact that 29.1% of its people live below the poverty line has made inflation a key macroeconomic problem in the country. The fact that the average yearly pay in India is so low—just 1,38,840 Rs. —adds to the difficulty. The goal of this study is to examine inflation patterns and how they affect the unemployment rate and the pace of economic growth, two crucial macroeconomic indicators.

The study is divided into five chapters, with the introduction detailing the objectives, problem statement, and restrictions of the study. In the second chapter, a thorough literature study that examines several academic publications is conducted. The third chapter provides an overview of the research methodology, which uses a descriptive study design and statistical techniques including regression analysis and correlation coefficients to explore the connection between unemployment, inflation, and economic growth.

According to recent trends, developed economies continue to experience inflation rates between 0.1% and 3.1%, whereas low-income developing countries experience inflation rates between 6.5% and 8.3%. Inflation in Bhutan is declining, although it is rising in Pakistan and Sri Lanka because of outside influences like China's economic influence. Inflation in India has averaged over 4% over the previous five years, while the world economy has grown by more than 3%.

Notably, South Asia's economies have continued to expand at good rates thanks to both Bangladesh and India.

The importance of macroeconomic policies that support economic development, job creation, and inflation management is emphasized as this research comes to a close. Although monetary policy aims to lower unemployment and accelerate economic development, its effectiveness frequently falls short. According to research, growing economies like India tend to benefit from moderate or low inflation rates, whereas high inflation rates are harmful.

Regression analysis and correlation coefficients show a modest association between inflation and economic growth, with the latter mainly unaffected by changes in inflation. Similar to job creation, unemployment also shows little sensitivity to changes in inflation. In conclusion, this analysis highlights the complex interactions that exist between inflation, economic growth, and unemployment in India's macroeconomic environment, highlighting the need for careful policy formulation to deal with these urgent economic issues.

CHAPTER 14

INTRODUCTION

1.1 General Background

India is a geographically diverse country that is covered by Mountain ranges in the North and by sea on the other three sides. In the south, there is the Indian Ocean, in the east there is the Bay of Bengal and in the west, there is the Arabian Sea. With this India become one of the important countries in International Trade and connect southeastern and eastern countries with the rest of the world. It completely lies in the Northern Eastern hemisphere of the world between latitudes 84° N and 37°6'N and longitudes 68°7' E and 97°25' E. India is massive in size, as we discussed it is the 7th largest country in terms of landmass. The total area of India is 3.28 million square km. India also covers 2.4% of the area on the globe, with a land boundary of 15,200 km and the coastal boundary that includes the islands is 7,516 km. With this all-India support, 17.31% [1.211 billion] of the total population of the world became the second most populated country. It's expected to reach 8.5 billion by 2030. By the end of April, India's population is expected to reach 1.425 billion, with projections to show future growth for several decades more, the UN said.

India's GDP growth rate in 2022 was 7.00%, a 2.05% decline from 2021. The growth rate in 2021 was 9.05%, a 14.89% increase from 2020. The growth rate for the 2022-23 fiscal year was revised higher to 7.2% from 7%. The Indian economy expanded 4.4% year-on-year in the three months

to December of 2022. The IMF projected India's 2023 GDP growth at 6.1%, a 0.2 percentage point upward revision from April. The revision was due to stronger-than-expected growth in the fourth quarter of 2022. With this India has become one of the fastest growing economies of the world. However according to the National

Multidimensional Poverty Index (MPI) in 2023, 14.96% of India's population lived in Multidimensional Poverty. The poverty rate in rural and urban areas was 19.28% and 5.27% respectively as per NITI Aayog. And the Gini-Coefficient, which shows the inequality in Income distribution is 82.3 in 2020 and remains the same in 2021.

The rate of overall price growth during a certain time is known as inflation. A common definition of inflation is the overall rise in prices or the whole increase in the cost of living for citizens of a nation (C. onera 2010, P-4). Pigou asserts that "inflation exists when money income is increasing more rapidly than the rate of increase in earning activity." Goutborn asserts that "inflation is too much currency about physical volume of business." According to Crowther, inflation is "a condition in which the purchasing power of money is decreasing, i.e., prices are rising." "Inflation is a persistent and appreciable rise in the general level or average of prices," claims Ackley. By analyzing these definitions, we say that-

- Inflation is an increase in the price level of goods and services.
- Inflation is when too much money chases a few goods.
- Inflation is too much increase in demand for goods compared to the supply of goods.
- Inflation also means too much currency supply in an economy.
- Inflation is also depicted as a fall in the value of money rises the value of money rise value of goods and services. (B. Dhungel and R.B, Bista; 2013 p-100)

Economic growth is the change in a country's GDP (Gross Domestic Product) during a specific period. GDP is the sum of the value of all the products produced in a country during a fiscal year. It is one of the indicators of the production and growth of the economy and plays a strategic role in the development, employment, and balance of payment of a country. (Volker; 2005).

Table 1.1**Inflation Rates of South Asian Countries and Others 2022**

S. No	Country	2020	2021	2022
1.	World	1.9%	3.5%	8.3%
2.	European Union	0.5%	2.6%	8.8%
3.	U.S. A	1.2%	4.1%	8%
4.	India	6.6%	5.1%	6.7%
5.	China	2.4%	1%	2%
6.	Pakistan	9.7%	9.5%	19.9%
7.	Bangladesh	5.7%	5.5%	7.7%
8.	Sri Lanka	6.2%	7%	49.7%
9.	Nepal	5.1%	4.1%	4.8%
10.	Bhutan	5.6%	7.3%	5.6%
11.	Malaysia	-1.1%	2.5%	3.4%
12.	Maldives	-1.4%	0.5%	2.3%

Source: IMF Report 2023

According to the World Economic Outlook report published by the International Monetary Fund (IMF) in 2023; World Economic Growth Increased by 3.5% in 2022 while it increased by 3.0 in 2023. Indian economy grew by 7.2% in 2022 and by 6.1% in 2023. On the other side, the Chinese economy grew by 3% in 2022 and by 5.2% in 2023. Only the Indian economy in Southeast Asia has grown more than the other countries in this region presented by the IMF.

The year 2020 was known as the year of covid-pandemic and this affected the economy of all the countries and countries suffered due to disturbance in demand and supply mismatch in the goods and services. The demand for essential goods suddenly booms but supply starts to fall, and this leads to the economy of countries in Recession and almost all countries show negative GDP growth in the year 2020. But in the next years, major countries show a great jump.

Table 1.2**Economic Growth Rate of South Asian and Other Countries**

S. No	Country	2020	2021	2022
1.	World	-3.0%	6.1%	3.6%
2.	European Union	-5.6%	5.4%*	3.5%
3.	U.S. A	-2.7%	5.9%	2.0
4.	India	-5.8%	9.1%	7.0%
5.	China	2.3%	8.4%	2.9%
6.	Pakistan	-1.3%	6.5%	6.2%
7.	Bangladesh	3.3%	7.2%	5.5%
8.	Sri Lanka	-4.6%	3.5%	-7.8%
9.	Nepal	-2.4%	4.8%	5.6%
10.	Bhutan	-10.0%	4.1%	4.0%
11.	Malaysia	-5.5%	3.1%	8.6%
12.	Maldives	-33.5%	41.7%	12.3%

Source: IMF Report 2023

According to the ILO guidelines, a person is unemployed if the person is: -

- not working
- currently available for work
- Seeking work.

The without-work condition serves to distinguish between the employed and the unemployed and thus guarantees that these are mutually exclusive categories of the working-age population, while the currently available work and seeking work separate the non-employed into the unemployed and the out of the labour force. The purpose of the availability for work conditions is to exclude those individuals who are seeking work to start later and thus is a test of current readiness. The intention of the seeking work criterion is, on the other hand, to ensure that a person will have taken certain active steps to be classified as unemployed. (Byrne & Strobl; 2000, 5). The unemployment problem has become a great concern all over the world.

According to the ILO Report 2022, 5.77 percent of the world's population was without a job in the world's workforce. According to the population composition of India, India's labour market has seen an improvement with over 15 million people entering the workforce in the last three quarters, shared the Centre for Monitoring Indian Economy. More than 11.2 million people

gained employment, showing that a higher number of willing workers were able to secure jobs. (Times Of India)

Table 1.3

Unemployment Rate of South Asian and Other Countries

S. No	Country	2020	2021	2022
1.	World	6.9%	6.2%	5.7%
2.	European Union	7.2%	6.7%	6.1%
3.	U.S. A	8.1%	5.3%	3.6%
4.	India	10.2%	7.6%	7.3%
5.	China	5.0%	4.5%	4.9%
6.	Pakistan	6.5%	6.3%	6.4%
7.	Bangladesh	5.2%	5.0%	4.7%
8.	Sri Lanka	5.2%	6.5%	6.7%
9.	Nepal	13.1%	12.2%	11.1%
10.	Bhutan	5.0%	4.0%	5.9%
11.	Malaysia	4.7%	4.9%	5%
12.	Maldives	5.34%	5.2%	4.8%

Source: IMF Report 2023

Inflation, economic growth rate, and unemployment are the main indicators of an economy showing Development. In the Indian economy, the inflation rate is steady (7.3%) and comparatively high (2020 exceptional year). However, the economic growth rate fluctuates significantly in successive fiscal years. Similarly, the unemployment rate is extremely high, and millions of people are affected by these three variables of an economy. **In which, inflation is taken as a free variable and Economic growth rate and unemployment as dependent variables on inflation.**

1.2 Problem

Theoretic literature shows that relationship between the inflation and Economic growth is positive, negative, and neutral in different situations. Also, the empirical findings are highly diversified based on the economic conditions, methodology used, data used, nature, situation of

the study whether cross-section, panel data, or country-specific, and period of the study as well as the number of explanatory variables included in the model to show the relationship between them. Price stability is considered as the key variable to promote economic growth as well as sustainable development of the country.

If money loses its value people lose confidence in it as a medium of exchange, store of value, and other uses. The effect is a fall in saving(S) and consequently lower investment(I) as well as economic growth which affects the demand for labour in the labour market which further decrease the aggregate income of people and then the demand for product and production also goes down which ultimately impacted the Economic Growth.

A lot of the economic literature found investment as the main channel through which inflation helps economic growth. That is, a high inflation rate hurts economic growth. The debate about the relationship between inflation and economic growth remained imprecise till 1970, the relationship was either neutral or positive. Huge empirical studies about the correlation between inflation and economic growth have been conducted to support the inflation-growth theories but they came out with inconclusive results. (Ruzima; 2016, 9)

Macroeconomic policy aims to promote economic growth and development, employment creation improved living standards of people, and distribution of income in the society. However, there is no consensus on the proper conduct of monetary policy to achieve the twin goals of low inflation and low unemployment. (Govera: 2015,1) So it shows a zero positive relationship between both.

Economists and policymakers of a country do not properly understand the effects of monetary policy on employment creation and economic development. On the other side, it is argued that an inverse relationship exists between inflation and unemployment which can be exploited to attain low unemployment based on the statistical findings by Phillips (1958) on the other hand, it is argued that price stability is regarded as an important precondition for the attainment of economic growth and consequently job creation. The argument justifies the use of inflation targeting as the main monetary policy control mechanism by the central bank.

Despite this argument, it is generally accepted that monetary policy does not influence the growth rate and employment, in the long run, it is only a short-term phenomenon of macro-Economics.

