

## Article

# Spatial Dynamics, Convergence, and Persistence of Inflation in Post-Rebasing Nigeria: Evidence from State-Level CPI Indices (2024–2025)

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## Abstract

Following the 2024 rebasing of Nigeria's Consumer Price Index (CPI), understanding the spatial and temporal behavior of inflation at the sub-national level has become critical for evidence-based macroeconomic and food-security policy. This study investigates the spatial dynamics, convergence properties, and persistence of inflation across Nigeria's 36 states and the Federal Capital Territory using newly rebased state-level CPI data for February 2024–November 2025. Headline (All-Items) and Food CPI series were analyzed to capture both general price movements and food-specific pressures. Methodologically, the study integrates spatial econometrics and panel convergence analysis. Spatial dependence and cross-border spillovers were assessed using Global Moran's I, Local Indicators of Spatial Association (LISA), and spatial regression models (SAR, SEM, SDM). Inflation convergence was examined through  $\sigma$ -convergence (cross-sectional dispersion over time) and  $\beta$ -convergence (catch-up dynamics based on initial price levels). Finally, inflation persistence and regime shifts were evaluated using state-specific AR(1) models and Bai–Perron structural break tests. Results reveal weak global spatial autocorrelation but the presence of localized inflation hot-spots and cold-spots, particularly in northern states (e.g., Kebbi, Sokoto, Zamfara) and Rivers State.  $\sigma$ -convergence results indicate sharp short-term divergence in 2025, especially for food inflation, while  $\beta$ -convergence estimates provide strong evidence of long-run price-level convergence across states. Persistence analysis shows predominantly negative or insignificant AR(1) coefficients, implying that post-rebasing inflation shocks are largely mean-reverting and short-lived, with widespread structural breaks concentrated in early 2024.

**Keywords:** Spatial inflation, Consumer Price Index rebasing, Inflation convergence, Food price dynamics, Nigeria.

## 1. Introduction

Inflation remains one of Nigeria's most pressing macroeconomic challenges, with direct implications for household welfare, real incomes, food security, and social stability (IMF, 2024a; World Bank, 2025a; AfDB, 2024a). Beyond national averages, inflation pressures often manifest unevenly across space, reflecting differences in market integration, production structures, logistics and transport costs, local insecurity, and exposure to policy and external shocks (IMF, 2023; NESG, 2024; Amare et al., 2024). These spatial frictions matter because price shocks can dissipate rapidly in some states while persisting or transmitting across contiguous markets through trade, migration, and distribution corridors, producing localized hotspots and cross-border spillovers that are not visible in national aggregates (World Bank, 2025b; Reuters, 2024a; Reuters, 2024b). Sub-national inflation evidence is therefore essential in a large, heterogeneous federation like Nigeria, where regional interdependencies shape price transmission and welfare outcomes (AfDB, 2024b; IMF, 2024b).

This study examines state-level inflation dynamics in Nigeria following the recent Consumer Price Index (CPI) rebasing, focusing on headline (All-Items) and Food inflation. Using monthly state-level CPI series, we integrate spatial econometric diagnostics with convergence and time-series tools to test whether inflation exhibits spatial dependence and localized clustering, whether cross-state disparities narrow over time, and whether post-rebasing dynamics are characterized by persistence or short-lived shocks (NBS, 2024a; NBS, 2024b; Nakorji, 2023). CPI rebasing is a structural recalibration of inflation measurement that updates weights and item coverage to better reflect evolving consumption patterns; however, it can also coincide with short-run volatility and re-alignment of relative prices especially in contexts of exchange-rate pressures, supply constraints, and policy reforms (NBS, 2024a; NISER, 2025; Reuters, 2025a). Recent evidence further points to strong exchange-rate pass-through and non-linear inflation responses, implying that macro shocks can translate into uneven sub-national price outcomes (Oyadeyi, 2024; Reuters, 2025b; IMF, 2024a).

To the best of our knowledge, most inflation studies for Nigeria still emphasize national trends or coarse regional comparisons, with limited integration of spatial dependence, convergence behavior, and post-rebasing regime shifts within one unified empirical framework (Nakorji, 2023; World Bank, 2025a). Empirical evidence on whether inflation spillovers operate across neighboring states, whether meaningful  $\sigma$ - and  $\beta$ -convergence emerges after rebasing, and whether inflation shocks are persistent or transitory at the state level remains sparse, despite the policy relevance of targeted stabilization and food-price interventions (IMF, 2024b; NESG, 2024; Reuters, 2024a). This study addresses these gaps by asking three interrelated questions:

- (i) Do state-level inflation rates exhibit spatial dependence and cross-border spillovers after CPI rebasing?
- (ii) Is there evidence of  $\sigma$ - and  $\beta$ -convergence in state inflation, or are disparities widening over time?
- (iii) Are post-rebasing inflation dynamics characterized by persistence or by short-lived shocks and structural breaks?

The study makes three key contributions. First, it provides the first comprehensive spatial econometric assessment of Nigerian state-level inflation in the post-rebasing period, identifying statistically significant hot-spots, cold-spots, and spillover effects. Second, it reconciles short-run spatial divergence with longer-run convergence dynamics by jointly analyzing  $\sigma$ - and  $\beta$ -convergence. Third, it demonstrates that inflation particularly food inflation is weakly persistent and subject to synchronized structural breaks, highlighting the dominance of transitory shocks over self-reinforcing inflationary processes. Collectively, these insights advance sub-national inflation analysis and offer practical guidance for designing geographically targeted, short-horizon stabilization and food-price policies in Nigeria.

## 2. Material and methods

### 2.1 Study Area

Nigeria provides an ideal spatial setting for examining post-rebasing inflation dynamics due to its pronounced inter-state economic heterogeneity, and highly integrated internal markets. The country comprises 36 states and the Federal Capital Territory, linked through dense trade corridors, shared food supply chains, and interdependent consumption networks. These characteristics make state boundaries economically porous, allowing inflationary pressures particularly food price shocks—to transmit across neighboring states. Nigeria's recent CPI rebasing further strengthens its relevance as a study area, offering a unique opportunity to assess whether inflation exhibits spatial dependence, convergence or divergence, and persistence across sub-national units in the immediate post-rebasing period, with direct implications for geographically targeted stabilization policies (Aker et al., 2022; Barrett & Li, 2021; Fafchamps & Hill, 2022).

