

The Significance of Inflation and Population Growth on GDP Growth in the Indian Context

Souvik Mukherjee

Research Scholar, HRDC (Economics), University of North Bengal, Darjeeling, West Bengal, India

ABSTRACT

This study employs a rigorous research methodology to investigate the impact of inflation and population growth on India's GDP. In this context, the change in GDP is the dependent variable, impacted by the independent variables, Population and Inflation. The data, meticulously sourced from the financial reports of the RBI and World Bank, span twenty years, providing a comprehensive and reliable view of GDP growth, Population growth, and Inflation at the national level of the Indian economy. The analysis is conducted using correlation, regression analysis, t-test, and ANOVA model, with the assistance of R software.

KEYWORDS: GDP, Regression, Tax bracket, Population growth

JEL classifications: C15, C55, O21, Q56

How to cite this paper: Souvik Mukherjee "The Significance of Inflation and Population Growth on GDP Growth in the Indian Context"

Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-8 | Issue-3, June 2024, pp.858-865,

URL: www.ijtsrd.com/papers/ijtsrd65007.pdf



IJTSRD65007

Copyright © 2024 by author (s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (<http://creativecommons.org/licenses/by/4.0>)



INTRODUCTION

Financiers will likely hear the stipulations, gross domestic product (GDP), and inflation almost daily. They often feel that these facts must be reviewed as a surgeon would study a patient's map before surgery. National income deals with the money worth of the flow of productivity of goods and services formed within a financial system over a period, where inflation can indicate either a rise in the currency supply or an enhancement in the price level. Commonly, when there is an increase in inflation, there is an increase in prices too. If the money supply has been augmented, then there is an enlargement in price levels (Zaigham Abbas Khan et al., 2013). Though inflation has always been a major public concern and subject to heated political debate, it is astonishing that since 1950, India has faced one of the lowest inflation rates in the world compared to other developing countries. For most of these years, it consistently maintained steady control over the inflation rate by limiting it to only a single-digit figure. (DR.S.JAMUNA, 2016) The biggest turmoil of inflation came from 2008 to 2009 when India experienced the highest and lowest inflation rates

within just a few months. Therefore, this study's findings on the impact of inflation and population growth on India's GDP are not only of academic interest but also have significant practical implications for understanding the dynamics of the Indian economy and guiding policymakers and economists in their decision-making processes.

CAUSES OF INFLATION

Inflation is a price rise that causes a nation's purchasing power to fall. As long as the annual percentage remains low, inflation is a normal economic development; once it rises over a pre-determined level, it is regarded as an inflation crisis. There are many causes of inflation, depending on several factors (S. Jamuna, 2016).

1. Excess money printing: Inflation can happen when governments print excess money to deal with a crisis. Correspondingly, prices rise exceptionally quickly to keep up with the currency surplus. This is termed the demand-pull, in which high demand forces prices upwards.

2. Rise in production costs: Another common cause of inflation is an increment in production costs, which leads to a surge in the price of the final product. For instance, if raw materials increase in price, the production cost will increase, leading to the company increasing prices to nourish steady profits. Rising labor costs can also accelerate inflation. Companies usually pass on those costs to their customers as workers demand wage increases.
3. International lending and national debts: Inflation can also be caused by international and national debts. As nations borrow money, they must deal with interest, which eventually causes prices to rise to keep up with their debts. A deep drop in the exchange rate can also result in inflation, as governments must deal with differences in import/export levels.
4. Rise in tax and duties: Finally, inflation can be caused by federal taxes imposed on consumer products such as fuel or cigarettes. As the taxes rise, suppliers often transfer the burden to the consumer; the catch is that once prices have increased, they hardly go back, even if the taxes are later reduced. Wars often cause inflation, as governments must recoup the money spent and repay the funds loaned from the central bank. War frequently influences everything from international trading to labour costs to product demand, so in the end, it always produces a price rise.

Effect of Inflation

Most effects of inflation are depressing and can hurt the economy alike:

1. Inferior national saving (when there is lofty inflation, saving money would mean surveillance your cash diminish in value relentlessly, so people lean to pay out the cash on something else).
2. *Fixed-income recipients will be hurt (as inflation augments, their incomes do not rise, and as a result, their income will not have as much value over time).*
3. Causes a rise in tax bracket (people will be taxed a higher proportion if their income increases following an inflation boost).
4. Currency degradation (which lowers the significance of a legal tender and occasionally becomes a source of new currency to be born).
5. *The growing prices of imports (if the currency has desecrated, then its purchasing power in the global market is lower. (Zaigham Abbas Khan et al., 2013).*

GDP and Inflation

Money is considered as storage of value. When money grasps its worth, people feel secure saving it. Inflation declines the utility of money as a storage of value since every unit of money is valued less with the passing of time and the enhancement of inflation. Hence, people lean toward paying for something else that can play the “storage of value.” In the meantime, inflation negatively connects with national income and hurts national savings because of the lower purchasing power.