In the context of India, Inflation rates were approximately stable after 2014 except for the year of Covid pandemic in which it went above the rate of the Inflation Rate of India 2 to 6 percent which

was fixed by the Reserve Bank of India. For India 2 to 6 percent is the manageable rate of inflation. So, it makes the study of the inflation rate, economic growth, and unemployment an important aspect of the development of India in Which the following issues are investigated: -

- What is the Trend of inflation in India?
- What Philips curve show in the short and long run show concerning India?
- What is the relationship between inflation and unemployment?
- What is the relationship between inflation and economic growth?
- What are the aspects affected by Inflation in India?

1.3 Objectives of the Study

The general goals of this study are to analyse the trend of inflation in the economic growth rate and unemployment in India. The specific goals are:

- i. To explain the trend of inflation in India.
- ii. To show the relationship between inflation and economic growth rate.
- iii. To analyse the impact of inflation on the economic growth rate in the context of India.
- iv. To show the relationship between inflation and unemployment in India.
- v. To show the impact of inflation on the unemployment rate of India.

1.4 Formulation of Hypothesis

Prof. Ronald Aylmer Fisher has proved that under the null hypothesis, the variables are uncorrelated in the population. So, the hypothesis for this study is formulated as.

- Null hypothesis $H_0 \rho = 0$ i.e., the variable inflation (I) and economic growth rate (G) is not correlated in the context of India.

Alternative hypothesis: $H_1 \rho \neq 0$ The variables inflation (I) and economic growth rate (G) is correlated in the context of India.

- Null hypothesis $H_0 \rho = 0$ i.e., the variables inflation rate (I) and unemployment rate (U) is not correlated in the context of India.

Alternative hypothesis: $H_1 \rho \neq 0$ the variables inflation rate (I) and unemployment rate (U) is correlated in the context of India.

1.5 Importance of this Study

Inflation affects the economy in various positive and negative ways. The negative effects of inflation increase the opportunity cost of holding money for future use and uncertainty over future inflation which may discourage the Investor for investing and saving. Positive effects include reducing the real burden of public and private debt and keeping nominal interest rates above zero. So that central banks can adjust interest rates and other monetary policy measures to stabilize the economy and reduce unemployment due to wage rigidity. (Singh 2018,7). Inflation caused by money supply (monetary policy) or an increase in demand for goods has an important impact on the macroeconomic variables of the country either positively or negatively to various degrees. Inflation accelerates the money supply in the market which leads to an increase in demand for products and ultimately affects the Prices of the product. (Mocan 1995 cited in R.).

Changes in political conditions and instability in the political situation of India after 2014 affected economic instability in India with the implementation of GST (July 1, 2017), Demonetization (November 8, 2016), Covid-19(2020) on economic policy, monetary policy, and fiscal policy. There is no common consensus between political parties and economists to control high inflation rates, low economic growth rates, and high unemployment. So, this study will supply necessary information about the inflationary trend in India and its impact on macroeconomic indicators economic growth rate, and unemployment. To control Inflation and reduce unemployment there is a need for consensus between political parties and economists and joint steps for better growth of the Country.

Research Through Innovation

CHAPTER 2

REVIEW OF THE LITERATURE

This chapter discusses the concept of inflation and its historical background and perspective on inflation in India. Next, the Phillips curve model and its emergence are explained in short; the remaining chapter discusses the empirical literature of different researchers and last, there is the conclusion of the literature review.

2.1 Historical Background of Inflation Theories

Historically, firstly commodities are used as the medium of exchange of goods which was called as Barter System but a lot of drawbacks of this system like-

- Double coincidence of wants.
- Lack of common measure of value.
- Indivisibility of certain goods.
- Difficulty in making deferred payments.
- Lack of store of value etc.

Then the demand for a new form of exchange comes into use which is known as a monetary system. The rapid increases in the quantity of money or the overall money supply have occurred in different societies throughout history changing with different forms of money used. When gold was used as currency, the government could collect gold coins, melt them down, and mix them with other metals such as silver copper, or lead to re-issue them at the same nominal value.

This practice would increase the money supply into the economy but at the same time, the relative value of each coin would be lowered. As the relative value of coins becomes lower consumers would need to give more coins in exchange for the same goods and would experience a price increase (Shostak-2005 cited in Wikipedia) which makes it difficult for poor society to buy the same goods at higher prices.

Song Dynasty China introduced the practice of printing money for fiat currency. The Mongol Yuan Dynasty spent a lot of money on wars and responded by printing more money, causing inflation. The Ming Dynasty, fearing inflation, initially refused to use paper money and went back to using copper coins. (Benholz-2003 cited in Wikipedia)

In the past, significant injections of gold or silver into an economy also caused inflation. Western Europe saw a significant inflationary cycle known as the "price revolution" from the second half of the 15th century to the first half of the 17th, during which prices, on average increased sixfold for 150 years. Early classical economists like David Hume and David Ricardo saw the connection between an excess of banknotes and a resultant decline in their value by investigating the impact of currency devaluation on the cost of products. In nations facing political turmoil, the money supply has often increased quickly, resulting in hyperinflations.

A notable illustration of this is the hyperinflation that exists in the Weimar Republic of Germany. As of October 2018, Venezuela has a hyperinflation rate of 833,997 percent which was the highest on record. According to Keynesian economics, the money supply does not directly affect prices in the short run and that visible inflation is the result of economic pressures expressing themselves in price (Corina, & Ponsj, 2018; cited in Wikipedia).

Robert J. Gordon's triangle model explains the three main types of inflation.

I. Demand-pull Expansion:

As a result of increased spending by the private sector and the government, among other factors, aggregate demand has increased. Because excessive demand and favourable market conditions will encourage investment and expansion, demand inflation encourages economic growth.

ii. Costs-Push Inflation:

It is additionally called supply shock expansion. A decrease in aggregate supply is to blame. This might be because of catastrophic events or expanded costs of inputs (raw material, labour, increase of taxes etc.).

iii. Built-in Inflation:

The price/wage spiral is often associated with built-in inflation, which is caused by adaptive expectations. It involves workers attempting to maintain their wages while prices rise, and businesses pass these increased costs on to their customers in the form of higher prices, creating a "vicious circle." Built-in inflation, also known as "hangover inflation," reflects past events.

2.1.1_Monetarist View

Monetarists believe the most significant factor inflaming inflation or deflation is how fast the money supply grows or shrinks. They consider fiscal policy, or government spending and

taxation, as ineffective in controlling inflation. The monetarist economist Milton Friedman famously stated "Inflation is always and everywhere a monetary phenomenon. (Friedman, Milton; 1963)

According to monetarists, the rate of expansion or contraction of the money supply is the primary factor that contributes to either inflation or deflation. They believe that fiscal policy, which includes taxation and spending by the government, does not work well to control inflation. Milton Friedman, a famous monetarist economist, once said, "Inflation is always and everywhere a monetary phenomenon." Friedman, Milton; According to monetarists, the empirical study of monetary history proves that inflation has always been a monetary phenomenon. Simply put, the quantity theory of money asserts that any change in a system's money supply will alter its price level. The equation of exchange is the foundation of this theory.

$$MV = PQ$$

Where,

M- the nominal quantity of money

V- the velocity of final expenditures.

P- General price level

Q- an index of the real value of final expenditure.

In this equation, the general price level is related to the level of real economic activity (Q) the quantity of money (M), and the velocity of money (V). The equation is an identity because the velocity of money (V) is defined to be the ratio of final nominal expenditure (PQ) to quantity of money (M). Based on this assumption, the primary driver of the change in the general price level is changes in the quantity of money.

2.1.2 Evolution of Phillips Curve

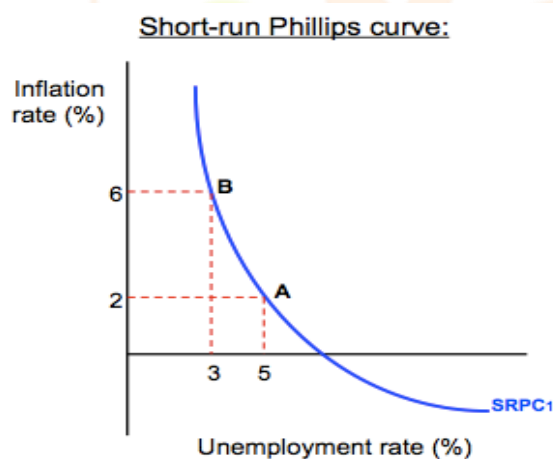
The Phillips curve has been the subject of theoretical and empirical literature since the 1950s. In the 1970s, the conventional Phillips curve connection broke down. Since then, whole new formulations have been developed to match the available empirical data. Most of the ground-breaking research on the Phillips curve connection is credited to Phillips (1958). He looked at wage inflation and unemployment statistics for England from 1861 to 1957 and found a negative

correlation between the two variables. The link between US price inflation and unemployment data for the years 1913 to 1957 was examined by Samuelson and Solow in 1960. The study discovered an analogous link between the two variables. The Phillips curve was the name of the model that stood for this connection.

This showed that policymakers had a choice of options, which was significant. The government may decide to sacrifice high unemployment to support low prices. On the other hand, low unemployment rates might be reached with an expansionary monetary policy (H. Govera, 2015, P-14).

The Phillips curve connects the impact of inflation to the unemployment rate. According to the Phillips curve, as unemployment declines, inflation rises. Still, the connection is not linear. When the unemployment rate is plotted on the X-axis and the inflation rate is plotted on the Y-axis, the short-run Phillips curve forms a shape (L-candela 2019, P-3)

Figure 2.1



The Phillips curve model's forecasts and suggestions were, however, called into question by economic developments in the US economy in the 1970s, when oil shocks led to severe hyperinflation and the greatest unemployment rate since the 1940s.

2.1.3 Friedman's Monetarist Views

The Phillips curve model, according to Friedman (1968), was improperly told. He offered a crucial theoretical insight: when there is a substantial surplus of labour, nominal wages are relatively high in comparison to price inflation, and the opposite is also true. According to Friedman, monetary policy can only temporarily affect unemployment. But over the long term, unemployment is still at a natural rate even with ongoing inflation. (Additional information: Kodrzycki, Little & Olivei, 2009).

2.1.4 Phelps's Contribution

Phelps (1967) used the adaptive expectations framework to derive the accelerationist Phillips curve model. The model posits that unemployment and inflation are independent overall (Govinda 2015, 15)

2.1.5 The New Keynesian Phillips Curve Model

According to Kiley (1997), Taylor (1990), Calvo (1983), and Fischer (1997) claimed that pricing rigidities within the NKPC framework supply a better representation of the short-term inflation dynamics. By linking inflation to ability usage or production costs, the NKPC model connects price inertia, inflation, and changes in the actual economy. Firms may adjust their output and employment levels in response to changes in monetary policy when prices are sticky. Inflation, companies' expectations of future inflation, marginal costs, and firm marginal costs are all connected in this way by the theory. The marginal expenses that businesses pass on to consumers when rising prices cause inflation to grow. In the short run, the corresponding Phillips curve is negative. Because it was micro-founded, NKPC was extensively distributed because it was thought to be logically better. As a result, it became the norm for modelling specifications. Dynamics of unemployment and inflation (Duplessis & Burger, 2006)

2.1.6 The Neo-Classical Theory

Neo-classical theory predominates in professional discussions on monetary policy. The linked Phillips curve has origins in Philips (1967), Friedman's (1968), and Lucas's (1976) work.

According to the strategy, inflation and money are both veils. A neutral monetary policy is expected in both the short and long terms. The corresponding Phillips curve is constructed as follows.

$$\pi = \alpha (u - u^*) + \pi^e$$

where $\alpha > 0$, π^e = expected inflation, u = unemployment rate, π = inflation rate, and u^* = natural rate of unemployment (H Govera -2015-19)

2.1.7 New Classical:

According to the new classical approach, even in the short term, production and employment will not be affected by systematic monetary and fiscal policy changes that alter AD. The new classical policy ineffectiveness premise is what it is known as.

