Food Inflation in Kerala: Exploring Interlinkages among Southern States in India

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Abstract: *Food inflation remains a critical economic concern, particularly in developing economies, where price volatility affects both consumers and producers. This study examines the regional dynamics of food inflation in Kerala in relation to other southern Indian states, namely Tamil Nadu, Karnataka, Andhra Pradesh, and Telangana, using monthly data from 2016 to 2024 to do so. Employing Johansen Cointegration and Granger causality tests, the study uncovered significant long-run co-movement among food inflation rates across these states. The results indicate that Tamil Nadu's food inflation has a significant short-term influence on Kerala, while Telangana exerts a dominant long-term impact, suggesting structural linkages in food supply chains. The corresponding Impulse Response Analysis reveals that inflation shocks from Kerala, Tamil Nadu, and Telangana generate positive spillover effects on Kerala's food inflation rates. Moreover, Granger causality tests confirm a unidirectional influence from all other southern states to Kerala, highlighting the predictive power of the regional inflation trends. These findings emphasise the need for coordinated food inflation control policies and supply chain improvements to mitigate inflationary pressures in the state. This study provides key policy recommendations, including enhanced regional price monitoring, trade facilitation, and inflation forecasting mechanisms to strengthen food price stability.*

Keywords: Food Inflation, India, Kerala, Regional price linkages, Southern States

INTRODUCTION

Food inflation is a critical macroeconomic challenge that affects both consumers and producers, particularly in developing economies, such as India. Rising food prices can erode purchasing power, disproportionately impacting lowincome households, while also influencing monetary policy decisions, fiscal stability, and overall economic growth, with their high backward and forward linkages with all other sectors of the economy. Food inflation volatility is often driven by a combination of supply side factors, including weather shocks, agricultural productivity, supply chain disruptions, and policy interventions such as Minimum Support Prices and trade restrictions. On the demand side, changing consumption patterns, population growth, and rising incomes contribute to food price fluctuations . Given its complex nature, food inflation is a key concern for policymakers aiming to balance food security, price stability, and economic development (Ahmed & Singla, 2014; Anand et al., 2016; Bhaskar et al., 2010; Bhattacharya & Gupta, 2015; Bhattacharya & Sen Gupta, 2018). In India, where food constitutes a significant portion (45.86 Weights) of the Consumer Price Index (CPI), controlling food inflation remains a policy priority to ensure overall price stability and, thereby, economic stability and social welfare.

While food inflation is a nationwide concern, its regional dynamics vary significantly across Indian states owing to differences in agricultural production, supply chain infrastructure, market linkages, and policy interventions. In this context, the southern states of India–Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, and Telangana exhibit distinct inflationary trends influenced by state-specific factors such as climate conditions, trade policies, and food distribution mechanisms. Kerala has the fifth highest inflation rate of 6.4 per cent (CPI) which is higher than the all-India average of 5.22 per cent and other southern states in India, namely Tamil Nadu (5.2 per cent), Karnataka (5.1 per cent), Andhra Pradesh (4.3 per cent), and Telangana (3.1 per cent) as of December 2024 (MoSPI). It is a consumerist state, where there is a significant increasing trend in the consumption of both food and non-food items, especially among the middle and low-income groups (Nithya, 2013). It is heavily reliant on food imports from neighbouring states, making it vulnerable to external price shocks. The transmission of inflation from one state to another highlights the importance of understanding regional interdependencies in food-price movements. However, limited research has focused on the spillover effects of food

DOI: https://doi.org/10.62656/SIJSS.v24i3.2458

inflation in Kerala and its relationship with other southern states. This study aims to bridge this gap by investigating how food inflation in Kerala is influenced by the inflationary trends in the southern states of India. Therefore, this study aims to analyse the trends and patterns of food inflation in Kerala and other southern states in India and determine whether Kerala's food inflation is cointegrated with food inflation in other southern states in India.