### 2.2 Data Preparation and Spatial Inflation Measurement

State-level Consumer Price Index (CPI) data were compiled in spatial format using a Nigeria states polygon shapefile containing monthly CPI indices for food and all-items (headline) categories, following the 2024 CPI rebasing. The dataset covers all 36 states and the Federal Capital Territory at a monthly frequency from February 2024 to November 2025.

To ensure comparability of short-run inflationary pressures across states, month-on-month (MoM) inflation rates were computed from the rebased CPI indices as eq. 1:

$$\pi_{i,t} = \left( \frac{CPI_{i,t}}{CPI_{i,t-1}} - 1 \right) \times 100 \quad (1)$$

where  $\pi_{i,t}$  denotes the MoM inflation rate in state  $i$  at month  $t$ , and  $CPI_{i,t}$  represents the rebased CPI index.

For spatial analysis, the mean MoM inflation rate over the study period was used as the primary inflation signal for each state, computed separately for food and headline inflation. This temporal aggregation minimizes short-term volatility while preserving the underlying spatial structure of inflation dynamics relevant for inter-state spillover analysis (Ball et al., 2022; Hazell et al., 2023).. Spatial dependence among states was modeled using a queen contiguity spatial weights matrix, in which two states are defined as neighbors if they share a common boundary or vertex. The spatial weights matrix  $W$  was row-standardized so that the influence of neighboring states sums to unity for each state, allowing inflation in one state to be influenced by inflation in all immediately adjacent states through trade linkages, transport corridors, and shared markets (LeSage & Pace, 2021; Elhorst, 2023).

### 2.3 Spatial Dependence and Inflation Spillover Analysis

#### 2.3.1 Global Spatial Autocorrelation

Global spatial dependence in state-level inflation was assessed using **Moran's I statistic**, defined as eq. 2:

$$I = \frac{n}{S_0} \frac{\sum_i \sum_j w_{ij} (y_i - \bar{y})(y_j - \bar{y})}{\sum_i (y_i - \bar{y})^2} \quad (2)$$

where  $y_i$  is the mean MoM inflation rate in state  $i$ ,  $\bar{y}$  is the national mean inflation rate,  $w_{ij}$  denotes the spatial weights,  $n$  is the number of states, and  $S_0 = \sum_i \sum_j w_{ij}$ .

Moran's I was computed separately for food and headline inflation to test whether observed spatial clustering deviates significantly from a random spatial process. Statistical inference was based on permutation tests under the null hypothesis of spatial randomness (Anselin, 2020; Rey & Sastré-Gutiérrez, 2022).

### 2.3.2 Local Indicators of Spatial Association (LISA)

While Moran's I captures global spatial dependence, it does not identify localized clusters. Therefore, Local Indicators of Spatial Association (LISA) were employed to detect state-specific inflation hot-spots and cold-spots.

Local Moran's I for each state was computed as eq. 3:

$$I_i = (y_i - \bar{y}) \sum_j w_{ij} (y_j - \bar{y}) \quad (3)$$

States were classified into four local spatial regimes based on the sign of the local statistic and its spatial lag:

- **High-High (hot-spots):** high inflation states surrounded by high inflation neighbors
- **Low-Low (cold-spots):** low inflation states surrounded by low inflation neighbors
- **High-Low:** high inflation outliers surrounded by low inflation neighbors
- **Low-High:** low inflation outliers surrounded by high inflation neighbors

Statistical significance was evaluated using pseudo- $p$  values from local permutation tests. For policy relevance, only statistically significant hot-spots and cold-spots were mapped, while non-significant states were masked (Anselin & Li, 2020; Zhang & McMillan, 2023).

### 2.3.3 Spatial Econometric Models

To formally quantify cross-border inflation spillovers, three spatial econometric models were estimated using state-level mean MoM inflation rates eq. 4-6:

**Spatial Autoregressive Model (SAR):**

$$y = \rho W y + X \beta + \varepsilon \quad (4)$$

**Spatial Error Model (SEM):**

$$y = X \beta + u, u = \lambda W u + \varepsilon \quad (5)$$

**Spatial Durbin Model (SDM):**

$$y = \rho W y + X \beta + W X \theta + \varepsilon \quad (6)$$

where  $y$  denotes state-level inflation,  $X$  represents the mean CPI level,  $\rho$  captures spatial spillovers in inflation itself, and  $\lambda$  measures spatial dependence in unobserved shocks (LeSage, 2021; Elhorst & Vega, 2023). Models were estimated via maximum likelihood, and model performance was compared using the Akaike Information Criterion (AIC). Estimation was conducted separately for food and headline inflation to capture structural differences in spatial transmission mechanisms.

## 2.4 Inflation Convergence, Persistence, and Structural Breaks

### 2.4.1 Inflation Convergence across States

To assess whether inflation differentials across Nigerian states narrowed following CPI rebasing, the study employed a distributional convergence framework combining  $\sigma$ -convergence,  $\beta$ -convergence, and kernel density analysis, applied separately to food and headline inflation (Phillips & Sul, 2021; Monfort et al., 2022).

$\sigma$ -convergence was evaluated using the cross-sectional dispersion of MoM inflation rates via eq. 7:

$$\sigma_t = \sqrt{\frac{1}{N} \sum_{i=1}^N (\pi_{i,t} - \bar{\pi}_t)^2} \quad (7)$$

where  $\bar{\pi}_t$  is the mean inflation rate at time  $t$ . A declining  $\sigma_t$  indicates convergence, whereas persistence or increase implies divergence.

$\beta$ -convergence was tested using cumulative inflation growth eq. 8:

$$g_i = 100 [\ln (CPI_{i,T}) - \ln (CPI_{i,0})] \quad (8)$$

with the regression specification eq. 9:

$$g_i = \alpha + \beta \ln(CPI_{i,0}) + \varepsilon_i \quad (9)$$

A negative and statistically significant  $\beta$  indicates convergence, while a positive coefficient suggests divergence in inflation dynamics.