Monetarists think that systematic monetary policy actions have actual consequences in the short run, even though they doubt the necessity and appropriateness of aggressive measures to alter production and employment as well as the efficacy of fiscal policy activities. According to new classical economics, economic actors will develop reasonable expectations.

The reasonable expectations hypothesis states that expectations are created based on all pertinent knowledge that is currently accessible about the variable being forecasted. The folks make sensible use of the facts at hand by understanding how the factors they see will affect the variable they are trying to forecast. The Keynesian model's backward-looking expectations and rational expectations' forward-looking characteristics can be contrasted in a meaningful way. Because a variable's expectations, like the price level, respond to the variable's historical behaviour, expectations under the Keynesian model are backward-looking. Instead, according to the rational expectation theory, economic actors make knowledgeable assessments of the implications of all pertinent information that is at their disposal for the future behaviour of a variable, such as price level.

According to the new classical approach, AD measures intended to stabilize production and employment play no beneficial function. New classical economics advocate for stability in fiscal policy and against using excessive, inflationary stimulus.

2.2 Historic Perspective of Inflation in India

A range of events over the years have had an impact on the complicated and multidimensional history of inflation in India. The historical background of inflation in India is provided in the following succinct manner:

- Prior to achieving independence in 1947, India went through times of inflation, which were mostly caused by supply-side elements including famines, agricultural failures, and interruptions

from World War II. To cover its expenditures, the colonial authority frequently turned to the printing press, which increased inflationary pressures.

- **Early Post-Independence Period (1950s–1960s):** India implemented a planned economy upon its independence, putting a focus on industry and self-sufficiency. Due to strict governmental controls over the economy and pricing in the early years, inflation was relatively low.
- **Green Revolution (1960s–1970s):** The 1960s saw a considerable rise in agricultural output, which helped to alleviate food shortages and stabilize food prices. But as the government became more involved in the economy, inflation started to swell.
- **Economic Liberalization (1990s–Present):** In 1991, India started the process of economic liberalization by allowing international commerce and investment into its country. Significant economic progress occurred during this time, but it also brought up new difficulties. Global issues, such as the price of oil and other commodities, and inflation have become increasingly entwined.
- **Period of High Inflation (2008–2014):** Between 2008 and 2014, India went through a period of comparatively high inflation that was fuelled by causes including rising oil costs, inflationary food prices, and increased demand. During this time, the Reserve Bank of India (RBI) used monetary measures to fight inflation.
- **Trends of Late (2015–Present):** India saw a decrease in inflation in the middle of the 2010s because of decreased oil costs and better food management measures. Inflation, which fluctuates due to variables including supply chain interruptions, weather-related disasters that affect agriculture, and general economic conditions, has remained a source of concern.
- **In 2016, the Reserve Bank of India (RBI) formalized its monetary policy framework by introducing inflation targeting.** In accordance with this framework, the RBI sets an inflation target for the Consumer Price Index (CPI) and modifies its policy interest rates to meet that target. Typically, the objective has been set at 4% with a +/- 2% tolerance range. This framework has made it possible to regulate inflation in a more organized manner.
- **Pandemic of COVID-19:** India's economy and prices were significantly impacted by the COVID-19 epidemic in 2020. Some industries were under deflationary pressure because of lockouts and supply chain interruptions, whereas food and healthcare expenses were under inflationary strain.

To lessen the pandemic's negative economic effects, the RBI adopted a number of steps to help the economy during this time, such as rate reduction and liquidity injections.

- **Food Price Inflation:** India's vast population and reliance on agriculture have historically made food inflation a significant contributor to inflation in that country. To control food costs, the government has undertaken a number of policies and initiatives, including the purchase and distribution of necessities, food subsidies, and the development of the Public Distribution System (PDS).
- **Outlook for Inflation:** In recent years, India has had periods of both low and moderate inflation, which has mostly been within the target range set by the RBI. The future for inflation in India is still impacted by several variables, such as local food production, international commodity pricing, and RBI monetary policy actions.

In conclusion, a combination of structural and cyclical elements can be seen in India's inflation history. Periods of relatively low inflation, high inflation, and deflation have all occurred in the nation at various times, with diverse economic and political changes impacting these tendencies. Key tactics for reducing inflation and preserving price stability in India include the RBI's adoption of inflation targeting and ongoing attempts to regulate food prices and supply-side restrictions. However, it's crucial to acknowledge that controlling inflation in a country with a varied and expanding economy like India continues to be difficult.

2.3 Research Review Between Inflation and GDP Growth Rate

- Wai (1956) examined the link between inflation and economic growth in his study report. A statistical analysis that looked at time series data from the years 1938 to 1954 to examine the link between inflation and economic development in less developed nations found no such association.
- Fischer (1993) examined the correlation between macroeconomic variables and economic growth using time series data from 1960 to 1989 for 101 countries in his research paper titled "The Role of Macroeconomic Factors in Growth". He found that inflation and economic growth are negatively correlated with each other, and that inflation delays economic growth through investment and rate of growth productivity.
- In his research paper titled "Inflation and Economic Growth," Barro (1995) used panel data from year 1960 to 1990 of 100 countries to examine the impact of inflation on economic growth

and investment. He concluded that inflation has a damaging and statistically significant impact on economic growth. The primary mechanism through which inflation slows down economic growth is investment.

- In a paper titled “Does the High Inflation Affect Growth in the Long and Short Run”, Faria and Carneiro (2001) examined time series data for Brazil from 1980 to 1995 and concluded that there is a negative correlation between inflation and economic growth.
- Khan and Senhadji (2001) used unbalanced panel data from 1960 to 1998 for 140 developed and developing countries to reexamine the existence of a threshold level of inflation above which inflation harms economic growth. They concluded that the threshold level of inflation on above which inflation hurts economic growth is 1-3 percent for industrial developed countries and 11–12 percent for developing countries.
- Phillips and Ghosh (1998) IMF researchers examined if there is a strong correlation between inflation and economic development using panel data from 1960–1996 for 145 countries in a report titled "Warning: Inflation may be harmful to your growth." They concluded that there is an adverse association between inflation and economic growth that is statistically and economically significant. When the inflation rate was between, a positive link between the two variables was found.
- Gokal and Hari (2004) examined the impact of inflation on economic growth using time series data for Fiji from 1970 to 2003 and concluded that there is only a weakly negative relationship between inflation and economic growth rate. Their working paper was titled "Relationship between inflation and economic growth."
- In their working paper titled "Inflation and Economic Growth in Bangladesh," Ahmed and Mortaza (2005) used annual data from 1980 to 2005 AD to empirically analyse the relationship between inflation and economic growth. They concluded that there is a statistically significant long-run negative relationship between inflation and economic growth rate.
- Gokal and Hari (2004) examined the impact of inflation on economic growth using time series data for Fiji from 1970 to 2003 and concluded that there is only a weakly negative relationship between inflation and economic growth rate. Their working paper was titled "Relationship between inflation and economic growth."
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between inflation and economic growth. They concluded that there is a statistically significant long-run negative relationship between inflation and economic growth rate.

- In their 2008 study book, *Inter-relationship between Economic Growth, Saving, and Inflation in Asia*, V. Chaturved et al. looked at how these factors interacted in Southeast and South Asia. Panel data for 13 Asian nations from 1989 to 2003 were used to draw the conclusion that inflation significantly and negatively affects economic growth.
- Using time series data from 1960 to 2007, Tabi and Ondo (2011) conducted a study titled "Inflation, Money and Economic Growth in Cameroon" to examine the relationship between inflation and economic growth rate. They concluded that increasing the money supply encourages economic growth rate and that inflation is not a major factor in economic growth rate.
- Relationship between Inflation and Economic development in Malaysia by Datta and Mukhopadhyay (2011) examined the relationship between inflation and economic development in Malaysia using yearly time series data from 1971 to 2007. While inflation and economic growth have a short-term negative association, they have a long-term positive link.
- Hossain et al. (2012) used annual time series data from 1978 to 2010 in their study "Inflation and Economic Growth in Bangladesh" to examine the long-term relationship between inflation and economic growth rate and concluded that there was no such relationship.
- In their article "Inflation and Economic Growth in India," Salinan and Gopakumar (2013). Using yearly time series data from 1972 to 2008, empirical research of the inflation-growth nexus in India concluded that there is a long-term negative link between inflation and economic growth. Growth is less sensitive to changes in inflation rates than inflation is to changes in growth rates.
- Impact of inflation on economic growth: A case study of Tanzania by Kasidi and Mwanemela (2013) examined the relationship between inflation and economic growth in the Tanzanian economy using annual time-series data from 1990 to 2001 and discovered that while there is a short-term negative impact of inflation on the economic growth rate, there is no long-term relationship between inflation and economy growth in the long run.
- 2014 R. Adhikari Using data from 1975 to 2012, it was determined in a *Journal of Economics* article titled "Whether Inflation Hampers Economic Growth in Nepal" that inflation has a mixed type of influence on the pace of economic growth. The Research Review's concern about the connection between employment and inflation.

2.4 Research Review of Relationship between Inflation and Employment

- In 2007, Furuoka Analysed Malaysia's inflation and unemployment patterns from 1973 to 2004. The study supported the idea that the two factors have a long-term trade-off connection. The research discovered a link between the two in Malaysia throughout the same time.
- According to Umarel and Zubairu (2012), the link between the Phillips curve and Niger from 1977 to 2009 is empirically testable. The Engle-Granger co-integration test, the ARCH, and the GARCH procedures were all utilized in the study to measure volatilities. The investigation there out no proof of a Phillips sponce connection in Nigeria during that time.
- In a 2013 study, Katria, Bhutto, Butt, Domki, Khawaja, and Khalid looked at 14 different nations' 1980–2010 Phillips curve relationships. Bangladesh, Russia, Nepal, Afghanistan, Pakistan, India, Bhutan, Bangladesh, Sri Lanka, Maldives, Indonesia, South Africa, and China. The standard least squares approach was utilized in the investigation. Inflation and unemployment rates in the nations were shown to be negatively correlated by the study.
- Niasken (2001) examined the Phillips curve connection in the US economy from 1960 to 2001 AD using the autoregressive distributed lag model. The reseated discovered a detrimental short-term association. However, there was no proof of a long-term Phillips curve link.
- In their 2013 study, Furuoka Munir and Harvey sought to determine if the Phillips curve connection existed in the Philippines between 1980 and 2010. The Hodrick-Prescott filter and the dynamic ordinary waste squares approach were both used in the investigation. In the time span under consideration, the research found a long-term, causally negative link between unemployment and inflation.

2.5 Research Gap

Theoretical analysis and research assessment have led to the conclusion that there is no actual, well-established relationship between unemployment and inflation which helps to forecast the future. The results of studies conducted in various contexts, even the same nation, with various models and time periods but no fixed result comes in front. In poor nations, moderate inflation at a low rate has been proven to improve economic growth rates but, in industrialized nations, it has less of an impact. According to the theoretical interpretation of the Phillips curve, as modified by various economists, there is a negative correlation between inflation and unemployment in emerging nations or developing countries.

Therefore, the goal of the current study is to investigate how unemployment, economic growth rate, and inflation relate to one another from the viewpoint of the Indian economy. In terms of

time series data, aims, and research methodology, this study differs from prior studies. Inflation trends in India were to be examined, as well as how they affected GDP growth and unemployment rates. Data are easily presented in the study utilizing a table graph and a figure. Drawing the Phillips curve, the correlation coefficient and the regression equation allow us to analyse the link between inflation and unemployment. But correlation-coefficient and regression analysis are used to examine the relationship between inflation and economic growth rate.