REVIEW OF LITERATURE

Price stability is a crucial factor in international trade and competition (Anderl & Caporale, 2023). Several studies have found interlinkages between inflation and its various factors, including GDP, trade balance, unemployment, exchange rates, budget outlay, stock returns, inflation expectations, nominal interest rates, Brent crude oil price, energy and food prices, government debts, and other domestic factors (Aizenman & Hausmann, 1995; Balduzzi, 1995; Bhattarai, 2016; Caporale & Gil-Alaña, 2019; Brouwer & Haan, 2022; Ahmed et al., 2023; Castle et al., 2023; Mulatu Kerorsa, 2023; Cepni & Clements, 2024). Regional consumer price inflation in India is shaped by several macroeconomic and structural factors, and there are only limited studies that delve into the interlinkages among the price dynamics of different regions. A. Jha & Dhal (2019) found that inflation persistence, per capita income growth, supply-side factors, oil prices, interest rates, state government expenditure, taxes, and structural factors such as power and water inputs have statistically significant effects on regional consumer price inflation.

However, market integration in India is not complete, primarily due to excessive government intervention in rice markets, which hinders the transmission of price signals from regions with abundant supply to those experiencing scarcity (R. Jha et al., 2005). Despite these market imperfections, evidence suggests that prices remain interrelated across regions. Paul and Karak (2022) reported co integration between wholesale and retail wheat prices and, using the Vector Error Correction Model (VECM), showed that price signals are transmitted across markets, with price changes in one market influencing prices in other markets. Their results further indicate that retail prices adjust more rapidly than wholesale prices to restore the long-run equilibrium. Similarly, Bhattacharya and Das (2008) found that relative price levels among various regions in India are mean-reverting, suggesting long-run convergence in regional prices.

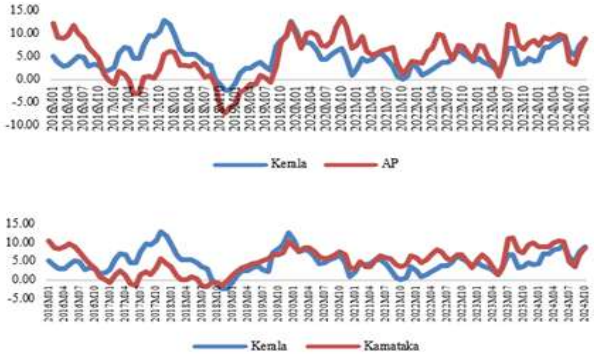
Against this backdrop, this study aims to examine the regional interdependencies in food inflation between Kerala and other southern Indian states. Using monthly data from 2016 to 2024, the study employs the Johansen Cointegration and Granger causality tests to analyse both short-run and long-run relationships in food inflation rates. Specifically, it aims to investigate the long-run co-movement of food inflation rates in Kerala and its neighbouring states, identify the short and long-run drivers of Kerala's food inflation, and assess how inflation in Tamil Nadu, Karnataka, Andhra Pradesh, and Telangana influences Kerala. This study further analyses Impulse Response Functions to understand Kerala's reaction to inflationary shocks from other states, examines variance decomposition to determine the relative contribution of different states to Kerala's inflation dynamics over time, and uses Granger causality tests to establish the direction of influence among these states. Through this comprehensive approach, this study provides valuable insights into regional price spillovers and their implications for inflation management in Kerala.

METHODOLOGY

This study aims to examine the interlinkages between food inflation levels in South Indian states, namely, Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, and Telangana, by using secondary sources of monthly data on the CPI-based food inflation rate (YoY) consisting of food and beverages (Compilation of Consumer Price Index: A Technical Note, 2020) retrieved from the online database of the Ministry of Statistics and Programme Implementation (MoSPI). The time series data on the food inflation rate spanning from 2016M01 to 2024M10 were used for the analysis to cover the period of the Flexible Inflation Targeting Regime. The excluded variables, such as fuel prices, transport costs, and rainfall, are regarded as underlying drivers of state-level inflation, whose effects are indirectly embodied in the observed inflation rates of individual states. Consequently, neighbouring states' inflation rates serve as reduced-form indicators that summarise the combined influence of these underlying structural factors (Sims, 1980). The Johansen Cointegration test and corresponding Vector Error Correction Mechanism (VECM), Granger Causality test, Impulse Response Function and Variance Decomposition were carried out to find the long-run equilibrium and shortrun relationship among the variables and Kerala's interlinkages with other southern states food inflation levels using EViews software.