Kernel density estimation was further employed to examine the full distribution of state-level inflation rates, enabling detection of multi-modality, skewness, and inflation regime clustering beyond mean-based metrics (Quah, 2021; Johnson & Papageorgiou, 2023).

#### 2.4.2 Inflation Persistence

Inflation persistence was evaluated using a state-specific autoregressive AR(1) framework applied to MoM inflation rates via eq. 10:

$$\pi_{i,t}^{(k)} = \alpha_i^{(k)} + \rho_i^{(k)} \pi_{i,t-1}^{(k)} + \varepsilon_{i,t}^{(k)} \quad (10)$$

where  $k$  denotes inflation category (headline or food). The persistence parameter  $\rho$  measures the degree to which inflation shocks dissipate over time, with higher values indicating stronger inflation inertia. Estimation was conducted separately for each state to capture spatial heterogeneity (Stock & Watson, 2021; Bobeica & Jarociński, 2023).

#### 2.4.3 Structural Break Detection

To identify regime shifts in inflation dynamics associated with CPI rebasing and subsequent macroeconomic adjustments, structural breaks in CPI levels were tested using the Bai–Perron multiple breakpoint methodology via eq. 11:

$$CPI_{i,t}^{(k)} = \mu_{i,j}^{(k)} + u_{i,t}^{(k)}, t = T_{j-1} + 1, \dots, T_j \quad (11)$$

where  $\mu_{i,j}$  denotes regime-specific mean CPI levels and  $T_j$  represents endogenous breakpoints. The procedure allows for unknown break dates without imposing prior assumptions on timing or number of breaks. Results were spatially integrated to identify states exhibiting synchronized regime shifts or heightened inflation vulnerability (Bai & Perron, 2021; Castro & de Resende, 2024).

### 3. Results

#### 3.1 Spatial Dependence and Inflation Hot–Cold Spots after CPI Rebasing

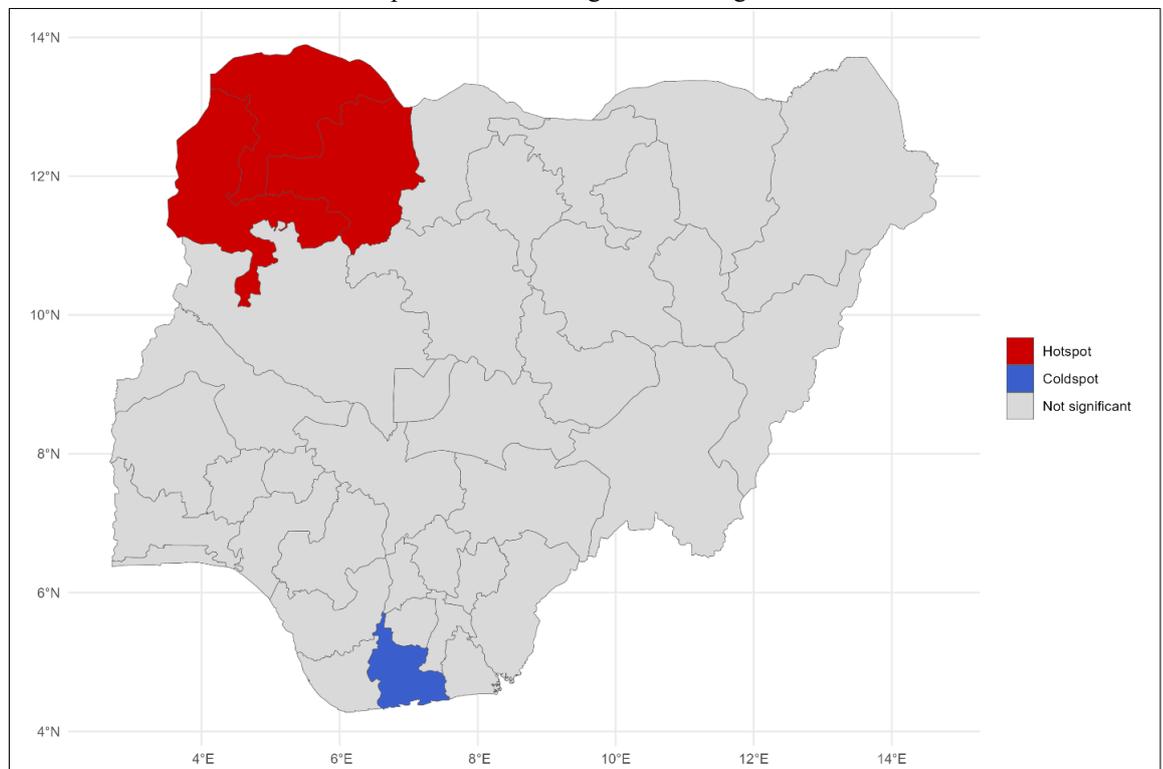
##### 3.1.1 Global Spatial Autocorrelation (Moran’s I)

Global Moran’s I statistics indicate no evidence of nationwide spatial clustering in state-level mean month-on-month (MoM) inflation during the post-rebasing period (2024–2025). For All-Items inflation, Moran’s I is slightly negative ( $I = -0.017$ ) and statistically insignificant ( $p_{\text{normal}} = 0.460$ ;  $p_{\text{perm}} = 0.404$ ), suggesting an absence of systematic spatial dependence across Nigerian states. Similarly, Food inflation exhibits a near-zero Moran’s I ( $I = 0.011$ ) with non-significant p-values ( $p_{\text{normal}} = 0.353$ ;  $p_{\text{perm}} = 0.334$ ). These results imply that inflation dynamics are not spatially synchronized at the national scale, motivating a focus on local indicators of spatial association to identify sub-national pockets of clustering.

