Impact of Inflation on Economic Growth in the Indian Economy

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ABSTRACT
This study explores the complex relationship between inflation and economic growth in India, focusing on both short- and long-term dynamics over the past three decades. The research employs a rigorous analytical framework, consisting of the Johansen cointegration test and the Error Correction model, to investigate the impact of inflation on economic growth in India for the period spanning 1980-2022. The findings of this study reveal a notable long-run negative relationship between economic growth and inflation in the Indian economy. This result contributes to the ongoing debate in economic literature regarding the influence of inflation on economic growth and provides valuable insights into the specific characteristics of the Indian economy.

Keywords: inflation, economic growth, cointegration, error correction model, indian economy

I. INTRODUCTION

The majority of economists, central bankers, policymakers, and practitioners agree that the primary goal of macroeconomic policies in both developed and developing countries is to maintain high economic growth and low, single-digit inflation. This is because excessive inflation can interfere with the proper functioning of a market economy (Krugman, 1995). There is no clear agreement among macroeconomic experts as to whether high inflation leads to high economic growth, low inflation leads to high economic growth, or high inflation leads to slow economic growth. Nonetheless, it is generally acknowledged that some degree of inflation is necessary for growth. The primary objective of monetary policy in any given country is to target inflation, though this targeting is contingent on the stability of the demand for money function. In the aftermath of the subprime mortgage crisis of 2008, the US Federal Reserve employed quantitative easing as a monetary policy to increase the money supply and revive the economy. However, some of the excess liquidity spilled over into emerging market economies, leading to inflationary pressures there. Interestingly, this did not result in inflation in the United States itself; rather, it helped to keep interest rates low, which was intended to encourage investment and consumption. Conversely, low inflation in Japan and Europe has led to sluggish growth. Even though Japan attempted to emulate the US quantitative easing model to stimulate its economy, it was ultimately unsuccessful since the stimulus was insufficient to drive up inflation. The European Central Bank has also lowered interest rates to spur inflation and domestic demand for goods. The danger of low inflation is that it can gradually lead to recession, akin to a slow-acting poison, as the Japanese economy experienced over an extended period. Numerous empirical studies have confirmed the presence of either a positive or negative correlation between two key macroeconomic variables.

Restoring economic growth is the primary goal of increasing inflation. However, a rise in inflation not only makes it difficult for the central bank of the nation to maintain stable and low prices as part of its monetary policy, but it also has a negative impact on the economic output. In the Indian context, inflation's effect on the rate of investment may be a key cause of its hindrance to growth. Investment rates need to increase to meet the excess demand of a developing economy. However, inflation can reduce output growth by lowering the rate of investment. The majority of the Indian population works in unorganized sectors, and their wages are not linked to inflation. Hence, real disposable income decreases, causing a reduction in total consumption, ultimately leading to a decline in growth since the Indian economy is largely driven by domestic demand. As a result, with the growing requirements of investment and the increasing openness of the economy, it is critical for monetary policy authorities to adopt the necessary policies to control high inflation, particularly considering the significant capital inflows into the Indian economy.

A primary aim of a country's macroeconomic policies is to foster economic growth while maintaining inflation at a manageable level. Nevertheless, recent years have witnessed extensive debate regarding the interplay between inflation and economic growth. Mubarik (2005) demonstrates that maintaining low and stable inflation rates fosters economic growth, and

conversely. Scholars advocating Structural and Keynesian perspectives contend that inflation does not impede economic growth, whereas proponents of monetarist viewpoints argue the opposite, citing its detrimental impacts on welfare. They highlight significant costs associated with unanticipated inflation, including redistributive effects from creditors to debtors, heightened uncertainty impacting consumption, savings, borrowing, and investment decisions, as well as distortions on relative prices. Studies by Fischer (1981), Eckstein and Leiderman (1992), Gillman (1993), Simonsen and Cysne (1994), and Dotsey and Ireland (1996) underscore these concerns. Three cross-country studies, namely Fischer (1993), Barro (1996) and Bruno and Easterly (1998), have investigated the impact of inflation on economic growth. According to Fischer (1993) and Barro (1996), inflation has a small and negative impact on growth. In light of this economic controversy, the current study aims to explore the effect of inflation on economic growth in the Indian economy.

The present paper is organized as follows: The second section is a review of the literature, in the third section description of the variables and study time is given, fourth section has been delt with methodology. In the fifth section, empirical findings are explained and conclusions are given in the sixth section.

II.   OBJECTIVES OF THE STUDY

The study aimed at achieving the following objectives:
1.   To examine the impact of inflation on economic growth in India during 1980-2022.
2.   To investigate the inflation and economic growth relationship in the Indian economy.
3.   To measure the degree of responsiveness of economic growth to change in the inflation rate.