RESULTS

Understanding the regional dynamics of food inflation is crucial for effective policy formulation and managing inflation. This section presents the empirical findings of the study, highlighting both the short and long-run relationships between Kerala's food inflation and that of other southern states of India. Kerala's inflation rate (6.4 percent) is higher than the all-India average of 5.22 percent and the other southern states in India, namely Tamil Nadu (5.2 percent), Karnataka (5.1 percent), Andhra Pradesh (4.3 percent), and Telangana (3.1 percent) as of December 2024 (Ministry of Statistics and Programme Implementation). Figure 1 depicts the relationship between food inflation in Kerala and the southern states of India, namely Tamil Nadu, Telangana, Karnataka, and Andhra Pradesh, from 2016 to 2024. It could be noted that Kerala's food inflation rate is moving together with the southern states food inflation rates.



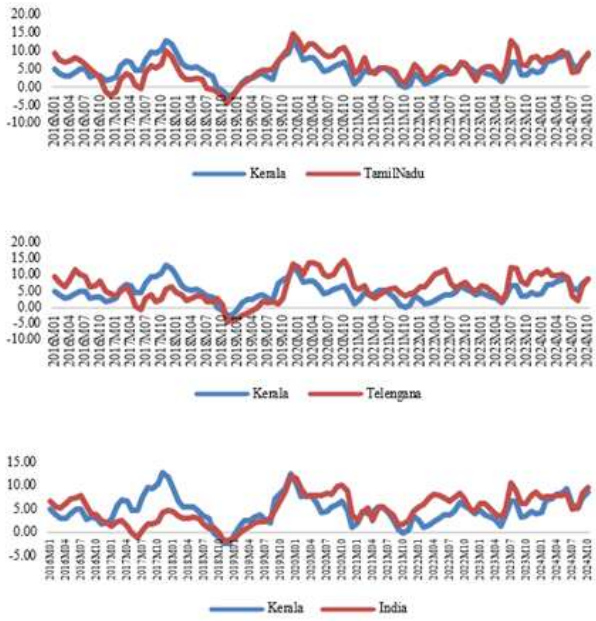


Figure 1: Kerala's Food inflation in comparison with other southern states of India

Source: Ministry of Statistics and Programme Implementation | Government of India, 2025

Table 1: Unit root test results

Variables	Level	First difference	Decision
Kerala	-2.6791	-8.6515	I(1)
	(-0.0811)	(0.0000)	
Tamil Nadu	-1.1489	-11.4653	I(1)
	(-0.2270)	(0.0000)	
Karnataka	-1.2584	-11.3053	I(1)
	(-0.1906)	(0.0000)	
Andhra Pradesh	-1.5996	-9.607	I(1)
	(-0.1030)	(0.0000)	
Telangana	-1.1852	-10.6514	I(1)
	(-0.2145)	(0.0000)	

Note: Values indicate the ADF test statistics, and the values in parentheses indicate the corresponding p-value at the 5% level of significance.

Table 1 shows the unit root test results of the rate of food inflation for all the southern states of India, namely, Kerala, Tamil Nadu, Karnataka, Andhra Pradesh, and Telangana, using the widely used Augmented Dickey Fuller (ADF) test. The test results show that all the series are stationary at the first difference or integrated at order one, that is, I(1). If the variables are integrated with the same order, we can employ the Johansen Cointegration test to find the long-run equilibrium relationship among the variables

Table 2: Johansen Cointegration test results

Hypothesis	Eigen value	Max-Eigen Statistic	p-value
None *	0.3029	36.4414	0.0242
At most 1	0.204	23.0397	0.1718
At most 2	0.1368	14.8554	0.2991
At most 3	0.1039	11.076	0.1504
At most 4	0.0946	10.0359	0.0015

Note: * denote the significance level at 5%

Table 2 shows the estimated results of the Johansen Cointegration test to find the long-run co-movement among the variables food inflation rates of southern states in India. The Cointegration test using the maximum eigenvalue statistic indicates that there is one cointegration equation among the variables at the 5 per cent level of significance.