Effects of Population

Population increase puts a supplementary strain on natural resource utilization. People must be fed, housed, and dressed; food and materials demand swell as the population rises. In some positions, the escalating utilization of land and resources goes beyond the carrying facility and causes the natural resources to be ineffective or exhausted. This could result in economic hardship. Specifically, every addition in population has led to more troubles than settlements. Some of the adverse effects of population increase include high population growth rates and immense investment in Social infrastructure. Due to the scarcity of investment finances, social infrastructure like schooling, well-being, transportation, and accommodation will likely diminish. This results in congestion and declining value of services. Every year, the world population enlarges by about 80 million. Towards the end of 2011, the total attains seven billion, more than twice since 1965. India's Gross Domestic Product (GDP) expanded by 1.80 percent in the third quarter of 2016 over the previous quarter. The GDP Growth Rate in India averaged 1.67 % from 1996 as late as 2016, reaching an all-time high of 5.80 % in the 2nd quarter of 2009 and an all-time low of -1.80 % in the 1st quarter of 2009 (Trading Economics, 2016). It is estimated to rise to 9.3 billion in 2050. Global inhabitants determine the carrying ability of the earth for humans, the economic means to devour resources, the technology available, and the lifestyle choices. Correct population data is an essential element of social and economic strategy. Governments cannot distribute well-organized services and infrastructure without facts of the national demographic sketch – the mass of the population, where people exist, how aged they are, and the net effect of birth rates, death rates, and exodus (Zaigham Abbas Khan et al. 2013).

Significance of Study

The study is significant because it highlights the importance of studying these underlying factors, such as inflation and population, which greatly steer the course of our GDP. As a vast country, our population

creates ripple effects on our economy, and the constantly changing dynamics of the world economy compels us to understand the ever-changing inflation rate, which significantly affects the lives of ordinary humans. The change in both these directly affects our daily lives; therefore, we need to study and understand them in terms of our national economy.

LITERATURE REVIEW

Arvind Virmani (1999), in his paper “Star Performers of the 20th (21st) Century: Asian Tigers, Dragons or Elephants,” has attempted to provide a better basis for making economic forecasts regarding GDP growth. For this, he first identified the fastest-growing economies of the last two decades of the 20th century based on World Bank data. Then, using a framework of ‘Catch-up growth,’ he analyzed the growth pattern of these high-growth economies. Finally, he has provided the projections for the first decade of the 21st century. His analysis has revealed that India ranks sixth in the world growth league in terms of GDP growth and per capita GDP growth during the last two decades of the 20th century. Only South Korea and Singapore among the ‘Asian Tigers,’ Thailand & Indonesia among the NICs (Newly Industrialized countries), and China, the newest Asian High Performing Economy, had a higher trend growth rate than India during these two decades. Besides, in the first decade of the 21st century, India’s growth ranking is projected to improve to the top three. Therefore, India is projected to grow faster than the Asian Tigers and NICs in the next decade. Its only Asian competitor in the growth sweepstakes would be China.

Ranen Ghosh (1983), in his paper “Analytical Implication of Time Series Economic Variable Data: Reeconomic Development,” conducted a case study on Nigeria and covered the period from 1960 to 1975. His research mainly aims to report whether or not the Nigerian economy is industrialized. He used three methods, namely trend study, frequency distribution, and chi-square test, to provide a better empirical analysis for understanding the ‘industrialization’ of the country over time. The data used for this study are taken from the UNO yearbook of National Accounts Statistics. His analysis shows that all the other components of GDP have an upward trend except for the agriculture, trade, and transport sectors, and the frequency distributions of these sectors are skewed to the right. This indicates the high value of GDP components and remarkable development. The chi-square test of significance means that the null hypothesis that the Nigerian economy does not move away from industrialization cannot be rejected with

the observed time series data on the GDP components.

