

An Empirical Analysis Of Food Inflation And Headline Inflation Dynamics In Post-Millennium India

Dr. Priyanshi Gupta
Assistant Professor, Department of
Humanities & Social Sciences
Integral University
Lucknow, India
dr.priyanshi0903@gmail.com

Prof. Bimal Jaiswal
Professor, Department of Applied
Economics
University of Lucknow
Lucknow, India
bimalsiyaram@gmail.com

Abstract— The topic of Inflation is considered to be one of those few topics in macroeconomics specially which have received a great attention. The reason being that it touches the life of people in all dispositions and walks of life which is why Inflation is considered to be a complex phenomenon. High inflation turns out to be disastrous for India as it's a developing country with the highest number of people in the world living below poverty line at present. In India's consumer inflation basket (CPI-Combined), food items account for 39% still which is a huge percentage. High and persistent food inflation emerged as a major concern during 2009-2014 in India, averaging 9% over this period and at over 20% food inflation peaked in 2009. Since all the sectors and industries are interlinked, here high food prices may get into their cost functions leading to high inflation in general. This study focuses on the impact of WPI-Food on WPI Headline/General, CPI-IW Food on CPI-IW Headline/General, CPI-AL Food on CPI-AL Headline/General, CPI-RL Food on CPI-RL Headline/General from 2001 to 2021.

Keywords-Food inflation, Headline inflation, WPI, CPI-IW, CPI-AL, CPI-RL.

I. INTRODUCTION

Inflation is a situation in which demand is in excess over supply. It is a situation in which too few goods are chased by too much of money, a situation wherein prices are chased by costs and wages and vice-versa. Thus, a persistent rise in the general price level is referred to as Inflation. Due to its adverse socio-economic impact, high inflation is considered to be a threat and a matter of concern. High inflation turns out to be disastrous for India as it's a developing country with the highest number of people in the world living below poverty line at present. High inflation results in reduction in the purchasing power of the money, increase in the number of people living below poverty line, create problems in the Balance of Payments, affect savings adversely. Overall, this widens the income and wealth inequalities and derails the growth process.

In the recent past, the problem of Food Inflation has been an important topic of discussion in India. When over a time for food articles people have to pay more than before, such a situation is known as Food Inflation. When compared with general inflation, food inflation has been of a greater concern for developing economies like India. Due to this reason the poorer sections of the society face the problem of basic survival as for assessing the means for their sustenance they

face a lot of hardships and are unable to make their both ends meet.

Price fluctuations in the food commodities play a huge role in the general price fluctuations due to the link-in factors. Food products inflation contributes largely in the Headline/General inflation off late. To identify whether the phenomena work at wholesale and retail levels, we have used cointegration and regression test analysis on the stationary variables for testing the hypothesis of the study and fulfilling the objectives of the same

A. Objectives

- To study the impact of WPI-Food on WPI General / Headline in India from 2001 till 2021.
- To study the impact of CPI-IW Food on CPI-IW General / Headline in India from 2001 till 2021.
- To study the impact of CPI-AL Food on CPI-AL General / Headline in India from 2001 till 2021.
- To study the impact of CPI-RL Food on CPI-RL General / Headline in India from 2001 till 2021.

II. Review of Literature

A. Food Inflation and Inflation Dynamics in Developing Economies

Food inflation has emerged as one of the most persistent macroeconomic challenges in developing economies because of its direct implications for price stability, household welfare, and economic growth. Unlike developed economies, where food expenditure constitutes a relatively smaller proportion of household consumption, developing countries are particularly vulnerable to food price fluctuations owing to higher dependence on agricultural output and larger shares of household income devoted to food consumption. Consequently, persistent food inflation not only reduces consumers' purchasing power but also exacerbates poverty, income inequality, and food insecurity. Furthermore, sustained increases in food prices often generate second-round inflationary effects by raising production costs, transportation expenses, and wage demands, thereby transmitting inflationary pressures to the broader economy. Several researchers have argued that structural constraints in agricultural production, supply-chain inefficiencies, and demand-supply imbalances are among the primary drivers of food inflation in developing countries. These structural factors

often result in persistent inflationary pressures that cannot be effectively addressed through conventional monetary policy alone, highlighting the need for comprehensive supply-side interventions.

B. Food Inflation and Headline Inflation in India

The relationship between food inflation and headline inflation has received considerable attention in the Indian context due to the significant weight assigned to food items in the country's inflation indices. Since food constitutes a substantial proportion of household expenditure, especially among low-income households, fluctuations in food prices have a pronounced influence on overall inflation.

