



INFLATION IN INDIA

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Abstract:- *The inflation has turned out to be more volatile during the subsequent period (2001-2022) than the previous sub-periods. The instability and uncertainty in the economy are dangerous for the growth of the economy. Monetary and fiscal measures should be adopted to stabilize the irregular behavior of inflation in India. The study has established that the growth rate in CPI was higher than the WPI during recent decades and this gap is increasing continuously. CPI is more comprehensive and highly concerned to ordinary consumers. The threat of such inflation required to be reduced. Hence, the government should establish a high powered committee to investigate the reasons for increasing such gaps. During recent decades, India is experiencing the transmission of inflation from other parts of the world. Ministries concerned should closely watch and control this effect. Industrial production, during recent decades, has been proved as an effective supply-side variable which has the capacity to control the inflation in the Indian economy. Therefore, the governments at both center and state levels should facilitate industrial production. Due to the high dependence on imports for crude oil, its prices are causing inflation in the Indian economy. Efforts should be made to improve the domestic production and dependence on imports should be reduced substantially. During recent decades, a significant positive relationship has been discovered between money supply and inflation. Therefore, the monetary policy committee (MPC) in India should closely monitor the growth in the money supply.*

Macro-economic management is a matter of major concern for contemporary governments. All the key macro-economic variables are required to function in synchronization for the smooth functioning of the economy. The level of inflation is closely connected to other macro variables. Hence, any movement in the inflation variable may have considerable influence on the performance and functioning of other variables. Consequently, this may disturb the growth and stability of any economy. Therefore, it is imminent to take care of the performance of inflation in the economy. It is a recognized fact that inflation should be in controlled limits. Almost every economy of the world, in the history of its development, had encountered this problem recurrently. Indian economy is no exception. The Indian economy has witnessed mild to severe forms of inflation from time to time. The dynamics of inflation are needed to be understood thoroughly to deal with it effectively.

The literature on the theory of inflation abounds with controversies. The inflation is directly linked to the money supply in the neo-classical paradigm whereas such relationship is indirect in Keynesian thought. He holds that money supply causes a rise in prices through its impact on aggregate demand, employment and output and this is due to less than full employment equilibrium. Therefore, Keynes has clarified the difference between inflation before and after full employment. This controversy further aggravated during the 1950s, when unemployment accompanied by high rates of inflation. Besides, one school of thought believed in cost-push inflation while others labeled it as demand-pull. The third school of thought was also developed with the name of Charles Schultz. The third school believed in demand shift theory of inflation. During this controversy, a new approach of inflation was presented by A.W. Phillips. It has, further, been developed in augmented Philips curve. The controversy regarding this variable is still live. Inflation in a developing nation like India is a very complex and complicated phenomenon. For, it has been determined by the multiplicity of factors that are inter-related in an intricate manner. It is affected by both external as well as internal factors. Politicians face such a daunting job of controlling inflation. As a political issue, circulating money is increasing to satisfy the increasing need of the economy, but it is most probably reflected in greater inflation owing to an imbalance with other macroeconomic factors. In addition, this has been shown in the monetary economics literature that money supply has a direct and beneficial connection with inflation. High levels of economic growth, as the Indian economy has experienced in the latest years, have improved people's purchasing power. Economic growth, however, improves the supply of products and services with the impact reduced by the cost. India's economy is more exposed to the remainder of

the globe, and the world economy's price changes are instantly reflected in the Indian economy. Domestic initiatives are sometimes not successful in the globalized age because of variables beyond the control of policymakers. Indian economy may also be suffering from price volatility, which may be affecting all the sectors. The Indian Economy is exposed to the world economy, due to which a significant rate of inflation comes from import prices cannot be denied. Fluctuations in the Exchange rate affects the purchasing power of people. The elevated inflation rate distorts investment and consumer choices, and the absence of a holistic strategy to inflation control can reduce production and thus increase the issue of unemployment. Therefore, to regulate the threat of inflation and create macroeconomic stability, it is essential to comprehend the dynamics of inflation.

Monetary policy is a major policy tool in the hands of policymakers to stabilize inflation. Hence, monetary policymakers have a major role to see the inflation dynamics in terms of when, why and how much the prices change. There may be considerable lags in the effectiveness of the monetary policy to control and trigger inflation. Therefore, monetary policymakers are required to pay close attention to drivers of inflation and to understand the inflation process.