Reddy (1978), in his paper “Growth Rates, has examined whether there is any indication of acceleration or retardation (or constancy) of growth in the Indian National Income as well as its two major components, namely industry and agriculture, during the period from 1950-51 to 1973-74. The data for this study has been collected from the Central Statistical Organization (CSO) and the Reserve Bank of India (RBI). The phenomena of constant growth rate in agricultural and actual national production and deceleration in industrial production have been observed during the entire study period from 1950-51 to 1973-74. However, by analyzing the subperiods, he has concluded that deceleration in industrial production began from 1964-65 onwards, and acceleration occurred during the first three plan periods. Despite the introduction of the green revolution in 1966-67, there has been a deceleration of growth in the agricultural sector.

Kannan (1990), in his paper “Kerala Economy at the Crossroads?,” estimated the compound growth rate of SDP and its significant sectors of Kerala from 1962-63 to 1985-86. By dividing the period into 1962-63 to 1974-75 (Period I) and 1975-76 to 1985-86 (Period II), he has concluded that the primary sector growth rate has been negative (-0.70 percent) in Period II leading to a decline in the growth rate of aggregate income or SDP from Period I (3.21 Percent) to Period II (1.76 Percent). The growth rate of the secondary sector (4.71 percent) was the highest of all industries in Period I, but it declined by half (2.15 Percent) during Period II. However, the tertiary sector has shown consistently high rates for both periods, with Period II registering (5.32 percent) a higher growth rate than (4.24 Percent) in Period I.

Nagaraj (2000), in his paper “Indian Economy Since 1980 Virtuous Growth or Polarization?” examined GDP and its major components, taking a break in 1991. The twenty years from 1980-81 to 1999-2000 were taken for his study, and the required data were collected from National Accounts Statistics. Using a semi-log model with a dummy variable, he concluded that there was no statistically significant break in the GDP, primary and tertiary sector growth rates from 1980-81 to 199-2000. The secondary sector growth rate witnessed a modest statistically significant slowdown after 1991-92.

Fischer, S., Feldstein, M., and Lucas (2000), in their paper “Inflation and Welfare,” found that Inflation and its inconsistency necessitate significant actual costs to the market. Numerous studies demonstrate that a 10% inflation rate can create losses of

approximately 3% of the real GNP during saving and investment misallocation or the loss of value of accurate balances.

Dr. S. Jamuna (2016), in his paper “Inflation and its impact on India,” found that Inflation has always been a primary public concern and has always been subject to heated political debate; it is an astonishing truth that since 1950, India has observed one of the lowest inflation rates in the world compared with other developing nations, and most of these years it had consistently maintained a steady domination over the inflation rate by limiting it to only a single digit figure. The most considerable turmoil of inflation came from 2008 to 2009, when India experienced the highest and lowest inflation rates within just a few months.

Khan, Mohsin, and Abdelhak (2000), in their paper “Threshold Effects in the Relationship Between Inflation and Growth,” found a significant negative effect of inflation that starts above a certain “threshold” inflation rate level and continues for all higher rates. The threshold inflation rate is 1% for industrial countries and 11% for developing countries; the inflation growth effect is positive below these rates.

Tobin (1965), in his paper “Money and Economic Growth,” regarded money as a substitute for capital and showed that higher inflation enhances investment and causes a higher output level. National income deals with the money worth of the flow of productivity of goods and services formed within a financial system over a period, where inflation can indicate either a rise in the currency supply or an enhancement in price level. Commonly, when there is an increase in inflation, there is an increase in prices too.

Fischer, S., Feldstein, M., and Lucas (2000) found in their paper “Inflation and Welfare” that Inflation and its inconsistency necessitate significant actual costs to the market. Numerous studies demonstrate that a 10% inflation rate can create losses of approximately 3% of the real GNP during saving and investment misallocation or the loss of value of real balances.

Bruno & M and W Easterly (1998), in their paper “Inflation Crisis and Long-Run Growth,” concluded that there was no evidence of a growth-inflation tradeoff in a sample that excluded discrete high inflationary crisis. On the other hand, ample evidence shows that growth turned sharply adverse when inflation ran across a high threshold rate of 40 % per annum. They also proclaim that the failure of investigators to detect a consequential relationship between inflation and growth can be accredited to a

stylized rapid recovery of output after inflation, which, on average, renders the overall statistical relationship insignificant.