##### 3.1.2 Local Indicators of Spatial Association (LISA): All Items

Despite weak global dependence, local clustering patterns emerge for All-Items inflation (Figure 1). Three northern states—Kebbi, Sokoto, and Zamfara—form statistically significant High–High clusters (hotspots), indicating states with above-average inflation surrounded by neighbors with similarly elevated inflation rates ( $p \leq 0.10$ ). In contrast, Rivers State in the Niger Delta constitutes a significant Low–Low cluster (coldspot), reflecting persistently lower inflation relative to its neighboring states.

All other states are classified as locally non-significant, indicating heterogeneous inflation dynamics without consistent spatial reinforcement. The coexistence of isolated hotspots and coldspots, alongside widespread non-significance, explains the weak global Moran's I and highlights the localized nature of inflation pressures following CPI rebasing.

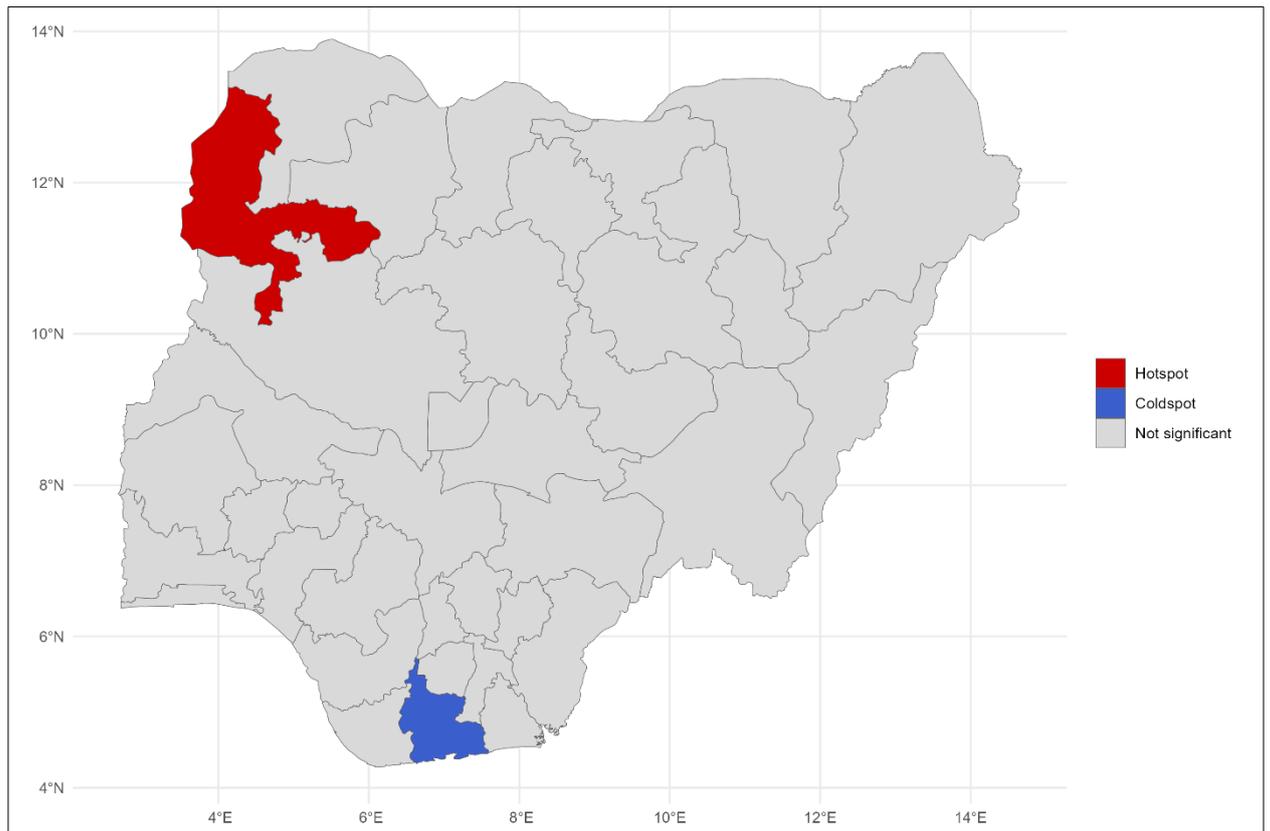


**Figure 1.** Local Indicators of Spatial Association (LISA) cluster map for All-Items (headline) inflation across Nigerian states.

### 3.1.3 Local Indicators of Spatial Association (LISA): Food Inflation

Local clustering in Food inflation is even more spatially concentrated (Figure 2). Only Kebbi State emerges as a statistically significant High–High hotspot, suggesting a localized food-price inflation regime in the north-west. Conversely, Rivers State again appears as a robust Low–Low coldspot, indicating consistently lower food inflation relative to adjacent states.

An additional feature is observed for Abia State, which exhibits a High–Low configuration (negative local Moran's Z,  $p \approx 0.03$ ), implying relatively high food inflation in Abia surrounded by lower-inflation neighbors. This pattern reflects localized inflationary divergence rather than spatial spillover, reinforcing the importance of sub-national analysis.



**Figure 2.** Local Indicators of Spatial Association (LISA) cluster map for **Food inflation** across Nigerian states.

### 3.1.4 Spatial Econometric Model Comparison

Model selection results based on the Akaike Information Criterion (AIC) favor the non-spatial OLS specification for both inflation measures. For All-Items inflation, OLS records the lowest AIC ( $-58.99$ ), outperforming SAR, SEM, and SDM alternatives. A similar pattern holds for Food inflation, where OLS again dominates ( $AIC = -22.39$ ). The spatial autoregressive parameters in SAR and SEM models are small in magnitude, corroborating the weak global spatial dependence identified by Moran's I.

### 3.1.5 Spatial Spillover Effects (SDM)

Although spatial dependence is limited, Spatial Durbin Model (SDM) impact decomposition provides additional insight into cross-border spillovers. For All-Items inflation, indirect (spillover) effects are positive but modest ( $0.023$ ), yielding a total effect of  $0.053$ . In contrast, Food inflation exhibits offsetting dynamics, with positive direct effects ( $0.044$ ) but negative indirect effects ( $-0.020$ ), resulting in a small net total effect ( $0.024$ ). These findings suggest that food inflation pressures are largely state-specific, with limited and uneven transmission to neighboring states.