CHAPTER 3

METHODOLOGY

Research is the process of looking at an issue repeatedly to learn more about it. The term "methodology" refers to the many processes a researcher often takes to investigate his research topic and the reasoning behind it. Therefore, research methodology is a process for methodically analysing the reasoning behind issues to get a conclusion regarding the issues.

Research design, data nature, data source, data collecting method, universe, sample, etc. are all questions that research methodology answers for the researcher. Observing the effects of the information on the unemployment rate and economic growth rate is the primary goal of this study.

It might be challenging to choose a good research technique, but it is crucial to the study's ability to be supported in the long run by reliable empirical research. This study includes both analytical and descriptive types.

3.1 Research Design

Quantitative information is collected to examine the trend of inflation, economic growth rate, and unemployment in India. The descriptive type of research methodology has been used for the study to make the results more significant and beneficial for the people to understand these aspects and their relationship with each other.

3.2 Population and Data Collection

The population for this study is the total population of India. Data are collected from different governmental sites and international institutions like ILO, IMF, UN and others from where authentic and reliable data is available.

3.3 Nature and Source of Data

This study is based on secondary data covering the period 1980 AD to 2020. Secondary data obtained from the various published and unpublished sources of government, IMF, World Bank, and private organizations of different periods have been used for the analysis and explanation of this subject matter under this study. To make the study more reliable, facts and figures from only authorized organizations have been used for collecting data for this research. Various economic surveys published by the Ministry of Finance, GOI are used. Similarly, the Economic Bulletin, Data of RBI has been used for getting information world level and South Asian countries, Different journals and reports on bulletin published by IMF, W.B. ADB are very useful.

3.4 Method of Analysis

This study has been carried out with analytical and descriptive design and is based on secondary data available from the government, IMF, World Bank, and private organizations. Tabulation trend lines and correlation coefficient regression equations have been used as tools of analysis based on requirements. The trend lines are also used to clarify the objective of the study.

3.4.1 Correlation Coefficient (r)

It is a simple statistical tool to find the relationship between two variables. If the value of r is 0, there is no relationship between the two given variables. If the value is +1, there is a very high directly proportional relationship between two given variables. If the value is -1 there is a very high negative or inverse relationship between two variables.

The word correlation usually conveys the relationship between two given variables. Two variables are said to have a 'correlation' when they are so related that the change in the value of one variable is affected by the change in the value of the other Correlation is an analysis of the co-variance between two or more variables and it deals to determine the degree of relationship between variables. (D.N. Sutihar 2017 p.317).

Croxtton and Cowdin claim that when a connection is of a quantitative character, rectification is the process of discovering, quantifying, and expressing the relationship in a concise formula using the right statistical methods.

$$\text{Correlation Coefficient (r)} = \frac{\sum(x-\bar{x})(y-\bar{y})}{\sqrt{\sum(x-\bar{x})^2 \sum(y-\bar{y})^2}}$$

After getting the value of r , if the value of $r = +1$, it shows that there is a perfect correlation between the two variables. If the value of $r = -1$, then there is a negatively perfect correlation between the two variables. When the value $r = 0$, then the variables are uncorrelated. The closer the value of r to $+1$, the closer the relationship between the two variables, and the nearer the value of r to 0 lesser the relationship.

3.4.2 Regression Equation:

A regression equation of $Y = a + bX$ is a linear equation in which X is an independent variable that can be used to state the relationship between Y and X . By solving an equation, we can find the value of a and b and with the help of a and b That can interpret the result.

The literal meaning of regression is the act of stepping or returning to the average value. According to M.M. Blair, "Regression analysis is a mathematical measure of the average relationship between two or more variables in terms of the original units of data. The regression analysis is used to describe the average relationship between two variables is known as simple regression analysis. (Sutihar, 2017)

Method of least square

A regression line of y on x where y is dependent variable and x independent variable can be stated in an equation if they are linearly related as,

$$Y = a + bX$$

The estimated value of Y is given by $\hat{Y} = a + bX$

(i) the error (ie. the difference between the observed value of Y and its estimated value of \hat{Y} is given by $e = Y - \hat{Y}$.

(ii) substituting the value of \hat{Y} in (i) $e = (y - a - bX)$ (ii) In the principle of least square, we must minimize the sum of squares deviation of observations from the estimated value of Y . We must square the equation.

(iii) Taking its summation.

$$\sum e^2 = \sum (Y - \hat{Y})^2 = \sum (Y - a - bX)^2 \quad \dots(iv)$$

For the minimization setting its first-order condition of partial derivative is zero. Taking partial derivation of (iv) w.r.t and setting it equal to zero.

$$\frac{\partial(\sum e^2)}{\partial a} = \frac{\partial \sum(Y - a - bX)^2}{\partial(Y - a - bX)} \times \frac{\partial(Y - a - bX)}{\partial a} = 0$$

$$2\sum(Y-a-bX) (-1) = 0$$

$$-2\sum (Y-a-bX) = 0$$

$$\sum Y - na - b\sum X = 0$$

$$\sum Y = na + b\sum X \dots (v)$$

Similarly, taking the partial derivative of (iv) w.r.t b and setting it equal to zero.

$$\frac{\partial(\sum e^2)}{\partial b} = \frac{\partial(\sum(y - a - bx)^2)}{\partial b}$$

$$\frac{\partial \sum(y-a-bx)^2}{\partial(y - a - bx)} \frac{\partial(y - a - bx)}{\partial b} = 0$$

$$2\sum (Y-a-bX) (-X) = 0$$

$$-2\sum (Y - a - bX) (X) = 0$$

$$\sum XY - a\sum X - b\sum X^2 = 0$$

$$\sum XY = a\sum X + b\sum X^2 \dots (vi)$$

Thus, two equations (v) and (vi) are normal equations that are used to predict the values of a and b.

$$\sum Y = na + b \sum X \dots (v)$$

$$\sum XY = a\sum X + b\sum X^2 \dots (vi)$$

Matrix method:

Putting in matrix from the solve the equations (v) and (vi)

$$\begin{bmatrix} \sum Y \\ \sum XY \end{bmatrix} = \begin{bmatrix} n & \sum X \\ \sum X & \sum X^2 \end{bmatrix} \begin{bmatrix} a \\ b \end{bmatrix}$$

$$\begin{bmatrix} a \\ b \end{bmatrix} = \begin{bmatrix} n & \sum X \\ \sum X & \sum X^2 \end{bmatrix}^{-1} \begin{bmatrix} \sum Y \\ \sum XY \end{bmatrix} \dots (vii)$$

$$\alpha = A^{-1} \beta \dots (viii)$$

$$|A| = n\sum X^2 - (\sum X)^2$$

$$\text{Factors of Matrix} = C = \begin{bmatrix} \sum X & -\sum X \\ -\sum X & n \end{bmatrix}$$

$$\text{Adjoint matrix of } A = [\text{adj } A] = C^T = \begin{bmatrix} \sum X^2 & -\sum X \\ -\sum X & n \end{bmatrix}$$

$$A^{-1} = \frac{1}{|A|} (\text{adj } A)$$

$$= \frac{1}{n\sum X^2 - (\sum X)^2} \begin{bmatrix} \sum X^2 & -\sum X \\ -\sum X & n \end{bmatrix} \begin{bmatrix} \sum Y \\ \sum XY \end{bmatrix}$$

$$a = \frac{\sum X \sum Y - \sum X \sum XY}{n\sum X^2 - (\sum X)^2}$$

$$b = \frac{-\sum X \sum Y + n\sum XY}{n\sum X^2 - (\sum X)^2}$$

$\sum X$, $\sum Y$, $\sum X^2$ and $\sum XY$ can be obtained by the observed value. When we put the value of n , $\sum X$, $\sum Y$, $\sum X^2$ and $\sum XY$ then we get value of a and b .

Substituting the value of a and b from equation (i)

$Y = a + bX$ is the result, with a and b serving as the regression parameters.

a is the regression line's intercept on the y -axis, which represents the mean value of Y and zero for X .

The slope of the regression line is determined by the regression coefficient, or $-b$. It displays the rate of change in Y because of a change in X per unit.

In this study, the rate of GDP growth, the unemployment rate, and the inflation rate are all considered dependent variables.

The GDP growth rate based on inflation's regression parameters a and b are then calculated as follows:

$$a = \frac{\sum I^2 \sum G - \sum I \sum IG}{n\sum I^2 - (\sum I)^2}$$

$$b = \frac{n\sum IG - \sum I \sum G}{n\sum I^2 - (\sum I)^2}$$

In a similar manner, regression parameters a and b may be found in the relationship between unemployment and inflation as,

$$a = \frac{\sum I^2 \sum U - \sum I \sum IU}{n \sum I^2 - (\sum I)^2}$$

$$b = \frac{n \sum IU - \sum I \sum U}{n \sum I^2 - (\sum I)^2}$$

3.4.3 Elasticity

Elasticities refers to the proportional change in one variable brought on by a proportionate change in another variable in regression analysis.

i) Let the correlation between inflation and the pace of economic expansion be:

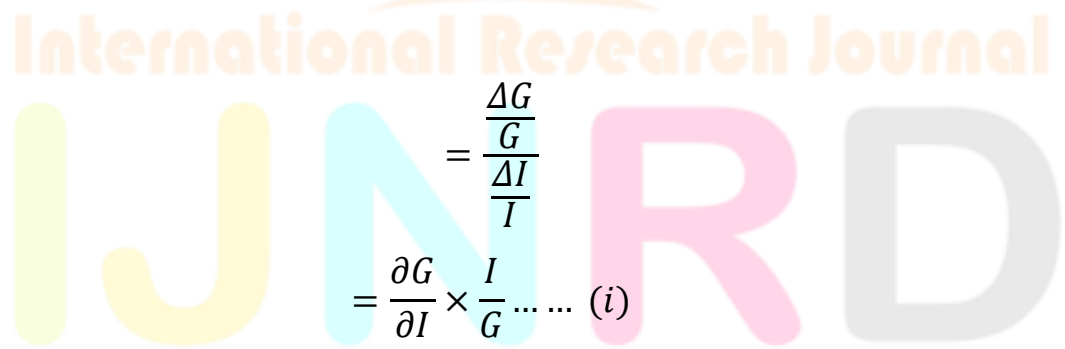
$$G = a + bI \dots\dots\dots (i)$$

where G = Economic growth rate

I = Inflation rate

The inflation elasticity of economic growth rate is defined by.

$$\text{Elasticity of inflation: } (eI) = \frac{\text{Proportional Change in Economic Growth Rate}}{\text{Proportionate Change in Inflation Rate}}$$



$$= \frac{\frac{\Delta G}{G}}{\frac{\Delta I}{I}}$$

$$= \frac{\partial G}{\partial I} \times \frac{I}{G} \dots\dots (i)$$

Differentiates the regression equation (i) with respect to I.

$$b = \frac{\partial G}{\partial I}$$

Hence, the average inflation elasticity of economic growth rate is expressed as,

$$eI = b \cdot \frac{\bar{I}}{\bar{G}}$$

Similarly, the average inflation elasticity of unemployment is expressed as,

$$eI = b \cdot \frac{\bar{I}}{\bar{U}}$$

CHAPTER 4

DATA ANALYSIS

4.1 Worldwide Situation of Economic Growth Rate

In the following table the economic growth rate of world is 3% to 4% but covid impacted the economy so drastically that economic growth rate goes -2.8% which was seen after Global Depression. In 2023, economic growth rate of world is 2.8%, economic growth rate of advanced economics is 1.3%, emerging and developing economics is 3.9%, Emerging and developing Europe is 1.2%. European countries recent times face the problem of Ukraine- Russia war.