Table 3: Estimation of Vector Error Correction Model (VECM)

Variables	Coefficient	Std. Error	t statistic
Long-run Coefficients			
Tamil Nadu*	7.0371	1.8608	-3.7817
Karnataka	2.6087	1.9637	-1.3284
Andhra Pradesh*	-6.1043	2.1015	2.9047
Telangana	-1.6379	1.8543	0.8833
ECT*	-0.023	0.0096	-2.3996
Short-run coefficients			
rKerala $_{t-1}$	0.2945	0.1644	1.7912
rKerala $_{t-2}$	0.0143	0.1759	0.0812
rTamil Nadu $_{t-1}$	0.1663	0.208	0.7997
rTamil Nadu $_{t-2}$	-0.1779	0.2114	-0.8416
r Karnataka $_{t-1}$	-0.1721	0.2243	-0.7673
r Karnataka $_{t-2}$	-0.0602	0.214	-0.2815
r Andhra Pradesh $_{t-1}$	-0.143	0.1392	-1.0275
r Andhra Pradesh $_{t-2}$	0.1189	0.1503	0.7908
rTelangana $_{t-1}$	0.0789	0.1316	0.5994
rTelangana $_{t-2}$	-0.3026	0.1214	-2.4932

Note: *indicates the significance level at 5 per cent

As the variables are cointegrated, the VECM is estimated to analyse the long and short-run relationships between food inflation in Kerala and other southern states of India from 2016M01 to 2024M10. In the long run, Tamil Nadu's food inflation has a significant positive impact on the food inflation rate in Kerala. The estimated long-run equation for Kerala's food inflation is as follows:

Kerala = 7.04 Tamil Nadu* + 2.61 Karnataka – 6.10 Andhra Pradesh* – 1.64 Telangana – 0.02 ECT*

The Error Correction term in the VECM indicates how quickly short-run deviations from the long-term equilibrium are corrected. The negative and significant Error Correction Term (ECT) coefficient (-0.02) indicates the speed of adjustment towards the equilibrium relationship, that only 2 per cent of any deviation from the long-run equilibrium is corrected in the next month, implying a slow speed of adjustment (Table 3).

In the short run (Table 3), Telangana's food inflation significantly impacts Kerala's food inflation with a two month lag (coefficient = -0.30, t = -2.4932). However, the short-run impact of the other Southern States is not statistically significant. The results suggest that Kerala's food inflation is significantly influenced by Tamil Nadu in the long run and Telangana in the short run. This highlights the need for coordinated food price policies among Southern States to manage inflation effectively. A shock in one state (for example, supply side disruptions) may spread through others owing to interconnectedness.

The Impulse Response Function shows how a shock to one variable affects other variables over time. Here, the response of Kerala's food price inflation to shocks in other southern states food inflation is displayed in Figure 2. The X-axis measures the time period (months), and the Y-axis measures the magnitude and direction (positive or

negative) of Kerala's food inflation response. The immediate response of food inflation rates in Kerala to a shock increases in the case of shocks in Kerala, Tamil Nadu, and Telangana and decreases in response to shocks in Karnataka and Andhra Pradesh. The magnitude of the response to other states is smaller than that of its own shocks. The rise in Kerala's food inflation in response to shocks in other states quickly returned to equilibrium. Tamil Nadu has comparatively stronger impact on Kerala as it is geographically closer to Kerala. Tamil Nadu's inflation shock significantly and positively affects Kerala's inflation in short term.