Early studies identified structural weaknesses in Indian agriculture as major contributors to persistent inflationary pressures. Sengupta [1] argued that structural inflation in India primarily originated from agricultural constraints and suggested that food inflation possesses a strong tendency to spread across interconnected sectors of the economy. Similarly, Chakravarthy [2] emphasized that irregular agricultural production was one of the principal causes of inflationary episodes and advocated a coordinated fiscal and monetary policy framework to stabilize prices.

The transmission of food price shocks to overall inflation has also been highlighted in subsequent studies. Mohanty [3] observed that supply-driven increases in agricultural commodity prices during 2008 and 2009 generated significant spillover effects on general inflation, indicating that food inflation can substantially influence broader price dynamics. These findings collectively suggest that food inflation serves not only as an independent source of inflationary pressure but also as a mechanism through which inflation is transmitted across different sectors of the economy.

C. Policy Responses and Empirical Evidence

Recent policy documents and empirical evidence further reinforce the dominant role of food inflation in determining India's overall inflation trajectory. The Economic Survey 2019–20 identified food inflation as the principal contributor to rising inflation during the financial year, attributing the surge primarily to adverse weather conditions that disrupted agricultural production [4]. Similarly, the Economic Survey 2020–21 reported that headline Consumer Price Index (CPI) inflation averaged 6.6% during April–December 2020, with food and beverages accounting for the largest share of overall inflation [5].

Evidence from the Economic Survey 2021–22 further demonstrated that the moderation of food inflation contributed significantly to the decline in retail inflation during the corresponding period [6]. Food inflation, measured through the Consumer Food Price Index (CFPI), declined substantially compared with the previous year, although temporary increases were observed during the latter half of 2021. These observations indicate that fluctuations in food prices continue to play a decisive role in shaping India's inflation dynamics and highlight the importance of addressing structural constraints in agricultural production and food supply chains for achieving long-term price stability.

D. Research Gap and Contribution of the Present Study

Although the existing literature provides valuable insights into the determinants, transmission mechanisms, and policy implications of food inflation in India, several limitations remain. Most previous studies have focused on explaining the causes of food inflation or examining its macroeconomic consequences during specific inflationary episodes. Comparatively fewer studies have undertaken a comprehensive empirical investigation of the relationship between food inflation and headline inflation across multiple price indices over an extended period.

Moreover, the majority of existing research has concentrated on either wholesale or consumer inflation individually, while limited evidence is available on the simultaneous examination of Wholesale Price Index (WPI), Consumer Price Index for Industrial Workers (CPI-IW), Consumer Price Index for Agricultural Labourers (CPI-AL), and Consumer Price Index for Rural Labourers (CPI-RL). A comparative assessment of these inflation measures can provide a more comprehensive understanding of how food price movements influence different segments of the Indian economy.

To address this gap, the present study investigates the impact of food inflation on headline inflation using annual data for the period 2001–2021. The study employs the Augmented Dickey-Fuller (ADF) unit root test, Johansen cointegration test, and regression analysis to examine both the long-run relationship and the magnitude of the impact of food inflation on headline inflation across four major inflation indices. By providing comparative empirical evidence across multiple price measures, the study contributes to a more comprehensive understanding of inflation dynamics in post-millennium India and offers policy-relevant insights for inflation management.

III. Data Nature and Sources

Here we study the impact of food inflation on headline inflation in the post millennium era. Thus, the study is based on the data series from 2001 to 2021. The study concentrates on the general (all commodities) and food index of Consumer Price Index – Industrial Workers (CPI-IW), Consumer Price Index – Agricultural Labourers (CPI-AL) and Consumer Price Index – Rural Labourers (CPI-RL). As the new CPI series has the data of lesser period. The study also considers the Wholesale Price Index (WPI) based general (all commodities) and food articles inflation, the data pertaining to which has been sourced from the Ministry of Commerce and Industry, Government of India. While the source of CPI-IW, CPI-AL and CPI-RL data is the Ministry of Labour and Employment, Government of India. The General (All Commodities) Index of WPI, CPI-IW, CPI-AL and CPI-RL have been taken as dependent variables whereas the Food Index of WPI, CPI-IW, CPI-AL and CPI-RL have been taken as independent variables in the study.