Table 4.1

World Economic Growth Rate (In %)

Economy	2016	2017	2018	2019	2020	2021	2022	2023
World Economy	3.3	3.8	3.6	2.8	-2.8	6.3	3.4	2.8
Advance economics	1.8	2.5	2.3	1.7	-4.2	5.4	2.7	1.3
Emerging and Developing economics	4.4	4.7	4.7	3.6	-1.8	6.9	4	3.9
Emerging and developing Asia	6.8	6.6	6.4	5.2	-0.5	7.5	0.8	1.2
Emerging and developing Europe	1.8	4.2	3.6	2.5	-1.6	7.3	0.8	1.2
Middle East and North African countries	4.3	2.2	2.8	1.6	-2.7	4.6	5.3	2.9
Other Advanced economics	2.6	3.1	2.8	2	-1.6	5.4	2.6	1.8

Source: World Economic Outlook Report,2023 by IMF

In the following table (4.2) economic growth rate in south Asian countries is comparatively high. In 2023, economic growth rate of India is 5.9% maximum and lowest is -3% in Sri Lanka. Economic growth rate of India, Maldives, Bangladesh, and China is consistently high in the period before and after covid, whereas economic growth rate of Afghanistan, Sri Lanka, Pakistan is constantly low.

Table 4.2**Trend of Economic Growth Rate of South Asian Countries and China. (in %)**

Countries	2016	2017	2018	2019	2020	2021	2022	2023
India	8.3	6.8	6.5	3.9	-5.8	9.1	6.8	5.9
China	6.9	6.9	6.8	6	2.2	8.4	3	5.2
Pakistan	4.6	4.6	6.1	3.1	-0.9	5.7	6	0.5
Nepal	0.4	9	7.6	6.7	-2.4	4.2	5.8	4.4
Bhutan	7.4	6.3	3.8	4.4	-2.3	-3.3	4.3	4.7
Srin Lanka	5.1	6.5	2.3	-0.2	-3.5	3.3	-8.7	-3
Bangladesh	7.1	6.6	7.3	7.9	3.4	6.9	7.1	5.5
Maldives	6.3	7.2	8.1	6.9	-33.4	41.7	12.3	7.2
Myanmar	6.4	5.8	6.4	6.8	3.2	-17.9	2	2.6

Source: World Economic Outlook Report,2023 by IMF

4.2 Worldwide Situation of Inflation

Annually, the International Monetary Fund (IMF issues) a comprehensive report that presents an overview of global macroeconomic indicators and individual country profiles based on economics aspects. Within this report, the inflation rate is determined through the analysis of various factors, notably the escalation of commodity prices, including those within the energy sector.

Table 4.3**Global Inflation Rate (in %)**

Economy	2016	2017	2018	2019	2020	2021	2022	2023
Advance economics	0.7	1.7	2	1.4	0.7	3.1	7.3	4.7
Emerging and Developing economics	4.4	4.5	4.9	5.1	5.2	5.9	9.8	8.6
Emerging and developing Asia	2.9	2.4	2.6	3.3	3.2	2.2	3.8	3.4
Emerging and developing Europe	5.6	5.6	6.4	6.7	5.4	9.6	27.9	19.7
Middle East and North African countries	5.9	7.1	10	7.6	10.4	12.8	14.3	15.9
Other Advanced economics	0.9	1.5	1.6	1.1	0.5	2.4	5.6	4.4

Source: World Economic Outlook Report, 2023 by IMF

From the table 4.3, inflation rate in developed economic Countries is comparatively lower than those developing countries and emerging economic countries. Inflation of rate of emerging and developing economics is 4% to 6% except after 2021. Inflation of developed economics is on an average 2% except the years during and after covid-19 but it goes down and as per IMF estimation it will normalize in 2025.

In South Asian countries, inflation rate of India, Bangladesh, Nepal, Afghanistan, and Pakistan is consistently higher whereas inflation rate of Maldives is comparatively lower. Inflation rate of Bhutan is continuously decreasing. In 2022-2023 inflation rate of Pakistan touch it maximum same as Sri Lanka touch it maximum during 2022. This scenario commonly saw in the South Asian countries mainly due to the **Debt Trap Policy** of China.

Impact of China's Debt Trap Policy on Inflation of Sri Lanka and Pakistan:

Inflation in Pakistan and Sri Lanka may be indirectly impacted by China's debt trap strategy in several ways.

First off, the high interest rates attached to some Chinese loans may put financial hardship on the borrowing nations, creating budgetary constraints. Governments may resort to increasing their money printing output in response, which would increase the money supply and raise the risk of inflation.

Table 4.4**Trend of inflation in south Asia and China**

Countries	2016	2017	2018	2019	2020	2021	2022	2023
India	4.5	3.6	3.4	4.8	6.2	5.5	6.7	4.9
China	2.1	1.2	1.9	2.9	2.5	0.9	1.9	2
Pakistan	2.9	4.1	3.9	6.7	10.7	8.9	12.1	27.1
Nepal	9.9	4.5	4.1	4.6	6.1	3.6	6.3	7.8
Bhutan	3.3	4.3	3.7	2.8	3	8.2	5.9	5.6
Srin Lanka	4	6.6	4.3	4.4	4.6	6	46.4	28.5
Bangladesh	5.9	5.4	5.8	5.5	5.6	5.6	6.1	8.6
Maldives	0.8	2.3	1.4	1.3	-1.6	.2	2.6	5.2
Myanmar	9.1	4.6	5.9	8.6	5.7	3.6	16.2	14.2

Source: World Economic Outlook Report, 2023 by IMF

Impact of China's Debt Trap Policy on Inflation of Sri Lanka and Pakistan:

Inflation in Pakistan and Sri Lanka may be indirectly impacted by China's debt trap strategy in several ways.

First off, the high interest rates attached to some Chinese loans may put financial hardship on the borrowing nations, creating budgetary constraints. Governments may resort to increasing their money printing output in response, which would increase the money supply and raise the risk of inflation.

Second, the necessity to devote a sizeable amount of government budgets to debt repayment may restrict spending on social programs and infrastructure improvements. Reduced governmental funding on vital industries can impede economic development and inflation by impeding economic growth.

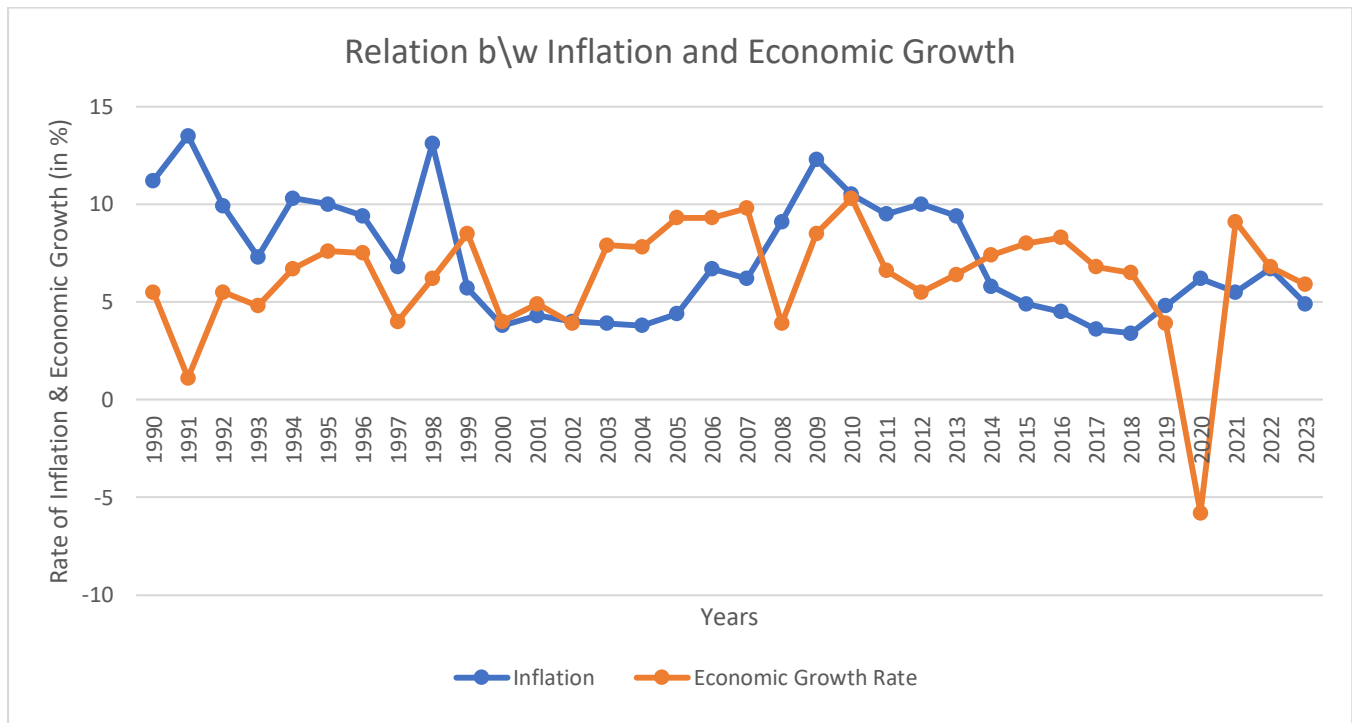
Furthermore, when nations rack up a lot of debt, especially in foreign currencies, their currencies are more susceptible to devaluation. A weakening local currency might result in greater import expenses, which can then be passed on to customers in the form of higher import-related prices, further stoking inflation.

Furthermore, reliance on a single creditor, such as China, might affect trade dynamics, possibly leading to unfavourable conditions that drive up import prices and cause inflation. Together, these elements highlight the complicated interplay between Pakistani and Sri Lankan inflationary pressures and China's debt trap policies.

4.3 Inflation and Economic Growth Rate

Figure: 4.1

Inflation and Economic Growth Rate Graph



In Context of India inflation is consistently under control after 2014 in the range decided by RBI $\pm 4\%$ except the year 2020 and 2022 due to many reasons like Demand- Pull inflation, Cost Push inflation, Monetary Policy, Fiscal Policy, Supply Chain Disruption, Exchange rates, Structural Issues, and Inflation Expectation. Same scenario also we see in Economic Growth Rate. In year it touches its lowest with -5.8 in 2020 and next year touch maximum of this decade.

Table 4.5

Relationship between inflation and economic growth rate (in %)

Year	Inflation	Economic Growth Rate
2023	4.9	5.9
2022	6.7	6.8
2021	5.5	9.1
2020	6.2	-5.8
2019	4.8	3.9
2018	3.4	6.5
2017	3.6	6.8
2016	4.5	8.3
2015	4.9	8
2014	5.8	7.4
2013	9.4	6.4
2012	10	5.5

2011	9.5	6.6
2010	10.5	10.3
2009	12.3	8.5
2008	9.1	3.9
2007	6.2	9.8
2006	6.7	9.3
2005	4.4	9.3
2004	3.8	7.8
2003	3.9	7.9
2002	4	3.9
2001	4.3	4.9
2000	3.8	4
1999	5.7	8.5
1998	13.1	6.2
1997	6.8	4
1996	9.4	7.5
1995	10	7.6
1994	10.3	6.7
1993	7.3	4.8
1992	9.9	5.5
1991	13.5	1.1
1990	11.2	5.5
Total	245.4	212.4
Average	7.217647	6.247059

4.3.1 Relationship between Inflation and Economic Growth Rate.

Calculating the value of the correlation coefficient allows one to investigate the connection between inflation and economic growth rate. The correlation coefficient was determined to be $r = -0.064707$ in appendix A.