Mishra, Naman, in his paper “The Effect of Changing Population and Inflation on the Indian GDP,” in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456- 6470, Volume-6 | Issue-5, August 2022, pp.1573- 1576, concluded that every factor is intertwined with each other population is influenced by inflation as with increasing inflation we see that the population is also influenced on the other hand we have already observed the relation in the middle the two individual factors, so it seems imperative to strike an equilibrium between all these factors which impact the economic growth of the country. Excess of all these factors will create disparity, and even the absence of either one of them would cause significant turmoil, so what remains is to hit the perfect balance so that none has any adverse effect on the other while bringing out the best in all of them.

OBJECTIVES

The purpose and objectives of this research are to:

1. To test the simultaneous impact of inflation and population growth on GDP growth in the Indian Economy between 1961 and 2022.
2. To test the individual impact of inflation and population growth on GDP growth in the Indian Economy between 1961 and 2022.

MODEL OF THE RESEARCH PAPER

The regression Equation is as follows;

- a. $GDP_Growth = \alpha + \beta * P$ (i)
- b. $GDP_Growth = \alpha + \beta * I$ (ii)
- c. $GDP_Growth = \alpha + \beta * P + \beta * I$ (iii)

Where:

‘P’: Population growth

‘I’: Inflation Rate

‘ α ’: representing the coefficient intercept term as constant

‘ β ’: representing the slope intercept as vibrant due to the multiplier value of Population and Inflation in Time.

The analysis was done using R software, with the regression analysis.

A. Data Source

In our analysis, three data were required: GDP growth (annual %), Inflation, GDP deflator (annual %), and Population growth (annual %). These data were collected from the World Bank database from 1961 to 2022. Here, GDP growth (annual %) implies GDP's annual percentage growth rate at market prices based on constant local currency. Aggregates are based on constant prices expressed in U.S. dollars. GDP is the

summation of gross value added by all the resident producers or manufacturers in the economy with the addition of any product taxes and subtracting any subsidies not incorporated in the value of the products. It is calculated without making deductions for the devaluation of fabricated assets or for the depletion and decay of natural resources. Inflation, the GDP deflator (annual %), can be defined by the yearly growth rate of the GDP. The implicit deflator

manifests the rate of price change in the economy. The GDP implicit deflator refers to the ratio or proportion of GDP in the current local currency to GDP in constant local currency. Population growth (annual percentage) is the exponential growth rate of the mid-year population from year t-1 to t, in percentage. The population is derived from the de facto definition of population, which counts all residents irrespective of legal status or citizenship.

ANALYSIS AND INTERPRETATION

After analyzing the available data, the following interpretation has been made.

| | GDP annual growth (%) | Inflation GDP deflator annual (%) | Population annual growth (%) |
|----------------|-----------------------|-----------------------------------|------------------------------|
| Mean | 5.1401 | 7.1849 | 1.8648 |
| Std. Deviation | 3.2239 | 3.7655 | 0.4556 |

Table 1: Descriptive Statistics

Standard deviation is widely used to measure dispersion or variability. A low or small standard deviation indicates data are clustered tightly around the mean, and a high or large standard deviation suggests data are more spread out. Higher standard deviation implies higher uncertainty, and vice versa. In Table 1, we see that inflation has the highest standard deviation, and population growth has the lowest standard deviation. Figure 1 also proves this fact.