Need for the Study

India is facing an acute problem of inflation; hence, its dynamics needed to be explored for the adequate solution of such a problem. Though such studies are undertaken in literature, most of them happened in other countries. Whatever studies took place in

India are more specific and do not provide a complete solution. Therefore, this study is intended to be more comprehensive taking monetary and real factor simultaneously under consideration. This study attempted to cover-patterns, long-period and short- period convergence, volatility and persistence behavior.

Objectives

- 1.To study the patterns of inflation experienced in the Indian economy.
- 2.To discern the importance of variables, under consideration, in explaining the variations in inflation levels over time.
- 3.To study the short-term behavior of relevant variables in terms of their tendency to converge towards the integrating relationships.
- 4.To determine the volatility and persistence behavior of Indian inflation.
- 5.To suggest the policies emerging from the study to stabilize the inflationary pressure.

Hypothesis

1. Indian economy did not experience any dramatic change in inflationary behavior overtime.
2. Indian inflation is expected to be influenced by demand and supply factors simultaneously.
3. Inflation as a variable has an equilibrating relationship with other macroeconomic variables in long-period.
4. Indian inflation may have the element of persistence with volatile behavior.

Methodology

The data sources for the variables used in this study are secondary. This study is basically dependent on officially published secondary sources and academic literature. The secondary data on relevant macro-economic variables used in the present study is largely extracted from the official website of the Reserve Bank of India (www.rbi.org.in) and Ministry of Statistics and Policy Implementation (www.mospi.gov.in). Besides, to corroborate the data and generate additional information following websites are used;

www.tradingeconomics.com, www.x-rates.com, www.indexmundi.com, www.allbankingsolutions.com

The data on CPI has been culled from the Labour Bureau and Central Statistical Office (CSO). The wholesale price index (WPI) series has been generated from the official website of the Ministry of Statistics and Policy Implementation (www.mospi.gov.in). The information on foreign exchange reserves has been taken from the official website of RBI and data website www.tradingeconomics.com. The data on crude oil prices have been extracted from www.tradingeconomics.com and www.iocl.com. The required data on the Index of Industrial Production (IIP), money supply, the prime lending rate has been obtained from the official website of RBI (www.rbi.org.in).

The data on the import price index in this study has been taken from the official website of RBI (www.rbi.org.in) and from www.planningcommission.nic.in. The monthly data has been developed for all the variables. Data for some variables are available on a daily basis, monthly average figures are used for the variables for which data is available on a daily basis. Hence, the times series of all the variables contains 444 observations. Of which 132

belongs to the pre-reform period (1980-1990), 120 for post-reform periods (1991- 2000) and 192 for the subsequent period (2001-2022). The variables for which the data is in index format and multiple base years have been spliced to the base year 2004-05.

Monthly information for the period 1980-2016 were used to investigate the dynamics of inflation in the Indian economy. This period, therefore, includes the eras of high to moderate inflation; it reflects appropriate information variability. On the official website of the Ministry of Statistics and Policy Implementation (www.mospi.gov.in), RBI (www.rbi.org.in), relevant macroeconomic factors are acquired. Besides, to corroborate the data and have additional information following websites have also been used; www.tradingeconomics.com; www.X-rates.com; www.indexmundi.com; www.allbankingsolutions.com.

The information thus acquired was evaluated using different methods of statistics and econometrics. For the overall description of the factors, the arithmetic mean, mean, variance, skew and kurtosis were used. Trend growth rate Besides, the Jerque-Bera test is employed to ascertain the normality of the variables. Moreover, to test the non- stationarity of the time series of the variables Augmented Dickey-Fuller (ADF) test has also been used. Since the macro-economic variables may exhibit bidirectional relationships. To know this fact among the variables Granger Causality test has been used. The cointegration among the variables under consideration has been tested through the Johansen's technique and vector error correction technique has been used to ascertain the long period as well as the short period relationship among the variables. Since inflation is an impulsive variable and may show considerable variation over time. To ascertain such volatility and test the persistence of inflation variable ARCH/GARCH models have been employed.