In the time series data from 1990 to 2023, the correlation coefficient between inflation and economic growth rate is equal to be $r = -0.064707$. It is very nearly nothing or near to 0.

Therefore, it demonstrates that there is no meaningful correlation between India's inflation rate and its pace of economic development. The results show no correlation between both of them, but Indian economist and policy maker consider inflation during making policies and other economic decision. Because although it has very low correlation, but it has a relationship.

4.3.2 t-Test to examine relationship between inflation rate and unemployment rate.

Co-relation coefficient (r) = -0.064707

$$\text{Value of } t = \frac{r}{\sqrt{1-r^2}} \times \sqrt{n-2}$$

$$\begin{aligned} & \frac{-0.064707}{\sqrt{1 - (-0.064707)^2}} \times \sqrt{33 - 2} \\ & \frac{-0.064707}{\sqrt{1 - 0.00418699}} \times \sqrt{31} \\ & \frac{-0.064707}{\sqrt{0.9958130}} \times \sqrt{31} \\ & \frac{-0.064707}{0.9979043} \times 5.56776 \\ & = -0.361029 \end{aligned}$$

For a 5 percent level of significance and 30 degrees of freedom, the tabulated value of t is 2.042. The calculated value of t-test is less than tabulated value. Null hypothesis is therefore accepted. It denotes that there is no discernible connection between the Economic growth rate and inflation.

4.3.3 Impact of Inflation on Economic Growth Rate

Regression analysis is used to investigate and analyse how inflation affects the pace of economic growth. In the linear regression line, the rate of economic growth is treated as a dependent variable, while inflation is treated as an independent parent. The following is the result of the regression between the economic growth rate (G) and the dependent variable inflation (I):

Linear regression line of economic growth rate on dependent variable inflation rate (I) is written as,

$$G = a + bI$$

Where,

G = Economic growth rate

I = Inflation rate

a = Y intercept or value of G when I = 0 percent

b = Value of I determine the slope of the regression line, which displays the change in G's value as a percent change.

When value of a and b from appendix B are put in the equation of $G = a + bI$, it

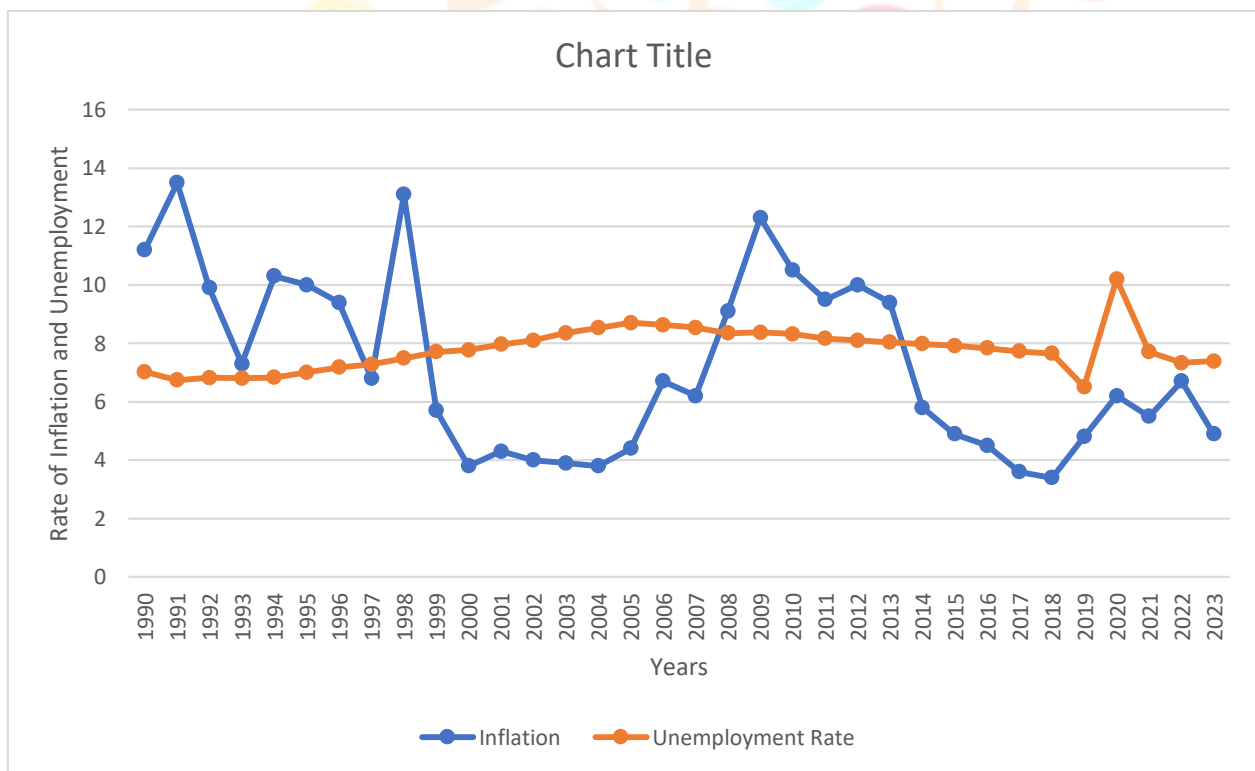
Forms:

$$G=8.414156 - 0.2659619459 I$$

It is evident from the regression line above that the relationship between inflation and economic growth is somewhat inverse. When inflation is 1%, the rate of economic growth falls by 0.26596194559%. However, the rate of economic growth is 8.414156% when inflation is zero. It demonstrates that inflation has a very- very minor impact on the rate of economic expansion. And inflation has no constructive function in generating economic growth.

4.4 Inflation and Unemployment

Figure 4.2
Inflation and Economic Unemployment Rate Graph



The most important macroeconomic indicator is unemployment. Both inflation and unemployment are detrimental to the health of the economy. The above table shows the trend of unemployment in India from 1990 to 2023.

It is evident from Table 4.6 that during the study period, the average unemployment rate was 7.796% and the average inflation rate was 7.217%. Inflation rates range from 6.51% in 1994 AD to a maximum of 10.20% in 1993 AD. The table demonstrates the consistency of the unemployment rate and inflation rate. The unemployment rate is low while the inflation rate is high. The average unemployment rate throughout the research period was 7.796764%, while the

average economic growth rate was 6.24706%. The very low unemployment rate might be attributed to work abroad.

Table 4.6

Relationship between inflation and Unemployment rate (in %)

Year	Inflation	Unemployment Rate
2023	4.9	7.02
2022	6.7	6.74
2021	5.5	6.82
2020	6.2	6.80
2019	4.8	6.83
2018	3.4	7.01
2017	3.6	7.18
2016	4.5	7.28
2015	4.9	7.49
2014	5.8	7.71
2013	9.4	7.77
2012	10	7.96
2011	9.5	8.10
2010	10.5	8.36
2009	12.3	8.53
2008	9.1	8.70
2007	6.2	8.63
2006	6.7	8.54
2005	4.4	8.35
2004	3.8	8.38
2003	3.9	8.32
2002	4	8.17
2001	4.3	8.10
2000	3.8	8.04
1999	5.7	7.98
1998	13.1	7.92
1997	6.8	7.84
1996	9.4	7.73
1995	10	7.65
1994	10.3	6.51
1993	7.3	10.20
1992	9.9	7.71
1991	13.5	7.33
1990	11.2	7.39
Total	245.4	265.09
Average	7.217647	7.796764

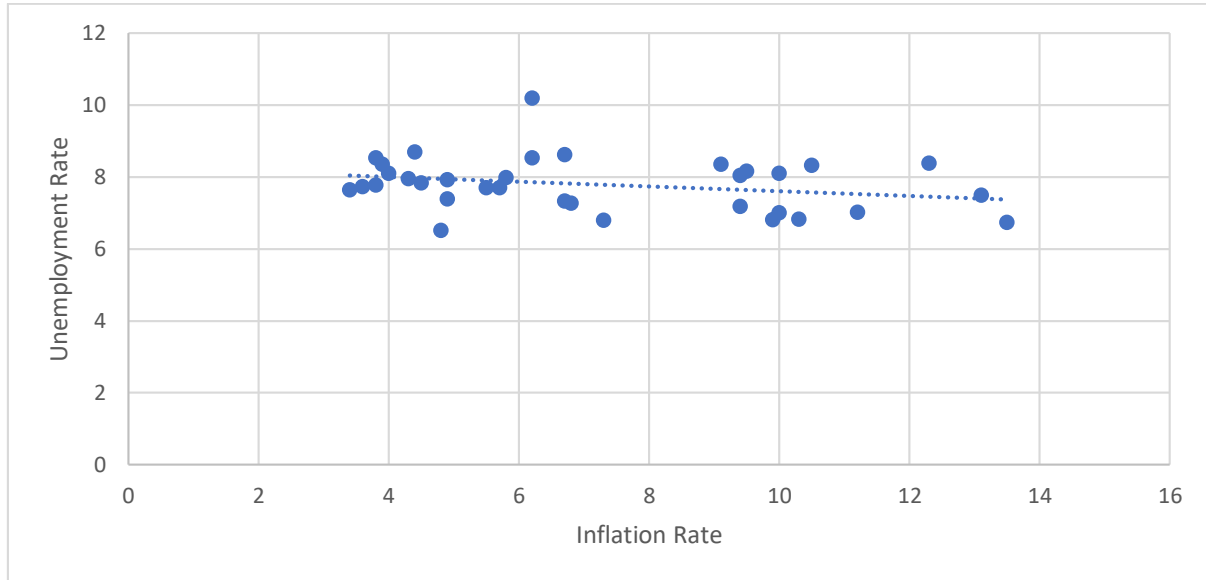
Source: World Bank Report 2023

Phillips Curve

The Phillips curve is a graphical representation of the inverse connection between inflation and unemployment rate. The relationship between unemployment and the rate of change in money wage rates in the United Kingdom, 1861–1957, was first introduced by William Phillips in his 1958 work. For all the world's main economies, this idea has now been established.

Figure 4.3

Phillips curve to show the relationship between inflation and unemployment.



The values of unemployment and inflation are displayed on the x-axis and y-axis to evaluate Phillips curves, Both the unemployment rate and inflation are maintained on the x-axis. It is obvious from Figure 4.3 that there is no meaningful correlation between the inflation rate and the unemployment rate. The relationship between unemployment and inflation is linear and slightly downward sloping, indicating that inflation only marginally lowers unemployment.

4.4.1 Relationship between Inflation and Unemployment

Co-relation coefficient is used to investigate the connection between inflation and the unemployment rate. The correlation between unemployment and inflation is determined as follows:

Value of correlation coefficient between unemployment and inflation is -0.2684697 . The value is quite close to zero. It demonstrates that there is no connection between unemployment and inflation.

4.4.2 t-Test to Examine Relationship between Inflation and Unemployment

Co-relation coefficient (r) = -0.2684697

$$\text{Value of } t = \frac{r}{\sqrt{1-r^2}} \times \sqrt{n-2}$$

$$\begin{aligned} & \frac{-0.2684697}{\sqrt{1 - (-0.2684697)^2}} \times \sqrt{33 - 2} \\ & \frac{-0.2684697}{\sqrt{1 - 0.07207597}} \times \sqrt{31} \\ & \frac{-0.2684697}{\sqrt{0.92792403}} \times \sqrt{31} \\ & \frac{-0.2684697}{0.96328813} \times 5.56776 \\ & = -1.5517422 \end{aligned}$$

For a 5 percent level of significance and 30 degrees of freedom, the tabulated value of t is 2.042. The calculated value of t-test is less than tabulated value. Null hypothesis is therefore accepted. It denotes that there is no discernible connection between the unemployment rate and inflation.