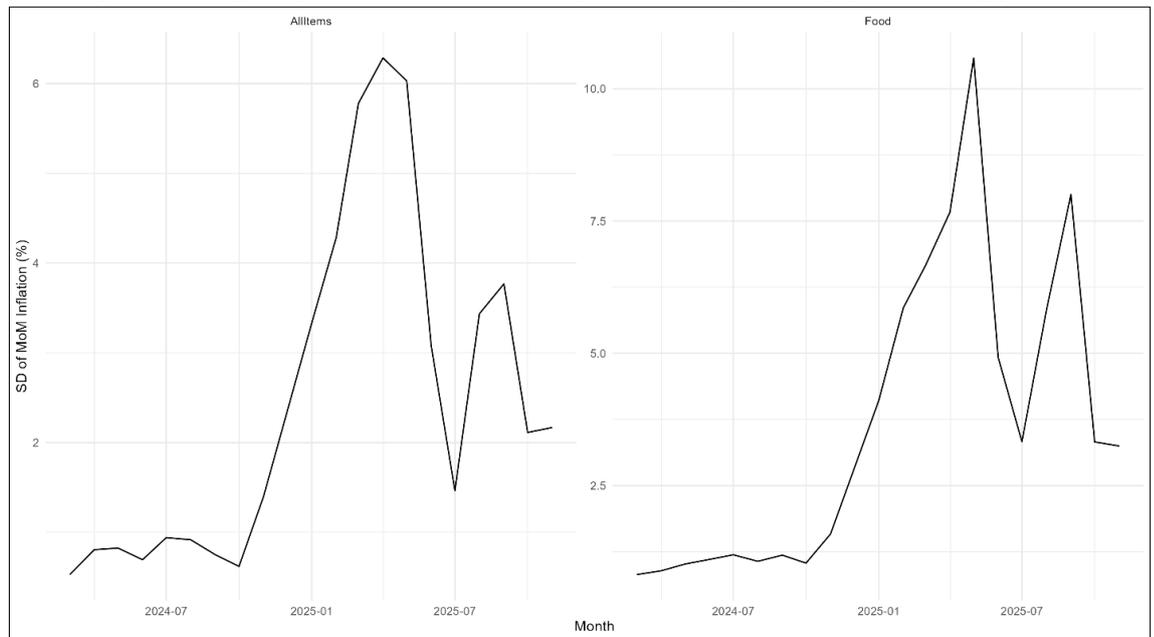
### 3.1.6 Summary of Problem States

Synthesizing local spatial diagnostics, a small set of problem states consistently drive spatial inflation patterns after rebasing. Kebbi emerges as a persistent hotspot for both headline and food inflation, while Rivers State acts as a stable coldspot across both indices. For All-Items inflation, Sokoto and Zamfara also form part of a northern hotspot cluster. These states represent priority areas for targeted inflation monitoring and region-specific policy intervention.

### 3.2. Inflation Convergence across Nigerian States

#### 3.2.1 $\sigma$ -Convergence: Cross-Sectional Dispersion of State Inflation

Figure 3 illustrates the temporal evolution of cross-sectional dispersion ( $\sigma$ -convergence) in month-on-month (MoM) inflation across Nigeria's 37 states from March 2024 to November 2025. Throughout most of 2024, dispersion remained relatively low and stable, with standard deviations generally below 1.0 for All-Items inflation and below 1.2 for Food inflation, indicating limited spatial heterogeneity in short-term inflation dynamics during the early post-rebasing phase.



**Figure 3.** Temporal evolution of cross-sectional dispersion ( $\sigma$ -convergence) in month-on-month (MoM) inflation across Nigeria's 36 states and the Federal Capital Territory from March 2024 to November 2025. The left panel shows headline (All-Items) inflation, while the right panel presents food inflation.

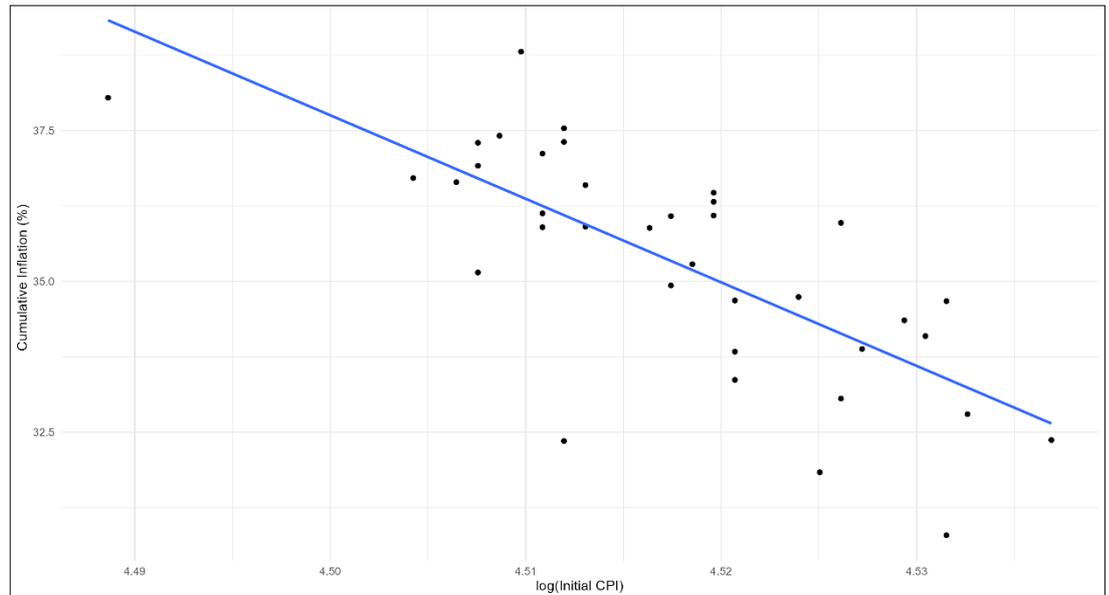
Food inflation consistently exhibited higher dispersion than headline inflation, reflecting stronger spatial differentiation in food price pressures driven by localized supply conditions, transport costs, and market integration constraints.