IV. Research Methodology

This research work involves quantitative time series data collected from various secondary sources which is thereafter to suit the analytical purposes, is then tabulated and graphed as per requirement and is then subjected to various statistical

tools and techniques available on the E-Views software like Augmented Dickey-Fuller (ADF) Test for checking the stationarity, Johansen Cointegration Test and Regression Analysis for hypothesis testing and impact analysis. All the data series has been converted to the base year 2012 with the help of splicing technique so that the results are authentic.

Johansen Cointegration Test is named after Soren Johansen and is used for testing cointegration of time series. Johansen test is of two types, namely: trace and eigenvalue with a little bit of different inferences. For the trace test, null hypothesis is that $r = r^* < k$ is the number of cointegration vectors, vs. that $r = k$ is the alternative hypothesis. For “maximum eigenvalue” test, the null hypothesis is the same as for trace test but, $r = r^* + 1$ is the alternate hypothesis respectively.

A set of statistical methods is used in regression analysis to estimate the relationships between one or more independent variable and a dependent variable. The basic assumptions of regression analysis (linear) are that the independent variable should not be random, a linear relationship between the slope and the intercept should be shown by the independent and dependent variables, the value of residuals should be zero and follow normal distribution along with being constant and non-correlated across all observations.

$$Y = a + bX + \epsilon$$

Where:

- Y – Dependent variable
- X – Independent / Explanatory variable
- a – Intercept
- b – Slope
- ϵ - Residual (error)

A. Wholesale Price Index (WPI)

The Office of Economic Adviser, Ministry of Commerce and Industry publishes the Wholesale Price Index (WPI) with the base year of 2011-12 at present. WPI is being published since 1947 regularly. It tracks the inflation at the producer level as the wholesaler deals in trade and sale of goods in bulk. In the formulation of trade, fiscal policy and other economic policies by the Government, inflation estimates based on WPI also serve as an important factor.

B. Consumer Price Index – Industrial Workers (CPI-IW)

The change in the prices of the commodity basket consumed by the industrial workers is measured by CPI-IW. Calculation of dearness allowance of government employees is done through CPI-IW in India. The existing series with the base 2001 has been replaced by the new series of CPI-IW with base 2016 as it covers the target population’s latest consumption pattern. CPI-IW is constructed by the Labour Bureau, Ministry of Labour and Employment (MOLE).

C. Consumer Price Index – Agricultural Labourers (CPI-AL)

CPI-AL is constructed by the Labour Bureau, Ministry of Labour and Employment (MOLE). The change in the prices of the commodity basket consumed by the agricultural labourers is measured by CPI-AL. With its base year as 1986-87, CPI-AL is used for revising the agricultural labourer’s minimum wage.

D. Consumer Price Index – Rural Labourers (CPI-RL)

CPI-RL is constructed by the Labour Bureau, Ministry of Labour and Employment (MOLE). CPI-RL with the base year of 1986-87 is used to revise the minimum wage of the rural labourers like cottage industry workers, rural artisans, etc. as it measures the change in the prices of commodity basket consumed by them.

First, Augmented Dickey-Fuller (ADF) test has been used for checking the Stationarity of General (All Commodity) and Food Index of WPI, CPI-IW, CPI-AL and CPI-RL respectively. The statistic of this test is a negative number. The more negative the number is, stronger rejection of the hypothesis proving that there is a unit root at some level of confidence. The optimum lag selected for fitting the model is 4, which has been fixed on the basis of Schwarz Bayesian Information Criterion (SIC) lag selection criterion. Table I reports the results of the Augmented Dickey-Fuller (ADF) unit root test. The findings indicate that all variables become stationary after differencing. WPI Food and CPI-IW Headline are stationary at the first difference, whereas WPI Headline, CPI-IW Food, CPI-AL Headline, CPI-AL Food, CPI-RL Headline, and CPI-RL Food attain stationarity at the second difference. The rejection of the null hypothesis of a unit root confirms that all variables are suitable for subsequent cointegration analysis.

TABLE I. UNIT ROOT TEST RESULT FOR WPI HEADLINE/GENERAL

Variable	Difference Level	Model Specification	ADF Statistic	p-value	Stationarity
WPI Headline	I(2)	None	-3.8727	0.0006	Stationary
WPI Food	I(1)	Constant	-3.0854	0.0449	Stationary
CPI-IW Headline	I(1)	Constant	-3.0524	0.0479	Stationary
CPI-IW Food	I(2)	None	-4.8256	0.0001	Stationary
CPI-AL Headline	I(2)	None	-4.6658	0.0001	Stationary
CPI-AL Food	I(2)	None	-6.3738	0.0000	Stationary
CPI-RL Headline	I(2)	None	-4.4680	0.0002	Stationary
CPI-RL Food	I(2)	None	-6.2167	0.0000	Stationary

^a Source: Authors' calculations using EViews.