4.4.3 Impact of Inflation on Unemployment Rate

$U = a + bI$ is the regression equation for unemployment on the dependent variable inflation (I), which may be used to study the relationship between inflation and unemployment. In which the parameters a and b show the unemployment rate at 0% inflation and the slope of the regression line, b, the change in the unemployment rate at 1% inflation, respectively. According to appendix D, the values of a and b are respectively 10.382163 and -0.3158981. Regression line can also be expressed as,

$$U = 10.382163 - 0.3158981 I$$

Average unemployment rate is 10.382163 percent when inflation is zero percent, and it reduces by -0.3158981 percent when inflation is one percent. It demonstrates how inflation has a detrimental effect on unemployment. Unemployment rates fall as inflation rates rise. even so. The topic and theory of the Philips curve are satisfied by inflation's extremely minor contribution to the reduction of unemployment.

4.5 Elasticity

From Appendix D, the average inflation elasticity of economic growth rate will be expressed as follows:

$$eI = b \cdot \frac{\bar{I}}{\bar{U}}$$

$$-0.26596 \times \frac{7.217647}{6.247059}$$

$$eI = -0.30728$$

According to the value $eI = -0.30728$, unemployment changes by -0.30728 percent for every 1 percent increase in inflation. Since $|eI| < 1$, unemployment is only very little correlated with inflation.

4.6 Key Finding

The study's key finding is stated below.

- The average inflation rate from 1990 to 2023 is 7.2176%.
- The inflation rate is 13.5 and 13.1 maximum in 1991 and 1998 respectively and 3.4% minimum in 2018.
- There is a negative association ($r = -0.064707$ between inflation and economic growth rate). It implies that the rate of economic growth is not significantly impacted by inflation. Additionally, it is possible to see inflation and the pace of economic growth as separate factors in the economy.
- The equation for the regression line of the economic growth rate with the independent variable inflation (I) is $G = 8.414156 - 0.2659619459 I$. It demonstrates that the economy grows at an average pace of 8.414156% when there is no inflation and at an average rate of 0.2659619459 when inflation is 1%.
- The average economic growth rate from 1990 to 2023 is 6.2471%.
- The economic growth rate is 10.3 percent maximum in 2010 and -5.8 percent minimum in 2020.
- The average unemployment rate is 7.7967%.
- The unemployment rate is 10.2% maximum in 2020 and 6.51% minimum in 2019.
- The correlation between unemployment and inflation is -0.2684697 . It demonstrates how little there is to no relationship between inflation and unemployment. Unemployment is not much impacted by inflation.
- The unemployment-inflation regression line is $U = 10.382163 - 0.3158981I$. It demonstrates that the unemployment rate is 10.382163 while there is no inflation and lowers by -0.3158981 when there is inflation of 1%. It demonstrates that the influence of inflation on unemployment is relatively minimal.

Research Through Innovation

CHAPTER 5

SUMMARY AND CONCLUSIONS

5.1 Summary

The most recent macroeconomics concern in India is inflation. Moreover 29.1% of Indians live in poverty as per the report of Global Hunger Index 2022 in which India take 107th position, while the average annual salary is only about 1,38,840Rs. This study's primary goal was to analyses inflation trends and their effects on the unemployment rate and the economic growth rate, which are the two of the most important macroeconomic indicators.

The entire study is divided into five chapters, the 1st of which contains an introduction to the subject matter, a problem statement, the study's goals, and its limitations. The 2nd chapter is a literature review, where several books and papers are critically analysed. The research methodology is covered in the 3rd chapter of this thesis. A descriptive study design has been modified to assess the data gathered from various sources. Correlation coefficients and regression lines are used to investigate how inflation affects the pace of economic growth and the unemployment rate. Regression line matrix methodology is employed all these things are discuss in 4th chapter.

In the past years, industrialized economies inflation rates between 0.1% and 3.1%, whereas low-income developing nations experienced inflation rates between 6.5% and 8.3%. Bhutan's inflation rate is declining continuously from past years, whereas that of the Pakistan and Sri Lanka's inflation rates touch its highest in last year due to China's interference in their economy. But over the past five years, India's inflation rate has ranged from ± 4 . Over the past five years, the global economy has grown by more than 3% but also facing the Covid-19 pandemic. In South Asia, Bangladesh, and India both have relatively strong economic growth rates.

5.2 End Conclusions

Macroeconomic policy strives to support economic growth, the creation of jobs, and inflation management. The impact of inflation on economic development and job creation is a hot topic of discussion. Although monetary policy seeks to reduce unemployment while promoting economic development, it does not provide adequate results. According to many studies, emerging nations like India, and other southeastern countries benefited from mild or low inflation rates. However, a high rate of inflation is detrimental to both established and emerging economies.

Using the correlation coefficient and regression line, the link between inflation and the rate of economic growth is examined. The correlation coefficient between the rate of inflation and the economy's growth is determined to be -0.064704. It demonstrates that there is little correlation between inflation and the pace of economic growth. The growth rate regression line $G=8.414156 - 0.2659619459I$ is similar. It makes it clear that while there is 0% inflation, the economic growth rate is 8.414156 % and when there is 1% inflation, the economic growth rate lowers by -0.2659619459%. It demonstrates that the rate of economic growth is not much impacted by

inflation. The use of inflation as a macroeconomic instrument to foster economic growth should not be considered by policymakers.

Correlation coefficient and regression lines are employed to examine how inflation affects unemployment. The correlation coefficient has a value of -0.2684697. It demonstrates that there is practically no but a mild correlation between unemployment and inflation. The creation of jobs and the reduction of unemployment are unaffected by inflation. The unemployment regression line based on inflation is $U=10.382163 - 0.3158981I$. This leads to the conclusion that the average unemployment rate with 0% inflation is 10.382163. Additionally, the jobless rate falls by 0.3158981% with a 1% inflation rate. Thus, both the pace of economic growth and the creation of new jobs are relatively little affected by inflation.

5.3 Recommendations

The following recommendations have been put out to assist the relevant authorities in taking the required actions to combat the effects of inflation without effecting economic growth rate and decreasing unemployment.

1. Training and Development of Skills

- To provide a solid basis for the workforce, raise the standard of primary and secondary education.
- Work with industry to build skill-development programs that are in line with consumer demand.
- Use internet resources and lifetime learning programs to promote ongoing learning and skill development on effective cost.

2. Construction of infrastructure

- Give higher priority to infrastructure initiatives that deal with the major bottlenecks in logistics, energy, and transportation.
- Create a national infrastructure network with transparent financing sources.
- Encourage eco-friendly infrastructure methods to reduce your bad and greedy effects on the environment.

3. Reforms to the Labor Market:

- To establish a balance between worker protection and labor market flexibility, reform labour laws.
- Create a reliable system for locating open vacancies and matching job searchers with them.
- Boost the social safety net to better safeguard employees during times of economic change.

4. Support for MSMEs and entrepreneurship:

- To encourage entrepreneurship, simplify business registration and licensing procedures.
- To aid startups and SMEs, specific economic zones and incubators should be established.
- With specialized financing initiatives, ensure that MSME have access to less expensive loans.

5. The transformation of agriculture

- To enhance farmers' incomes, implement market-oriented agriculture policy.
- Increase Invest in upgrading of irrigation systems, post-harvest facilities, and farming practices.
- Encourage the development of food processing and agribusiness clusters.

6. Financial Policy:

- Maintain a central bank (RBI) with a transparent inflation-targeting structure that is credible and independent.
- Utilize a flexible inflation targeting system to change interest rates as necessary to keep inflation under control.
- Create a forward-looking monetary strategy that takes both short as well as long-term growth into account.

7. Fiscal Policy:

- Adopt a reasonable budgetary strategy that aims to consolidate the budget over the next few years.
- Simplify and rationalize subsidies to lessen the fiscal load.
- To increase revenue, broaden the tax base and improve tax collection effectiveness.

8. Trade Promotion and Trade Policy:

- Enable greater access to international markets by negotiating and signing trade agreements.
- Offer exporters financial incentives and support services.
- Streamline trade facilitation and lower trade obstacles.

9. Reforms to the Financial Sector:

- Boost the banking industry through reforms and capital injections.
- To improve financial inclusion, support fintech and digital banking technologies like UPI, Net Banking.
- To avoid crises, the financial industry must be carefully monitored and regulated by a separate Committee of RBI.

10. Sustainability of the environment:

- Put environmental policies into effect and enforce them to encourage sustainable growth.
- Promote eco-friendly technology, renewable energy, and green investments for sustainable development.
- Encourage effective water resource management and climate-resilient agriculture in India.

11. Regional Development:

- Create plans for regional development to lessen regional inequalities.
- Target infrastructure development and investment incentives in less developed areas.
- Promote the expansion of industries into less developed regions.

12. Research and innovation:

- Increase investment in R&D to promote creativity and technical progress which is more required thing at present time.
- Aid research institutes and technological clusters.
- Offer tax breaks to companies which invest in R&D.

13. Government Accountability and Transparency:

- Strengthen anti-corruption policies and encourage openness in government decision-making and procurement.
- Improve the systems for public financial management and auditing.

14. Monitoring and Evaluation:

- Establish a thorough system for assessing the efficacy of policy.
- Use data and evidence-based policymaking to guide choices and modifications.

15. Cooperation between nations:

- Work with international organizations and surrounding nations to strengthen economic integration.
- Look for technology transfer and foreign direct investment agreements.



Appendix A

Calculation of the relationship between inflation and economic growth rate

Year	I	G	$i=i-\hat{I}$	$g=G-\hat{G}$	i^2	g^2	$i*g$
1990	11.2	5.5	3.9824	-0.747	15.85951	0.558009	-2.97485
1991	13.5	1.1	6.2824	-5.147	39.46855	26.49161	-32.3355
1992	9.9	5.5	2.6824	-0.747	7.19527	0.558009	-2.00375
1993	7.3	4.8	0.0824	-1.447	0.00679	2.093809	-0.11923
1994	10.3	6.7	3.0824	0.453	9.50119	0.205209	1.396327
1995	10	7.6	2.7824	1.353	7.74175	1.830609	3.764587
1996	9.4	7.5	2.1824	1.253	4.76287	1.570009	2.734547
1997	6.8	4	-0.4176	-2.247	0.17439	5.049009	0.938347
1998	13.1	6.2	5.8824	-0.047	34.60263	0.002209	-0.27647
1999	5.7	8.5	-1.5176	2.253	2.30311	5.076009	-3.41915
2000	3.8	4	-3.4176	-2.247	11.67999	5.049009	7.679347
2001	4.3	4.9	-2.9176	-1.347	8.51239	1.814409	3.930007
2002	4	3.9	-3.2176	-2.347	10.35295	5.508409	7.551707
2003	3.9	7.9	-3.3176	1.653	11.00647	2.732409	-5.48399
2004	3.8	7.8	-3.4176	1.553	11.67999	2.411809	-5.30753
2005	4.4	9.3	-2.8176	3.053	7.93887	9.320809	-8.60213
2006	6.7	9.3	-0.5176	3.053	0.26791	9.320809	-1.58023
2007	6.2	9.8	-1.0176	3.553	1.03551	12.62381	-3.61553
2008	9.1	3.9	1.8824	-2.347	3.54343	5.508409	-4.41799
2009	12.3	8.5	5.0824	2.253	25.83079	5.076009	11.45065
2010	10.5	10.3	3.2824	4.053	10.77415	16.42681	13.30357
2011	9.5	6.6	2.2824	0.353	5.20935	0.124609	0.805687
2012	10	5.5	2.7824	-0.747	7.74175	0.558009	-2.07845
2013	9.4	6.4	2.1824	0.153	4.76287	0.023409	0.333907
2014	5.8	7.4	-1.4176	1.153	2.00959	1.329409	-1.63449
2015	4.9	8	-2.3176	1.753	5.37127	3.073009	-4.06275
2016	4.5	8.3	-2.7176	2.053	7.38535	4.214809	-5.57923
2017	3.6	6.8	-3.6176	0.553	13.08703	0.305809	-2.00053
2018	3.4	6.5	-3.8176	0.253	14.57407	0.064009	-0.96585
2019	4.8	3.9	-2.4176	-2.347	5.84479	5.508409	5.674107
2020	6.2	-5.8	-1.0176	-12.047	1.03551	145.1302	12.25903
2021	5.5	9.1	-1.7176	2.853	2.95015	8.139609	-4.90031
2022	6.7	6.8	-0.5176	0.553	0.26791	0.305809	-0.28623
2023	4.9	5.9	-2.3176	-0.347	5.37127	0.120409	0.804207
Total	245.4	212.4	0.0016	0.002	299.8494	288.1247	-19.0182