Our study covered a period of 37 years from 1980-2016. In this period there is high as well as moderate inflation, hence; represents adequate variation in the data. This period relates to Pre- Reform & Post-reform period. The entire time period has been trifurcated purposively into three-time spans namely, pre-reform period (1980-90), post-reform period (1991-2000) and subsequent period (2001-22).

To process the data, following econometric and statistical packages have been used;

❖ MS-Excel

❖ SPSS (Statistical Package for Social Sciences)

❖ E-Views

❖ EGARCH Model:

Asymmetric volatility is not captured by the GARCH model; hence, Nelson's Exponential GARCH model for volatility estimation. In the EGARCH model, the mean and variance specifications are:

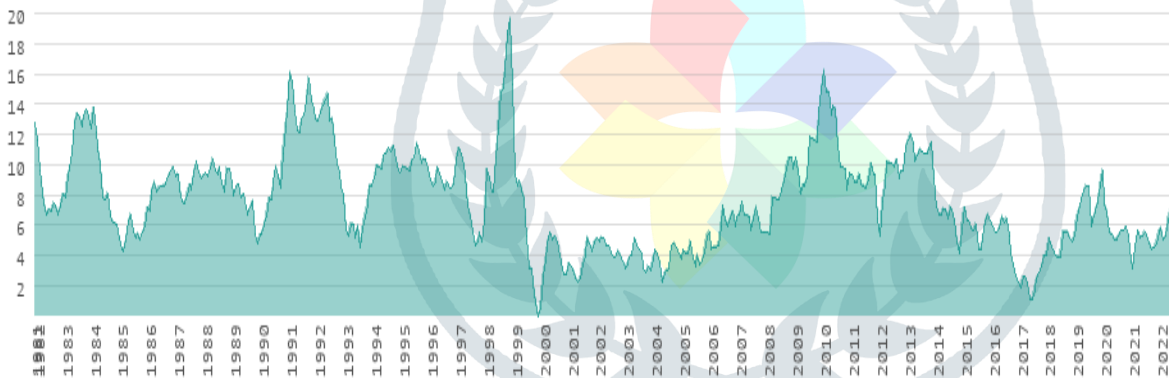
Mean Equation: $CPI_t = c + \varepsilon_t$

Variance Equation: $\log h_t = \omega + \alpha_1 (|\varepsilon_{t-1}/ h_{t-1}| - 2/\pi) + \gamma (\varepsilon_{t-1}/ h_{t-1}) + \beta_1 \log (h_{t-1})$

inflation rates:-

Year	India	Ø EU	Ø USA	Ø World	Year	India	Ø EU	Ø USA	Ø World
2021	5.13%	2.55%	4.70%	3.42%	1990	8.97%	6.15%	5.40%	8.13%
2020	6.62%	0.50%	1.23%	1.92%	1989	7.07%	6.26%	4.83%	7.00%
2019	3.73%	1.63%	1.81%	2.19%	1988	9.38%	4.54%	4.08%	7.15%
2018	3.94%	1.74%	2.44%	2.44%	1987	8.80%	4.02%	3.66%	5.76%
2017	3.33%	1.43%	2.13%	2.19%	1986	8.73%	3.68%	1.90%	5.82%
2016	4.95%	0.18%	1.26%	1.55%	1985	5.56%	5.40%	3.55%	6.86%
2015	4.91%	-0.06%	0.12%	1.43%	1984	8.32%	7.67%	4.30%	8.12%
2014	6.67%	0.20%	1.62%	2.35%	1983	11.87%	8.67%	3.21%	8.77%
2013	11.06%	1.22%	1.46%	2.62%	1982	7.89%	9.58%	6.13%	10.24%
2012	9.31%	2.66%	2.07%	3.73%	1981	13.11%	11.77%	10.33%	12.47%
2011	8.86%	3.29%	3.16%	4.82%	1980	11.35%	12.91%	13.55%	13.98%
2010	11.99%	1.53%	1.64%	3.35%	1979	6.28%	8.22%	11.25%	n/a
2009	10.88%	0.84%	-0.36%	2.94%	1978	2.52%	7.76%	7.63%	n/a
2008	8.35%	4.16%	3.84%	8.95%	1977	8.31%	9.77%	6.50%	n/a
2007	6.37%	2.51%	2.85%	4.82%	1976	-7.63%	9.35%	5.74%	n/a
2006	5.80%	2.67%	3.23%	4.28%	1975	5.75%	10.47%	9.14%	n/a
2005	4.25%	2.49%	3.39%	4.11%	1974	28.60%	13.16%	11.05%	n/a
2004	3.77%	2.29%	2.68%	3.38%	1973	16.94%	7.75%	6.18%	n/a
2003	3.81%	2.09%	2.27%	3.03%	1972	6.44%	6.01%	3.27%	n/a
2002	4.30%	2.42%	1.59%	2.83%	1971	3.08%	5.24%	4.29%	n/a
2001	3.78%	3.37%	2.83%	3.84%	1970	5.09%	4.51%	5.84%	n/a
2000	4.01%	3.15%	3.38%	3.49%	1969	-0.58%	2.67%	5.46%	n/a
1999	4.67%	2.16%	2.19%	3.08%	1968	3.24%	3.24%	4.27%	n/a
1998	13.23%	2.42%	1.55%	5.11%	1967	13.06%	3.32%	2.77%	n/a
1997	7.16%	3.11%	2.34%	5.57%	1966	10.80%	3.70%	3.02%	n/a
1996	8.98%	3.56%	2.93%	6.55%	1965	9.47%	3.99%	1.59%	n/a
1995	10.22%	4.43%	2.81%	9.15%	1964	13.36%	3.42%	1.28%	n/a
1994	10.25%	4.72%	2.61%	10.32%	1963	2.95%	2.92%	1.24%	n/a
1993	6.33%	4.85%	2.95%	7.51%	1962	3.63%	3.55%	1.20%	n/a
1992	11.79%	6.22%	3.03%	7.71%	1961	1.70%	2.08%	1.07%	n/a
1991	13.87%	5.48%	4.23%	9.00%	1960	1.78%	1.74%	1.46%	n/a