Then Johansen Cointegration Test has been used for testing cointegration and as the variables are cointegrated (test results), regression analysis has been performed on the same to check the impact of WPI Food, CPI-IW Food, CPI-AL Food and CPI-RL Food on WPI Headline/General, CPI-IW Headline/General, CPI-AL Headline/General and CPI-RL Headline/General respectively. Table II summarizes the Johansen cointegration test results for all four inflation models. Both the Trace and Maximum Eigenvalue statistics indicate the existence of at least one cointegrating relationship in each model at the 5% significance level. These findings confirm that food inflation and headline inflation share a stable long-run equilibrium relationship across all selected price indices in India during the study period (2001–

2021). Consequently, regression analysis is employed to estimate the magnitude of this long-run relationship.

TABLE II. SUMMARY OF JOHANSEN COINTEGRATION TEST RESULTS

Model	Variables	Trace Test	Max-Eigen Test	Cointegration (5% Level)	Long-run Relationship
Model 1	WPI Headline – WPI Food	Significant	Significant	Yes	Exists
Model 2	CPI-IW Headline – CPI-IW Food	Significant	Significant	Yes	Exists
Model 3	CPI-AL Headline – CPI-AL Food	Significant	Significant	Yes	Exists
Model 4	CPI-RL Headline – CPI-RL Food	Significant	Significant	Yes	Exists

b Source: Authors' calculations using EViews.

V. CONCLUSION

Following the confirmation of a long-run equilibrium relationship through the Johansen cointegration test, simple linear regression analysis was employed to estimate the magnitude and direction of the relationship between food inflation and headline inflation. Regression analysis is an appropriate statistical technique for examining the extent to which variations in an independent variable explain changes in a dependent variable while quantifying the strength and statistical significance of the relationship.

In the present study, food inflation served as the independent variable, whereas headline inflation represented the dependent variable. Four separate regression models were estimated to examine the impact of WPI Food on WPI Headline, CPI-IW Food on CPI-IW Headline, CPI-AL Food on CPI-AL Headline, and CPI-RL Food on CPI-RL Headline. The estimated regression coefficients measure the expected change in headline inflation associated with a one-unit change in food inflation, thereby enabling an assessment of the responsiveness of overall inflation to food price movements.

The statistical significance of the estimated models was evaluated using the t-test for individual regression coefficients, the F-test for overall model significance, and the coefficient of determination (R^2) to assess the explanatory power of each regression model. A statistically significant positive regression coefficient would indicate that increases in food inflation contribute to corresponding increases in headline inflation, thereby supporting the study's hypothesis that food prices play a crucial role in shaping overall inflation dynamics in India.

The regression model employed in the study is specified as follows:

$$\text{Headline Inflation}_t = \beta_0 + \beta_1(\text{Food Inflation}_t) + \varepsilon_t$$

where:

Headline Inflation = WPI Headline, CPI-IW Headline, CPI-AL Headline, or CPI-RL Headline

Food Inflation = Corresponding food price index

β_0 = Intercept

β_1 = Regression coefficient measuring the impact of food inflation on headline inflation

ε_t = Random error term

As reported in Table III, food inflation exerts a statistically significant positive effect on headline inflation across all four models. The estimated coefficients indicate that a one-unit increase in food inflation leads to an increase ranging from 0.601 to 1.045 units in headline inflation, depending on the price index considered. The high values of the coefficient of determination ($R^2 = 0.971$ – 0.998) demonstrate the strong explanatory power of the regression models, while the statistically significant F-statistics confirm the overall goodness of fit. These results suggest that food price movements constitute a major determinant of headline inflation in India.

TABLE III. SUMMARY OF REGRESSION ANALYSIS RESULTS

Model	Independent Variable	Dependent Variable	Coefficient	t-Statistic	p-value	R^2	F-statistic	Result
Model 1	WPI Food	WPI Headline	0.601	25.161	0.000	0.971	633.093	Significant Positive Impact
Model 2	CPI-IW Food	CPI-IW Headline	0.972	70.793	0.000	0.996	5011.595	Significant Positive Impact
Model 3	CPI-AL Food	CPI-AL Headline	1.045	96.767	0.000	0.998	9363.857	Significant Positive Impact
Model 4	CPI-RL Food	CPI-RL Headline	1.044	90.676	0.000	0.998	8222.185	Significant Positive Impact

c Source: Authors' calculations using EViews.