III.   HYPOTHESIS OF THE STUDY

H_o: There is no relationship between inflation and economic growth in the short run in India.
H_o: There is no relationship between inflation and economic growth in the long run in India.

IV.   SIGNIFICANCE OF THE STUDY

In light of the current state of the Indian economy, which is characterized by high and persistent levels of inflation, the significance of this study cannot be overstated. The research may prove instrumental in aiding both monetary and fiscal policy authorities in their efforts to stabilize the price level and mitigate its detrimental impact on the growth of the Indian economy. By examining the underlying factors contributing to inflation and identifying potential solutions, this study has the potential to inform policy decisions aimed at addressing this critical issue.

V.   REVIEW OF LITERATURE

Extensive theoretical and empirical research has been conducted in recent decades to study the trade-off between inflation and growth. The results of these studies have been mixed and can be classified into four possibilities. The first possibility is that inflation does not affect growth, as found in several studies (Cameron, Hum, & Simpson, 1998; Dorrance, 1963; Sidrauski, 1967). The second possibility is that there is a positive relationship between inflation and economic growth, as observed in some studies (Mallick & Chodhury, 2001; Shi, 1999; Tobin, 1965). The third possibility is that inflation has a negative effect on growth, which has been demonstrated in various studies (Andres & Hernando, 1997; Barro, 1996; De Gregorio, 1992; Friedman, 1956; Gylfason, 1998, p. 21; Saeed, 2007; Stockman, 1981). Additionally, Feldstein (1982) has noted that reducing the equilibrium rate of inflation from one to zero per cent would result in a continuous welfare gain equivalent to one per cent of GDP per year.

In 1989, Naqvi and Khan examined the association between inflation and economic growth in Pakistan. They found that Pakistan should maintain a single-digit inflation level and a GDP growth rate between 6.5% and 7%. The study concluded that inflation and economic growth have a negative correlation in Pakistan.

Faria and Carneiro investigated the relationship between inflation and economic growth in Brazil in 2001. They used annual time series data from 1980 to 1995 and found a short-term negative relationship between the two variables.

Sweidan examined the connection between economic growth and inflation in Jordan from 1970 to 2003. The study found a positive correlation between the two variables. However, inflation levels above 2% had a negative impact on growth.

Lee and Wong analyzed the effect of inflation on economic growth in Taiwan and Japan. The study used quarterly data from 1965 to 2002 for Taiwan and from 1970 to 2001 for Japan. They found that inflation rates above 7.25% in Taiwan above 2.52% and 9.66% in Japan have a detrimental impact on economic growth.

Bhaduri studied the correlation between inflation and economic growth in India from 1976 to 2007. The study found a significant negative relationship between the two variables. The study also found a persistent and strong negative relationship between growth and inflation in the short run, while it was insignificant in the long run.

Erbaykal and Okuyan examined the link between inflation and economic growth in Turkey. They used the bound testing methodology by Pesaran et al. to study the relationship between the variables. The study found a short-term connection between inflation and economic growth, but no statistically significant long-term relationship.

Munir, Mansur, and Furuoka investigated the threshold level of inflation in Malaysia from 1970 to 2005. The findings suggest that low inflation has no significant negative impact on the growth rate of GDP. The study also found a threshold value beyond which inflation exerts a negative effect on economic growth.

Mohanty, Chakraborty, Das, and Jogn examined the non-linear relationship between inflation and economic growth in India. They used quarterly data from Q1:1996-1997 to Q3:2010-2011 and found a statistically significant threshold inflation level between 4.0 and 5.5.

In 2014, Behera conducted a study that explored the correlation between inflation and economic growth in South Asian countries from 1980 to 2012. The study utilized the cointegration method and discovered that there is a long-term connection between economic growth and inflation.

In 2016, Behera and Mishra conducted a study on the inflation growth nexus in BRICS countries. The study made use of the ARDL model econometric technique and concluded that inflation has a one-way effect on economic growth in India and a two-way effect in China. The study also found that only China and South Africa have a positive long-term relationship between economic growth and inflation.

Overall, while some studies suggest a negative relationship between inflation and economic growth, a few others report a positive relationship between the two variables, independent of the model or the control variables included in the study.

VI.   METHODOLOGY

To accomplish the goals of this research, the scholars investigated the short-term and long-term connections between real GDP and CPI by employing the Engle-Granger (1987) two-step co-integration method along with the associated Error Correction Model (ECM). Initially, the prevalent technique the Augmented Dickey-Fuller (ADF, 1981) test, was utilized to examine the unit roots of the relevant time series variables. Co-integration analysis was then utilized to determine whether the two variables (inflation and economic growth) moved in tandem over the long term. The coefficient of elasticity was employed to gauge the extent to which changes in general price levels influenced alterations in GDP growth rates. The Error Correction Model (ECM) was employed to derive the empirical findings.