A pronounced regime shift emerges at the start of 2025. In January 2025,  $\sigma$  increased sharply to 3.33 for All-Items inflation and 4.11 for Food inflation, coinciding with a nationwide contraction in average MoM inflation. Dispersion continued to rise through March–April 2025, peaking at 6.29 (All-Items) and 7.67 (Food). The highest level of spatial divergence is observed in May 2025 for Food inflation ( $\sigma = 10.58$ ), highlighting extreme heterogeneity in state-level food price adjustments. From mid-2025 onwards, dispersion gradually declined—particularly for All-Items inflation—suggesting partial re-alignment of state inflation paths. However, Food inflation remained persistently more dispersed, indicating weaker  $\sigma$ -convergence in food prices relative to headline inflation. This pattern points to enduring spatial frictions in food markets even as broader price dynamics began to stabilize.

#### 3.2.2 $\beta$ -Convergence: Catch-Up Dynamics in State Inflation

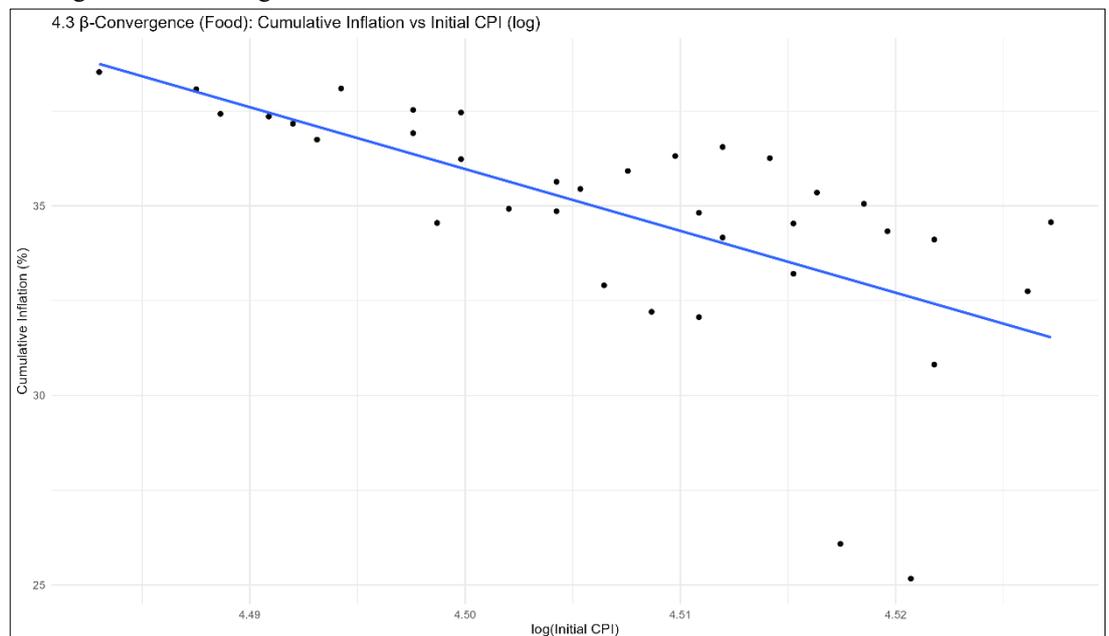
To assess long-run convergence,  $\beta$ -convergence was evaluated by regressing cumulative inflation growth (February 2024–November 2025) on initial CPI levels. Figures 4 and 5 summarize the results for All-Items and Food inflation, respectively.

For All-Items inflation, the estimated  $\beta$  coefficient is  $-138.52$  ( $p < 0.001$ ), with an  $R^2$  of 0.53, indicating strong and statistically significant convergence. States with higher initial price levels experienced systematically lower cumulative inflation growth, consistent with classical price-level catch-up dynamics.



**Figure 4.**  $\beta$ -convergence in All-Items (headline) inflation across Nigerian states. The figure plots cumulative inflation growth (February 2024–November 2025) against initial CPI levels, with the fitted regression line indicating a negative relationship.

Similarly, Food inflation exhibits an even stronger convergence effect, with a  $\beta$  coefficient of  $-163.15$  ( $p < 0.001$ ) and an  $R^2$  of 0.43. The larger magnitude of the coefficient suggests faster adjustment among initially lower-price states, reflecting sharper re-pricing in food markets following the CPI rebasing.