Data basis: International Monetary Fund, World Bank and OECD Inflation CPI indicator



Indian inflation measured through consumer price index (CPI) and wholesale price index (WPI) has witnessed a continuously increasing trend over time. Every successive sub-period of study has witnessed a higher average level of inflation than the previous sub-periods. The rates of increase in both the indices were almost same till 1995; however, subsequently, there was a significant difference between the rate of growth in CPI and WPI. CPI has been recorded relatively higher than WPI. And such gap was dramatic during the subsequent period (2001-2022). As we know, an increase in CPI may have more negative effects on the commoners, hence, this is a matter of major concern. During the pre-reform period, WPI grew faster than CPI. However, the rate of growth in CPI was faster than WPI during the post-reform period and subsequent periods. Inflation rate based on both the indicators has been fluctuating, particularly during the subsequent period. The amplitudes of fluctuations in WPI & CPI inflation are highest during this phase. The fluctuations in WPI & CPI inflation are however moderate in the pre-reform & post-reform period.

The Indian economy has witnessed dramatic growth after the introduction of a new economic policy in 1991. Such inklings are apparent in our results also. The weights of primary articles have declined in weights of the wholesale price index, whereas such weights have registered a considerable increase in the categories of manufacturing, and fuel and power. It has been noticed that in primary articles, shares of food and non-food articles have witnessed a decrease over time. In the category of fuel and power, the weights of oils and coal have increased whereas it decreased in electricity component. So far as the weights in the manufactured products are concerned, the weights of traditional items have declined and it has increased in other items. This is an indicator of growth process trajectory. The changes witnessed in weights of CPI are indicators of a growing economy. For, the weights of food items have reduced overtimes and such weights have increased in terms of clothing, housing,

and fuel. So, we can conclude that CPI and WPI are closely associated and move in tandem irrespective of the sub-periods. For, very high correlation coefficient has been recorded between WPI and CPI.

The macro-economic variables may display one-way and two-ways causation between them. Such causal connections have helped us to understand the depth of relationships. Indian economy recorded relatively slow growth during the pre-reform period as compared to post and subsequent sub-periods. Accordingly, IIP did not emerge as a cause for decreasing inflation; however, inflation was causing some effects on IIP. Such causal relationship continued during the post-reform period (1991-2000). This relationship was bidirectional during the subsequent period (2001-2022). Here, the effect of improvement in IIP started reflecting on the performance of the inflation variable. The level of growth in the money supply was relatively less during the pre-reform period as compared to post-reform periods. Hence, its causal relationship with inflation was contrary to the established theory. Money supply did not cause inflation during the pre-reform period. The nature of this relationship did not change during the post-reform period (1991-2000). However, such causal relationship appeared bi-directional during the subsequent period (2001-2022), that is the money supply was causing inflation and inflation was causing money supply. During the first and second sub-periods, the causal effect of imports on inflation did not appear. But, during the subsequent period, the economy felt the heat of imported inflation also.