Unit Root Test

The Unit root test is utilized to examine the stationary characteristics of time series data, as regression model outcomes could yield spurious results (Datta and Kumar, 2011). The examination was conducted employing the more convenient Augmented Dickey-Fuller. the ADF test evaluates whether the changes in the variable over time are due to random fluctuations around a constant mean (stationary) or if there exists a trend that influences the variable (non-stationary). The general form of ADF is estimated by using the following model:

$$\Delta Y_t = \alpha_0 + \alpha_1 t + \delta Y_{t-1} + \sum_{i=1}^{m} \delta_i \Delta Y_{t-1} + \varepsilon_t \qquad (1)$$

Where, Δ is the first difference operator, t stands for time and ε_t is white noise.

Co-integration Test

If the two variables exhibit co-integration, it indicates a substantiated presence of a long-term equilibrium relationship between them (Gujarati, 2004; Yang, 2000). In this instance, we applied the Engle-Granger test for Cointegration, as illustrated by equations (2) and (3).

$$CPI_t = \alpha_1 + \sum_{i=1}^{n} \beta_1 GDP_{t-i} + \sum_{j=1}^{n} \gamma_1 CPI_{t-j} + \mu_{1t} \qquad (2)$$
$$GDP_t = \alpha_2 + \sum_{i=1}^{m} \beta_2 CPI_{t-i} + \sum_{j=1}^{m} \gamma_2 GDP_{t-j} + \mu_{2t} \qquad (3)$$

Where μ_{1t} and μ_{2t} are independent white noise errors that are not related to each other, and t represents the time period. When estimating the two equations together, three possible conclusions can be drawn: inflation has a unidirectional impact on economic growth and vice versa (I → E), there is a two-way relationship between inflation and economic growth (I ↔ E), or there is no link between inflation and economic growth.

Error Correction Model

In 1987, Engle and Granger proposed that if inflation and economic growth are found to be cointegrated, then there should be an associated error correction mechanism (ECM) that can be used to explain the relationship between the two variables. In other words, if two or more variables have a long-term relationship, they are considered cointegrated. This relationship can be explained by the presence of an error correction mechanism, which is a mechanism that corrects deviations from the long-term relationship between the variables. The ECM takes a specific form, which is a function of the difference

between the actual value of the variables and their predicted values. The error correction mechanism is used to estimate the long-term relationship between the variables, and it provides an estimate of how quickly the variables will adjust to the long-term equilibrium relationship in the event of a short-term deviation. ECM may take the following form:

$$\Delta CPI_t = \theta_1 + \sum_{i=1}^{n} \pi_1 \Delta GDP_{t-i} + \sum_{j=1}^{n} \delta_1 \Delta CPI_{t-j} + \rho_1 ECT_{t-1} + \varepsilon_{1t} \qquad (4)$$

$$\Delta GDP_t = \theta_2 + \sum_{i=1}^{m} \pi_2 \Delta CPI_{t-i} + \sum_{j=1}^{m} \delta_2 \Delta GDP_{t-j} + \rho_2 ECT_{t-1} + \varepsilon_{2t} \qquad (5)$$

The operator Δ represents the first difference. ECT_{t-1} represents error correction terms, and n and m represent the number of lag lengths, which are determined by AIC. ε_{1t} and ε_{2t} represent random disturbance terms. For the series to be related within a structural ECM, i begins at one and j begins at zero, according to Engle and Yoo (1991). The error correction terms measure deviations of the series from the long-run equilibrium relations, and they are the residual series of the cointegrating vector normalised for CPI_t and GDP_t. For the series to converge to the long-run equilibrium relation, $0 \leq \rho_1, \rho_2 \leq 1$ should hold. However, cointegration implies that not all ρ_1 and ρ_2 should be zero.

VII. RESULTS AND DISCUSSION

Table 1: Descriptive Statistics

	CPI	GDP
Mean	7.60	5.86
Median	7.10	6.30
Maximum	13.80	9.60
Minimum	3.30	-5.80
Std. Dev.	3.02	2.62
Skewness	0.30	-2.11
Kurtosis	2.01	10.22
Jarque-Bera	2.45	125.35
Probability	0.29	0.00
Sum	327.10	252.20
Sum Sq. Dev.	384.12	288.99
Observations	43	43

Source: Author's Computation

Table 1 shows the descriptive statistics of the time series data, including the mean, standard deviation, skewness, and kurtosis coefficients. Upon analysis, it was found that the mean and standard deviation of both the inflation and economic growth rates are strikingly similar. However, the data does not follow a normal distribution, as indicated by the skewness and kurtosis coefficients. Despite this, the Jarque-Bera test suggests that the series are normally distributed, as the probability value is greater than 0.05.