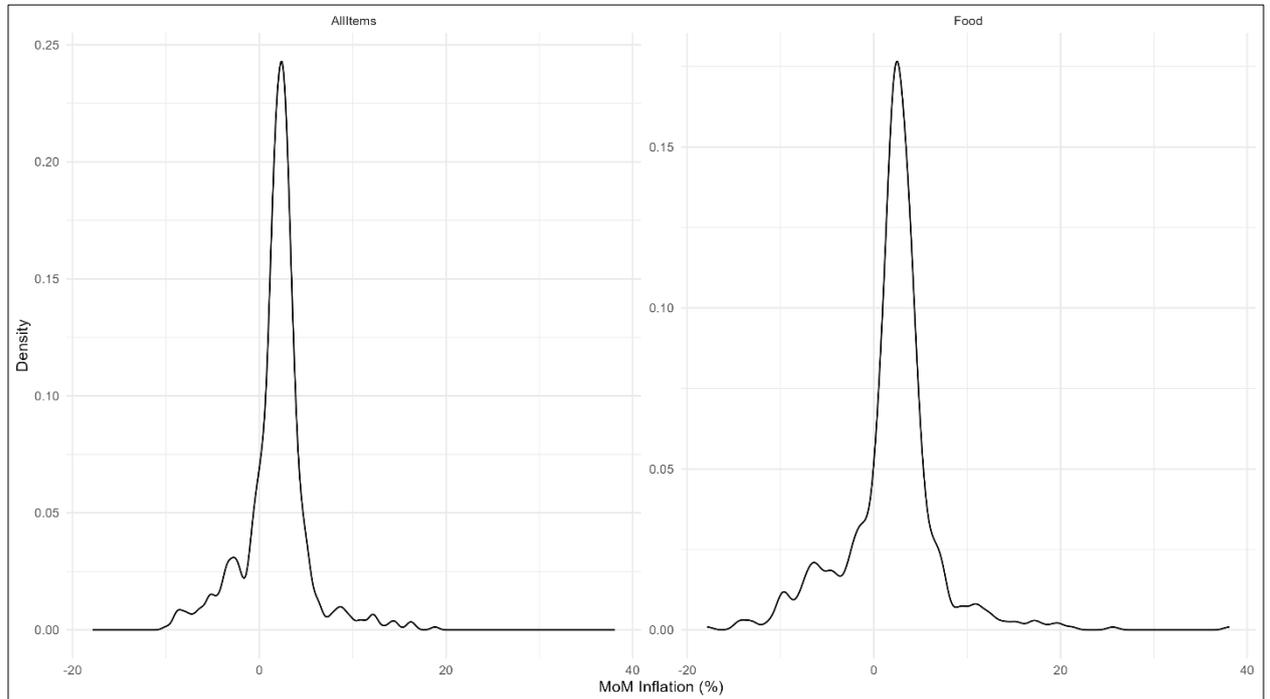


**Figure 5.**  $\beta$ -convergence in Food inflation across Nigerian states. Cumulative food inflation growth over February 2024–November 2025 is regressed on initial food CPI levels.

Despite the pronounced short-term divergence observed in  $\sigma$ -convergence—especially during early 2025—the  $\beta$ -convergence results provide robust evidence that state-level inflation paths did not diverge permanently. Instead, cumulative inflation growth followed a systematic catch-up process that limited long-run spatial inequality in price levels.

### 3.3.3 Distributional Interpretation and Link to Persistence Dynamics

Figure 6 presents the kernel density evolution of state-level MoM inflation, complementing the  $\sigma$ - and  $\beta$ -convergence results. The widening and subsequent re-compression of the distribution reinforce the coexistence of **short-run spatial divergence** and **long-run convergence** in post-rebasing inflation dynamics.



**Figure 6.** Kernel density evolution of state-level month-on-month (MoM) inflation across Nigerian states for the post-CPI rebasing period. The left panel shows All-Items (headline) inflation, while the right panel presents food inflation

Importantly, the convergence results do not imply uniform inflation behavior across states. Rather, they mask substantial state-specific persistence and adjustment heterogeneity, which is examined explicitly through AR(1) persistence estimates and structural break diagnostics. These subsequent analyses reveal that convergence occurred through heterogeneous adjustment speeds, with some states exhibiting rapid mean reversion while others experienced prolonged inflation persistence.

### 3.2.4 Synthesis of Convergence Evidence

Taken together, the  $\sigma$ - and  $\beta$ -convergence results indicate a dual inflation regime in post-rebasing Nigeria. In the short run, inflation—particularly food inflation—diverged sharply across states due to localized shocks and structural constraints. Over the full 2024–2025 horizon, however, strong  $\beta$ -convergence ensured that these divergences did not translate into permanent spatial inflation inequality.

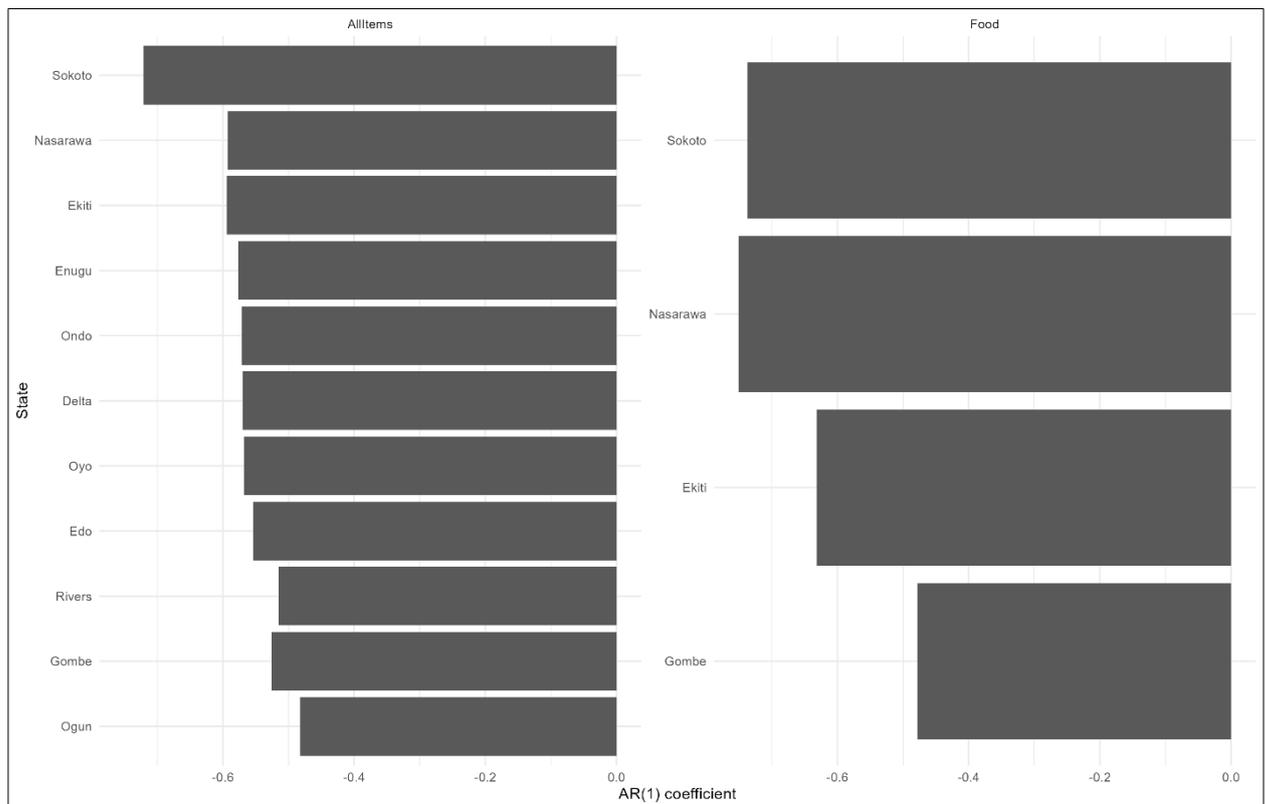
This coexistence of short-term spatial volatility and long-term convergence underscores the importance of complementing convergence analysis with state-level persistence and break-point diagnostics, addressed in Section 5, to identify structurally vulnerable and policy-relevant “problem states.”