In the macroeconomic environment, variables under consideration can display short period and long period relationships among themselves. Hence, we may be able to discern the converging and diverging relationship among them over a long period. Besides, shocks to one variable may have temporary as well as the permanent effect on others. The study has established that variables under consideration are non-stationary in nature during all the sub-periods. But, all the variables are stationary at the first difference level. The cointegration tests have established that variables have a long period relationship. One or two cointegrating relationships have turned out. And the relationships which are economically more relevant are interpreted. Normalized cointegration relationship – normalized for CPI – measuring long period relationships has discovered that money supply has a positive effect on inflation. IIP, instead of playing its role to control the inflation affected it another way round during the first sub-period under study. However, IIP was effective in controlling the inflation during the post-reform and subsequent periods so far long period relationship is concerned. Imported inflation could become an effective variable during the subsequent period after being ineffective for pre and post-reform periods.

The long period relationship of cointegrating variables with inflation is converging and stabilizing for the first sub-period. However, such a relationship between convergence and stability was slow during the post and subsequent period. Indian inflation is positively influenced by the previous period's inflation. Besides, it has also been proved that inflationary shock at one time sustains for some period before being normal. The dynamic relationship (short period relationship) of Money Supply and inflation turned out to be strong. The shocks to the money supply variable are positively reflected in inflation for some time and gradually turned to normal. Any injection to IIP variable has an unstable relationship with inflation.

The study established that during the pre-reform period, time-varying volatility was not present. Hence, previous period information did not appear as a factor to influence the inflation volatility of current period. However, previous period volatility appeared as an important factor to contribute to the current period volatility. Besides, the persistence and leverage effects were also present. During this period (pre-reform period), negative innovation shocks were stronger than positive shocks. During the post-reform and subsequent periods, liberal reforms were introduced and policy shocks were given continuously. So, it is expected that some instability in macro-economic variables including inflation must have appeared. During these periods, the economy had witnessed high growth trajectory and levels and variations in the inflation variable were relatively higher as compared to the pre-reform period. The current period's volatility was a function of previous period information (ARCH) and previous period volatility. The effect of previous period conditional variance was remarkably higher than the previous period information. It has also been confirmed that the presence of volatility persistence implying that the effect of inflation shocks on inflation volatility stayed for longer periods. Significant asymmetric term confirmed the asymmetric response of volatility to inflation shocks. However, the leverage effect was absent that is their conditional volatility are more responsive to positive shocks than negative innovations.

Decisions

❖ It was hypothesized that the Indian economy did not experience any dramatic change in inflationary patterns overtime. Our study did not support this hypothesis. For, the economy witnessed dramatic changes in its behavior during the pre-reform period and post-reform periods in terms of relationships between wholesale price index and consumer price index, nature of relationship and strength of relationships with other macro-economic variables and so on.

❖ Economic theory states that inflation in an economy may be influenced by demand and supply factors simultaneously. Indian economy is no exception. The demand and supply-side variables under consideration in

this study turned out to be important in explaining the Indian inflation; though, with different strength during regimented and liberalized periods.

❖ The inflation variable may generate instability in the economy and may disturb the overall equilibrium in the economy. So, it was hypothesized that inflation as a variable has an equilibrating relationship with other macro-economic variables in a long period. This study established that the long period relationship of cointegrating variables with inflation is converging and stabilizing for the first sub-period. However, such a relationship between convergence and stability was slow during the post and subsequent period. Therefore, this hypothesis is accepted with some reservation.

❖ The volatility was present in the Indian inflation irrespective of the sub-periods under consideration. However, such an effect was weak during the pre-reform period whereas such relationship turned out to be very strong during post-reform periods. Hence, the existence of volatile behavior and persistence in Indian inflation are accepted without any hesitation.

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