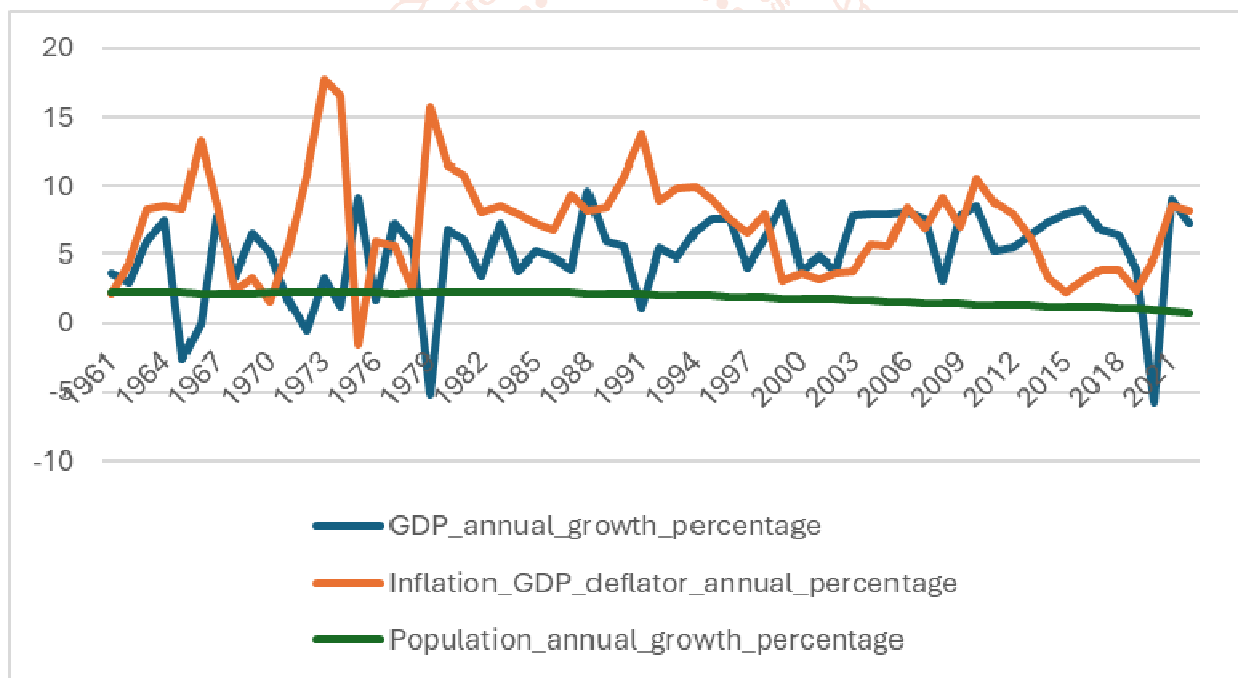


Figure 1: Data Plot

To fulfill our objectives, we have developed three linear regression models. In all these models, the dependent variable is GDP annual growth, but the independent variables have been different.

In Model 1, the Inflation and Population growth rates have been considered simultaneously to assess their joint impact on the GDP growth rate.

In Models 2 and 3, the Inflation and Population growth rates have been considered individually to assess their standalone impact on the GDP growth rate.

| | | | | |
|--|----------|------------|---------|--------------|
| Call: | | | | |
| lm(formula = GDP_annual_growth_percentage ~ ., data = my_data) | | | | |
| Residuals: | | | | |
| Min | 1Q | Median | 3Q | Max |
| -12.5397 | -1.3069 | 0.6089 | 2.1597 | 5.0834 |
| Coefficients: | | | | |
| | Estimate | Std. Error | t value | Pr(> t) |
| (Intercept) | 8.8689 | 1.696 | 5.229 | 2.35E-06 *** |
| Inflation_GDP_deflator_annual_percentage | -0.2348 | 0.108 | -2.174 | 0.0337 * |
| Population_annual_growth_percentage | -1.0947 | 0.8927 | -1.226 | 0.225 |
| Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1 | | | | |
| Residual standard error: 3.074 on 59 degrees of freedom | | | | |
| Multiple R-squared: 0.1205, Adjusted R-squared: 0.09069 | | | | |
| F-statistic: 4.042 on 2 and 59 DF, p-value: 0.02264 | | | | |

Model 1

In Model 1, inflation and population growth rates are considered independent variables. However, the analysis found that only the Inflation rate has a statistically significant negative impact (-0.2348) on GDP growth. Though population growth negatively impacts GDP growth (-1.0947), it has not been proven significant. Although the model has a low Adjusted R^2 (9.069%), it proved to be a weak model for prediction.

| | | | | |
|---|----------|------------|---------|--------------|
| Call: | | | | |
| lm(formula = GDP_annual_growth_percentage ~ Inflation_GDP_deflator_annual_percentage, data = my_data) | | | | |
| Residuals: | | | | |
| Min | 1Q | Median | 3Q | Max |
| -11.6251 | -1.473 | 0.8063 | 2.3402 | 4.7686 |
| Coefficients: | | | | |
| | Estimate | Std. Error | t value | Pr(> t) |
| (Intercept) | 7.0667 | 0.85 | 8.314 | 1.43E-11 *** |
| Inflation_GDP_deflator_annual_percentage | -0.2681 | 0.105 | -2.554 | 0.0132 * |
| Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1 | | | | |
| Residual standard error: 3.087 on 60 degrees of freedom | | | | |
| Multiple R-squared: 0.09808, Adjusted R-squared: 0.08305 | | | | |
| F-statistic: 6.525 on 1 and 60 DF, p-value: 0.01319 | | | | |

Model 2

In Model 2, the individual impact of the inflation rate on GDP growth has been assessed. Here, the Inflation rate has been proven to be a statistically significant adverse impact factor (-0.2681) at $\alpha = 0.05$.