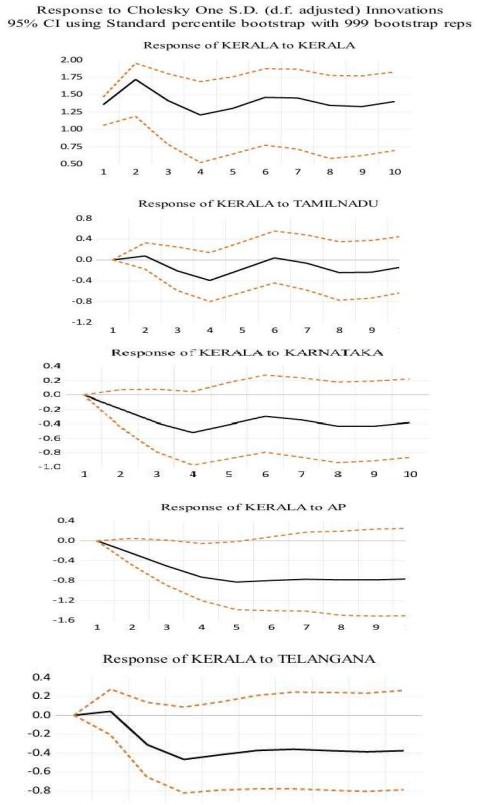


Figure 2: Impulse Response Function (IRF) of Kerala in response to innovations in other Southern States of India

Table 4: Variance Decomposition of Kerala's Food Inflation

Period	Std. Error	Kerala	Tamil Nadu	Karnataka	Andhra Pradesh	Telangana
1	1.3555	100	0	0	0	0
2	2.213	97.83	0.12	0.74	1.28	0.04
3	2.727	91.28	0.67	2.43	4.28	1.33
4	3.1731	81.86	2.04	4.45	8.49	3.16
5	3.5816	77.47	1.84	4.79	12.05	3.85
6	3.978	76.26	1.5	4.43	13.8	4
7	4.3339	75.48	1.29	4.36	14.82	4.06
8	4.6465	74.03	1.4	4.64	15.75	4.18
9	4.9355	72.85	1.47	4.86	16.5	4.32
10	5.216	72.43	1.37	4.88	16.93	4.39

Note: Using Cholesky (d.f. adjusted) Factors

Variance Decomposition in Table 4 provides insight into how much of the forecast error variance of Kerala's food inflation is explained by shocks to itself and food inflation of Tamil Nadu, Karnataka, Andhra Pradeesh and Telangana. Kerala's food inflation variance is largely explained by its own shocks (100 per cent), indicating localised dynamics in both the short- and long-run. In the long run, Kerala's own shocks contribution reduced (72 per cent). Andhra Pradesh becomes the dominant external contributor (17 per cent) followed by Karnataka (5 per cent), Telangana (4 per cent) and Tamil Nadu (1 per cent), which indicates significant regional spillovers over the long term with Andhra Pradesh being the most influential. Both in the short and long terms, Kerala's food inflation is largely self-driven; however, Andhra Pradesh and other states also exert a significant influence over the long term. Regional policy coordination may be necessary to address food inflation effectively. Supply chain integration or collaborative agricultural policies may mitigate inflationary pressures. The increasing contribution of other state shocks over time highlights the interdependence of state economies. The policies affecting one state's food inflation are likely to impact the other states food inflation levels.

Table 5: Diagnostic test results

Null Hypothesis	Test Statistic	P value
Normality	9.2083	0.101
No autocorrelation	17.4045	0.8669
Homoskedasticity	1200.43	0.1718

The diagnostic tests (Table 5) confirm that the estimates are robust, with no auto correlation (LM test p=0.87), no heteroskedasticity (p=0.17), and the residuals are normally distributed (Jarque-Bera p=0.10). The Granger causality test in Table 6 indicates predictive relationships based on past values. There is unidirectional feedback from the lagged values of the food inflation rates of Telangana, Tamil Nadu, Karnataka, and Andhra Pradesh to Kerala's food inflation. Southern states inflation can help predict Kerala's food inflation, but not the other way around, except for Tamil Nadu.