To evaluate the empirical relationship between food inflation and headline inflation, hypothesis testing was conducted based on the results of the regression analysis. The purpose of hypothesis testing was to determine whether the estimated impact of food inflation on headline inflation was statistically significant and to verify the research hypotheses formulated for each inflation index.

For each regression model, the null hypothesis (H_0) stated that food inflation has no significant impact on the corresponding headline inflation measure, whereas the alternative hypothesis (H_1) proposed that food inflation exerts a significant influence on headline inflation. The decision regarding hypothesis acceptance or rejection was

based on the statistical significance of the estimated regression coefficient (β_1) at the 5% significance level. A p-value less than 0.05 was considered sufficient evidence to reject the null hypothesis in favor of the alternative hypothesis.

The outcomes of the hypothesis testing are summarized in Table IV, which presents the statistical decision and the corresponding conclusion for each empirical model. This consolidated presentation provides a comprehensive assessment of whether food inflation significantly affects headline inflation across the Wholesale Price Index (WPI), Consumer Price Index for Industrial Workers (CPI-IW), Consumer Price Index for Agricultural Labourers (CPI-AL), and Consumer Price Index for Rural Labourers (CPI-RL).

TABLE IV. SUMMARY OF HYPOTHESIS TESTING RESULTS

Hypothesis	Test Applied	Decision	Conclusion
H₀₁: WPI Food has no significant impact on WPI Headline inflation.	Linear Regression	Rejected	WPI Food significantly influences WPI Headline inflation.
H₀₂: CPI-IW Food has no significant impact on CPI-IW Headline inflation.	Linear Regression	Rejected	CPI-IW Food significantly influences CPI-IW Headline inflation.
H₀₃: CPI-AL Food has no significant impact on CPI-AL Headline inflation.	Linear Regression	Rejected	CPI-AL Food significantly influences CPI-AL Headline inflation.
H₀₄: CPI-RL Food has no significant impact on CPI-RL Headline inflation.	Linear Regression	Rejected	CPI-RL Food significantly influences CPI-RL Headline inflation.

d Source: Authors' calculations using EViews.

This study examined the impact of food inflation on headline inflation in India during the post-millennium period (2001–2021) using four major inflation indicators, namely the Wholesale Price Index (WPI), Consumer Price Index for Industrial Workers (CPI-IW), Consumer Price Index for Agricultural Labourers (CPI-AL), and Consumer Price Index for Rural Labourers (CPI-RL). Annual time-series data were analyzed using the Augmented Dickey–Fuller (ADF) unit root test, Johansen cointegration test, and regression analysis to investigate both the long-run relationship and the magnitude of the impact of food inflation on headline inflation.

The empirical findings reveal that food inflation and headline inflation exhibit a stable long-run equilibrium relationship across all four inflation measures. The regression results further demonstrate that food inflation exerts a statistically significant and positive influence on headline inflation, with high explanatory power across all estimated models. The consistent rejection of the null hypotheses

confirms that fluctuations in food prices are a major determinant of overall inflation dynamics in India.

These findings underscore the importance of food price stability in achieving broader macroeconomic stability. Since food inflation is capable of transmitting inflationary pressures to other sectors of the economy through higher production costs, transportation expenses, and inflation expectations, monetary policy alone may not be sufficient to ensure effective inflation management. A comprehensive policy approach combining prudent monetary measures with structural reforms aimed at enhancing agricultural productivity, improving storage and warehousing facilities, strengthening supply-chain infrastructure, reducing post-harvest losses, and ensuring efficient market distribution is essential for containing food price volatility and maintaining long-term price stability.

The study contributes to the existing literature by providing a comparative empirical assessment of the relationship between food inflation and headline inflation across four major inflation indices over an extended post-millennium period. Unlike many previous studies that focus on a single inflation measure, the present analysis offers a broader understanding of how food price movements influence different segments of the Indian economy.

Despite these contributions, the study is subject to certain limitations. The analysis is based on annual data and focuses exclusively on the direct relationship between food inflation and headline inflation. Future research may employ higher-frequency data, incorporate additional macroeconomic variables such as crude oil prices, exchange rates, money supply, rainfall, and agricultural output, and apply more advanced econometric techniques to examine both the short-run and long-run dynamics of inflation. Such investigations would provide a more comprehensive understanding of inflation transmission mechanisms and support the formulation of more effective inflation stabilization policies.

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