| Call: | | | | |
|---|----------|------------|---------|--------------|
| lm(formula = GDP_annual_growth_percentage ~ Population_annual_growth_percentage, data = my_data) | | | | |
| Residuals: | | | | |
| Min | 1Q | Median | 3Q | Max |
| -12.4109 | -1.1843 | 0.6187 | 2.1754 | 4.9933 |
| Coefficients: | | | | |
| | Estimate | Std. Error | t value | Pr(> t) |
| (Intercept) | 8.0916 | 1.7086 | 4.736 | 1.38E-05 *** |
| Population_annual_growth_percentage | -1.5827 | 0.8905 | -1.777 | 0.0806 . |
| Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1 | | | | |
| Residual standard error: 3.168 on 60 degrees of freedom | | | | |
| Multiple R-squared: 0.05002, Adjusted R-squared: 0.03419 | | | | |
| F-statistic: 3.159 on 1 and 60 DF, p-value: 0.08057 | | | | |

Model 3

In Model 3, the individual impact of the population growth rate on GDP growth has been assessed. The population growth rate has been proven to be a statistically significant negative impact factor (-1.5827) at $\alpha = 0.1$.

However, models 2 and 3 are weak for “goodness-of-fit” because of their low Adjusted R^2 (8.305% and 3.419%, respectively).

FINDINGS AND CONCLUSION OF THE STUDY

1. The inflation and population growth rates have simultaneous adverse effects on GDP growth, yet population growth has a statistically insignificant impact.
2. Considering the inflation and population growth rates individually, both statistically significantly negatively impact GDP growth.
3. Considering low Adjusted R^2 , there is ample scope to include new macroeconomic variables to explain GDP growth over past years.
4. This paper has analyzed 62 years of data as a whole. Still, suppose we can break the study period into the relevant number of years. In that case, it will depict the impact of different social and political incidents from relevant periods on the country's economic prosperity.

Bibliography

- [1] Arvind Virmani (1999a), “Star Performers of the 20th (21st) Century: Asian Tigers, Dragons or Elephants”, <http://www.icrier.org/avpapers.html>, Occasional Paper, Chintan, September 1999.
- [2] Renen Ghosh, “Analytical Implication of Time series Economic variable Data: Reeconomic Development”, Economic Affairs, Vol.28 Qr-2, April-June 1983.
- [3] Reddy, V. N., “Growth Rates”, Economic and Political Weekly, Vol. XIII No.19, May 13, 1978.
- [4] Kannan, K. P., “Kerala Economy at the Crossroads?”, Economic and Political Weekly, Vol. XXV Nos.35 & 36, September 1-8, 1990.
- [5] Nagaraj, .R., “Growth Rate of India’s GDP: 1950-51 to 1987-88”, Economic and Political Weekly, Vol. XXV No.26, June 30, 1990.
- [6] Nagaraj, R., “Excess Growth of tertiary sector?”, Economic and Political Weekly, Vol. XXVI No.15, February 2, 1991.
- [7] Nagaraj, R., “Indian Economy Since 1980 Virtuous growth or Polarization?”, Economic and Political Weekly, Vol. XXXV No.32, August 5, 2000.
- [8] Fischer, S. 1981. Towards an Understanding of the Costs of Inflation. Carnegie Rochester Conference Series on Public Policy, 15, pp. 5-42.
- [9] S. Jamuna. 2016. Inflation and Its Impact on Indian. International Journal of Application or Innovation in Engineering & Management (IJAIEM), 5(4).
- [10] Khan, M., & Abdelhak S. 2000. Threshold Effects in the Relationship Between Inflation and Growth. IMF Working Paper.

- [11] Tobin J.1965.Money and Economic Growth, Econometrica, 33 (4), 671-684. 2456-6470, Volume-6 | Issue-5, August 2022, pp.1573-1576
- [12] Bruno, & M and W Easterly.1998. Inflation Crisis and Long Run Growth. Journal Monetary Economics, 41. [14] Jearth, Palvi & Munjal, Shikhil & Singh, Gurcharan. (2019). an Emperical Study of GDP in Indian Economy on Inflation and Population.
- [13] Naman Mishra , "The Effect of Changing Population and Inflation on the Indian GDP" , International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: [15] Singh, Rubee. (2018). Impact of GDP and Inflation on Unemployment Rate: "A Study of Indian Economy in 2011-2018".