Correlation coefficient between inflation rate and economic growth rate:

$$r = \frac{\sum(I - \bar{I})(G - \bar{G})}{\sqrt{\sum(I - \bar{I})^2 \sum(G - \bar{G})^2}}$$

$$= \frac{\sum_i g}{\sqrt{\sum i^2 \sum g^2}}$$

$$= \frac{-19.01824}{\sqrt{299.8494 \times 288.1247}}$$

$$= \frac{-19.01824}{\sqrt{86394.0184}}$$

$$= \frac{-19.01824}{293.928592}$$

$$r = -0.064707$$

Appendix B**Calculation of impact of inflation on economic growth rate.**

Year	I	G	I ²	I*G
1990	11.2	5.5	125.44	61.6
1991	13.5	1.1	182.25	14.85
1992	9.9	5.5	98.01	54.45
1993	7.3	4.8	53.29	35.04
1994	10.3	6.7	106.09	69.01
1995	10	7.6	100	76
1996	9.4	7.5	88.36	70.5
1997	6.8	4	46.24	27.2
1998	13.1	6.2	171.61	81.22
1999	5.7	8.5	32.49	48.45
2000	3.8	4	14.44	15.2
2001	4.3	4.9	18.49	21.07
2002	4	3.9	16	15.6
2003	3.9	7.9	15.21	30.81
2004	3.8	7.8	14.44	29.64
2005	4.4	9.3	19.36	40.92
2006	6.7	9.3	44.89	62.31
2007	6.2	9.8	38.44	60.76
2008	9.1	3.9	82.81	35.49

2009	12.3	8.5	151.29	104.55
2010	10.5	10.3	110.25	108.15
2011	9.5	6.6	90.25	62.7
2012	10	5.5	100	55
2013	9.4	6.4	88.36	60.16
2014	5.8	7.4	33.64	42.92
2015	4.9	8	24.01	39.2
2016	4.5	8.3	20.25	37.35
2017	3.6	6.8	12.96	24.48
2018	3.4	6.5	11.56	22.1
2019	4.8	3.9	23.04	18.72
2020	6.2	-5.8	38.44	-35.96
2021	5.5	9.1	30.25	50.05
2022	6.7	6.8	44.89	45.56
2023	4.9	5.9	24.01	28.91
Total	245.4	212.4	2071.06	1514.01

Value of a and b are obtained as

$$a = \frac{\Sigma I^2 \Sigma G - \Sigma I \Sigma IG}{n \Sigma I^2 - (\Sigma I)^2}$$

$$\begin{aligned} & \frac{2071.06 \times 212.4 - 245.4 \times 1514.01}{33 \times 2071.06 - 245.4 \times 245.4} \\ & \frac{439893.144 - 371538.054}{68344.98 - 60221.16} \\ & \frac{68355.09}{8123.82} \\ & = \mathbf{8.414156} \end{aligned}$$

Now

$$b = \frac{n \Sigma IG - \Sigma I \Sigma G}{n \Sigma I^2 - (\Sigma I)^2}$$

$$\begin{aligned} & \frac{33 \times 1514.01 - 245.4 \times 212.4}{33 \times 2071.06 - 245.4 \times 245.4} \\ & \frac{49962.33 - 52122.96}{68344.98 - 60221.16} \end{aligned}$$

$$\frac{-2160.627}{8123.82}$$

$$=-0.2659619459$$

When value of a and b are put in the equation of $G = a + bI$, it forms

$$G=8.414156 - 0.2659619459 I$$

Appendix C

Calculation of relationship between Inflation and Unemployment Rate

Year	I	U	$i=i-\hat{i}$	$u=U-\hat{U}$	i^2	$u*u$	$i*u$
1990	11.2	7.02	3.9824	-0.77676	15.85951	0.603356	-3.09337
1991	13.5	6.74	6.2824	-1.05676	39.46855	1.116742	-6.63899
1992	9.9	6.82	2.6824	-0.97676	7.19527	0.95406	-2.62006
1993	7.3	6.80	0.0824	-0.99676	0.00679	0.99353	-0.08213
1994	10.3	6.83	3.0824	-0.96676	9.50119	0.934625	-2.97994
1995	10	7.01	2.7824	-0.78676	7.74175	0.618991	-2.18908
1996	9.4	7.18	2.1824	-0.61676	4.76287	0.380393	-1.34602
1997	6.8	7.28	-0.4176	-0.51676	0.17439	0.267041	0.215799
1998	13.1	7.49	5.8824	-0.30676	34.60263	0.094102	-1.80449
1999	5.7	7.71	-1.5176	-0.08676	2.30311	0.007527	0.131667
2000	3.8	7.77	-3.4176	-0.02676	11.67999	0.000716	0.091455
2001	4.3	7.96	-2.9176	0.16324	8.51239	0.026647	-0.47627
2002	4	8.10	-3.2176	0.30324	10.35295	0.091954	-0.97571
2003	3.9	8.36	-3.3176	0.56324	11.00647	0.317239	-1.86861
2004	3.8	8.53	-3.4176	0.73324	11.67999	0.537641	-2.50592
2005	4.4	8.70	-2.8176	0.90324	7.93887	0.815842	-2.54497
2006	6.7	8.63	-0.5176	0.83324	0.26791	0.694289	-0.43129
2007	6.2	8.54	-1.0176	0.74324	1.03551	0.552406	-0.75632
2008	9.1	8.35	1.8824	0.55324	3.54343	0.306074	1.041419
2009	12.3	8.38	5.0824	0.58324	25.83079	0.340169	2.964259
2010	10.5	8.32	3.2824	0.52324	10.77415	0.27378	1.717483
2011	9.5	8.17	2.2824	0.37324	5.20935	0.139308	0.851883
2012	10	8.10	2.7824	0.30324	7.74175	0.091954	0.843735
2013	9.4	8.04	2.1824	0.24324	4.76287	0.059166	0.530847
2014	5.8	7.98	-1.4176	0.18324	2.00959	0.033577	-0.25976
2015	4.9	7.92	-2.3176	0.12324	5.37127	0.015188	-0.28562
2016	4.5	7.84	-2.7176	0.04324	7.38535	0.00187	-0.11751
2017	3.6	7.73	-3.6176	-0.06676	13.08703	0.004457	0.241511
2018	3.4	7.65	-3.8176	-0.14676	14.57407	0.021538	0.560271
2019	4.8	6.51	-2.4176	-1.28676	5.84479	1.655751	3.110871
2020	6.2	10.20	-1.0176	2.40324	1.03551	5.775562	-2.44554
2021	5.5	7.71	-1.7176	-0.08676	2.95015	0.007527	0.149019
2022	6.7	7.33	-0.5176	-0.46676	0.26791	0.217865	0.241595
2023	4.9	7.39	-2.3176	-0.40676	5.37127	0.165454	0.942707
Total	245.4	265.09	0.0016	0.00016	299.8494	18.11634	-19.7871

Correlation coefficient between inflation rate and Unemployment rate:

$$\begin{aligned}
 r &= \frac{\sum(I - \bar{I})(U - \bar{U})}{\sqrt{\sum(I - \bar{I})^2 \sum(U - \bar{U})^2}} \\
 &= \frac{\sum iu}{\sqrt{\sum i^2 \sum u^2}} \\
 &= \frac{-19.7871}{\sqrt{299.8494 \times 18.11634}} \\
 &= \frac{-19.7871}{\sqrt{5432.217367}} \\
 &= \frac{-19.7871}{73.703281} \\
 \mathbf{r} &= \mathbf{-0.2684697}
 \end{aligned}$$

Appendix D**Calculation of impact of inflation on economic growth rate.**

Year	I	U	I ²	I*U
1990	11.2	7.02	125.44	78.624
1991	13.5	6.74	182.25	90.99
1992	9.9	6.82	98.01	67.518
1993	7.3	6.80	53.29	49.64
1994	10.3	6.83	106.09	70.349
1995	10	7.01	100	70.1
1996	9.4	7.18	88.36	67.492
1997	6.8	7.28	46.24	49.504
1998	13.1	7.49	171.61	98.119
1999	5.7	7.71	32.49	43.947
2000	3.8	7.77	14.44	29.526
2001	4.3	7.96	18.49	34.228
2002	4	8.10	16	32.4
2003	3.9	8.36	15.21	32.604
2004	3.8	8.53	14.44	32.414
2005	4.4	8.70	19.36	38.28
2006	6.7	8.63	44.89	57.821
2007	6.2	8.54	38.44	52.948
2008	9.1	8.35	82.81	75.985
2009	12.3	8.38	151.29	103.074

2010	10.5	8.32	110.25	87.36
2011	9.5	8.17	90.25	77.615
2012	10	8.10	100	81
2013	9.4	8.04	88.36	75.576
2014	5.8	7.98	33.64	46.284
2015	4.9	7.92	24.01	38.808
2016	4.5	7.84	20.25	35.28
2017	3.6	7.73	12.96	27.828
2018	3.4	7.65	11.56	26.01
2019	4.8	6.51	23.04	31.248
2020	6.2	10.20	38.44	63.24
2021	5.5	7.71	30.25	42.405
2022	6.7	7.33	44.89	49.111
2023	4.9	7.39	24.01	36.211
Total	245.4	265.09	2071.06	1893.539

Value of a and b are obtained as,

$$a = \frac{\sum I^2 \sum U - \sum I \sum IU}{n \sum I^2 - (\sum I)^2}$$

$$\frac{2071.06 \times 265.09 - 245.4 \times 1893.539}{33 \times 2071.06 - 245.4 \times 245.4}$$

$$\frac{549017.2954 - 464674.4706}{68344.98 - 60221.16}$$

$$\frac{84342.8248}{8123.82}$$

$$= 10.382163$$

Now

$$b = \frac{n \sum IU - \sum I \sum U}{n \sum I^2 - (\sum I)^2}$$

$$\frac{33 \times 1893.539 - 245.4 \times 265.09}{33 \times 2071.06 - 245.4 \times 245.4}$$

$$\frac{62486.787 - 65053.086}{68344.98 - 60221.16}$$

$$\frac{-2566.299}{8123.82}$$

$$= -0.3158981$$

When value of a and b are put in the equation of $U = a + bI$, it forms

$$U = 10.382163 - 0.3158981 I$$

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