Table 6: Granger Causality test results

Null Hypothesis (X does not Granger-Cause Y)	F-statistic	Prob.
Tamil Nadu ↛ Kerala**	3.13745	0.0117
Kerala ↛Tamil Nadu*	2.06276	0.0774
Karnataka ↛ Kerala**	2.33495	0.0484
Kerala ↛ Karnataka	1.87217	0.1070
Andhra Pradesh ↛ Kerala*	1.97292	0.0902
Kerala ↛ Andhra Pradesh	1.48137	0.2037
Telangana ↛ Kerala***	3.98379	0.0026
Kerala ↛ Telangana	1.30690	0.2682
Karnataka ↛ Tamil Nadu	0.77168	0.5726
Tamil Nadu ↛ Karnataka	1.02531	0.4076
Andhra Pradesh ↛ Tamil Nadu	1.64811	0.1554
Tamil Nadu ↛ Andhra Pradesh **	2.98569	0.0154
Telangana ↛Tamil Nadu**	2.41945	0.0417
Tamil Nadu ↛ Telangana**	2.74500	0.0235
Andhra Pradesh ↛ Karnataka	1.78398	0.1241
Karnataka ↛ Andhra Pradesh *	2.27019	0.0541
Telangana ↛ Karnataka	1.86019	0.1092
Karnataka ↛ Telangana**	3.18376	0.0108
Telangana ↛ Andhra Pradesh	1.24842	0.2933
Andhra Pradesh ↛ Telangana**	2.67435	0.0267

Note: *, **, *** denote significance levels at 10%, 5%, and 1%, respectively.

The results provide several key insights into the regional dynamics of food inflation in Kerala in relation to the other southern states of India. The results indicate the existence of regional price transmission, suggesting that inflation trends in these states move together over time. Therefore, policymakers should establish regional coordination mechanisms for monitoring prices. Given that Tamil Nadu significantly influences Kerala's food inflation in the short run, the Kerala government should strengthen price monitoring systems and supply chain efficiencies to mitigate sudden inflationary shocks. To reduce its dependence on price fluctuations in other states, Kerala should invest in food storage facilities, transportation networks, and local production and productivity enhancement.

CONCLUSION

This study examines the regional dynamics of food inflation in Kerala in relation to other southern states of India using monthly data from 2016–2024. This study makes a significant contribution to the literature on regional foodinflation dynamics in India. While previous research has focused on national-level food inflation trends, this study provides a state-level perspective, highlighting the spillover effects of inflation in southern states. The findings reveal that Tamil Nadu's food inflation has a significant short-run impact on Kerala, while Telangana's inflation exerts a dominant long-run influence, underscoring the structural linkages between these states. The findings reveal a strong long-run co-movement among food inflation rates across these states, highlighting significant interdependencies in food price movements. While Tamil Nadu's food inflation exerts a short-run impact on Kerala, its long-run influence is driven by Telangana, suggesting a structural linkage in agricultural supply chains and trade flows. Food inflation in Kerala reacts positively to shocks from Tamil Nadu and Telangana, reinforcing the idea of regional inflation spillovers. This further establishes that food inflation in Kerala is influenced by other southern states, but not vice versa. The Impulse Response Analysis confirms that food inflation shocks from Kerala, Tamil Nadu, and Telangana generate positive spillover effects, and the Variance Decomposition results indicate that Andhra Pradesh's influence on Kerala's food inflation increases over time. The Granger causality test further established a unidirectional transmission mechanism from all the other southern states to Kerala. These insights have important policy implications, emphasising the need for regional price monitoring and coordinated policy interventions to ensure the stability of food prices. These findings underscore the need for coordinated inflation-management strategies among southern states and state-specific policy interventions in Kerala to mitigate inflationary pressures.

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