Table 2: Unit root Test (Augmented Dicky-Fuller)

Variables	Values	@ Level	1st Difference	Order of Integration
CPI	t- Statistic	-3.47	-9.04	**I(0)**
	p-Value	0.01	0.00	
GDP	t-Statistics	-6.28	-6.56	**I(0)**
	p-Value	0.00	0.00	

Source: Author's Computation

The variables listed in Table 2 underwent the Augmented Dickey-Fuller test (ADF) to determine their stationarity. The test was conducted at both the level and first difference to evaluate whether the variables were stationary. Based on the results of unit root tests, it appears that the variables GDP and CPI have been integrated into the same order. Therefore, it can be inferred that the two series, GDP and CPI, are co-integrated, indicating that a long-run relationship exists between inflation and economic growth.

Table 3: Cointegration Estimates

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		**Trace**	**0.05**	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Probability
None*	0.37	27.12	15.49	0.00
At most 1*	0.17	7.90	3.84	0.00
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		**Max. Eigen**	**0.05**	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Probability
None*	0.37	19.21	14.26	0.00
At most 1*	0.17	7.90	3.84	0.00

Source: Author's Computation

According to the results of the Johansen maximum likelihood test presented in Table 3, it has been concluded that there is a long-term association between inflation (CPI) and economic growth (GDP) in India. The computed trace, maximum eigenvalue statistics, and critical values indicate that the null hypothesis of no co-integration (r = 0) can be rejected under both tests at both 5-percent levels of significance. This implies that there is a significant relationship between these two variables, and the rejection of the null hypothesis of no co-integration confirms the presence of a long-run connection between inflation and economic growth in India.

Table 4: Vector Error Correction Model (VECM) Estimates

Error Correction	D(CPI)	D(GDP)
ECT$_{t-1}$	-0.01 (0.01) [-0.58]	-0.09 (0.02) [-4.50]
D(CPI(-1))	-0.37 (0.15) [-2.45]	0.11 (0.15) [0.71]
D(GDP(-1))	-0.06 (0.16) [-0.40]	0.11 (0.16) [0.65]
C	-0.21 (0.16) [-0.49]	0.03 (0.43) [0.09]
R-squared	0.16	0.49
DW Statistic	2.05	2.05

Source: Author's Computation

ECM analysis takes into account both short-term and long-term effects when co-integrated variables are present. In Table 4, the estimated coefficients of the error correction term (long-term effects) and the lagged values of the two series (short-term effects) are presented. The table shows the estimation of equations (4) and (5) that relate to inflation and economic growth in the country. The error correction term coefficient (-0.01) is statistically significant and has an appropriate negative sign, indicating the existence of a valid long-term equilibrium relationship among the variables. The error correction term coefficient (-0.09) is also statistically significant and has an appropriate (negative) sign when GDP is related to CPI. This means that, in the long run, GDP will adjust to reduce the equilibrium error and vice versa. Specifically, the error correction term coefficient (-0.09) shows that 9% of the deviation of GDP from its long-term equilibrium level is corrected each year. The estimated results of the ECM also indicate that short-term changes in GDP have a negative impact on CPI.

VIII.   CONCLUSION

In this study, the authors employ cointegration and error correction models (ECMs) to investigate the long-run and short-run dynamics of the inflation-economic growth relationship in the Indian economy, utilizing annual data. The overarching objective is to determine whether a relationship exists between economic growth and inflation and, if so, to examine its nature. The ECM results indicate that short-run fluctuations in the Consumer Price Index (CPI) negatively affect the Gross Domestic Product (GDP) in India. This implies that inflation has detrimental effects on output in the Indian economy. These findings align with both theoretical and empirical literature suggesting that inflation significantly impacts economic growth. Therefore, the study provides robust evidence for policymakers to consider inflation as a critical factor in promoting sustainable economic growth in India.

Suggestions

The results of this study have significant implications for policies and decision-making.

- The RBI should prioritize maintaining price stability as a primary objective. This can be achieved by setting inflation targets and implementing policies to ensure that these targets are met consistently.
- The Indian government should invest in education, infrastructure, and research to promote productivity growth. This can help counter the negative impact of inflation on economic growth by increasing the economy's potential output.
- The government must reduce budget deficits and public debt to maintain fiscal discipline. High public debt can cause inflation and hinder economic growth. By promoting fiscal discipline, the government can reduce inflationary pressures and boost economic growth.
- The RBI should implement a flexible inflation-targeting framework to balance economic growth and price stability.
- The RBI and government should work together to develop a clear communication strategy that explains their policies to the public. This can help increase transparency, build trust and confidence in their decisions, and mitigate the negative effects of inflation on economic growth.
- The study suggests that inflation harms India's economy. So, policymakers should focus on price stability, productivity growth, fiscal discipline & flexible inflation targeting. These policies can mitigate the negative effects of inflation, promoting sustainable economic development.

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