## 3.3. Inflation Persistence and Structural Regime Shifts across Nigerian States

### 3.3.1 State-Level Inflation Persistence (AR(1) Dynamics)

Figure 7 (AR1\_Persistence\_Top15) summarizes state-level inflation persistence using estimated AR(1) coefficients for month-on-month (MoM) inflation following CPI rebasing. Overall, inflation

persistence is weak and predominantly negative across Nigerian states, indicating limited temporal inertia in short-run inflation dynamics.

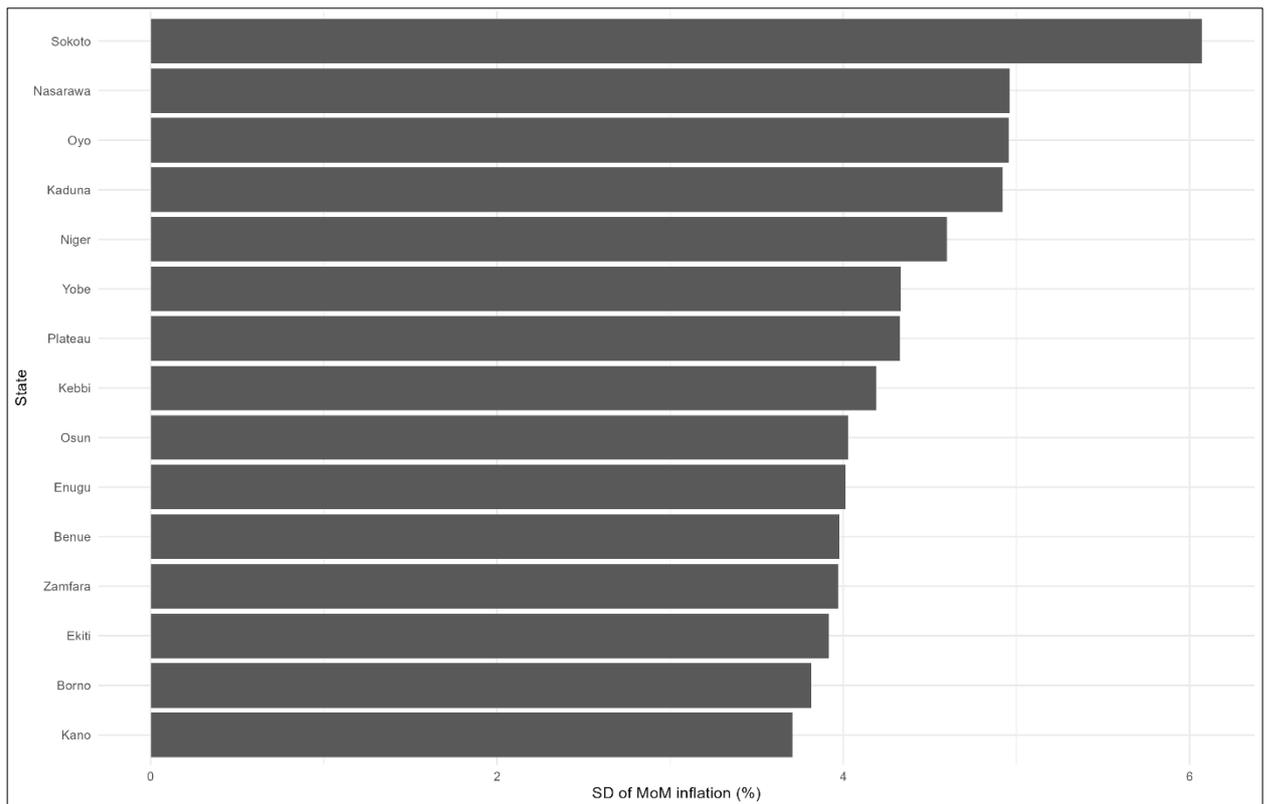


**Figure 7.** State-level inflation persistence following CPI rebasing, based on estimated AR(1) coefficients for month-on-month (MoM) inflation. The figure displays the top 15 states by absolute persistence for All-Items (left panel) and Food inflation (right panel).

For All-Items inflation, several states exhibit statistically significant negative AR(1) coefficients, including Sokoto ( $-0.72$ ,  $p < 0.001$ ), Ekiti ( $-0.59$ ,  $p < 0.01$ ), Enugu ( $-0.58$ ,  $p < 0.05$ ), Edo ( $-0.55$ ,  $p < 0.05$ ), Rivers ( $-0.52$ ,  $p < 0.05$ ), Ogun ( $-0.48$ ,  $p < 0.05$ ), Kaduna ( $-0.48$ ,  $p < 0.05$ ), and Oyo ( $-0.57$ ,  $p < 0.05$ ). These values indicate mean-reverting behavior, whereby inflationary spikes tend to dissipate quickly rather than propagate forward.

In contrast, Food inflation displays even weaker persistence. Only a very limited subset of states—notably Sokoto ( $-0.74$ ,  $p < 0.001$ ) and Nasarawa ( $-0.75$ ,  $p < 0.001$ )—show statistically significant negative persistence. For most states, AR(1) coefficients are statistically indistinguishable from zero, implying highly volatile and non-persistent food price dynamics.

Taken together, Figure 5.1 indicates that post-rebasing inflation dynamics in Nigeria are dominated by short-lived shocks, with little evidence of self-reinforcing inflation processes—particularly in food prices.



**Figure 8.** Top 15 most volatile Nigerian states based on the standard deviation of month-on-month (MoM) inflation following CPI rebasing. Higher values indicate greater short-run inflation variability and heightened exposure to transitory price shocks.

### 3.3.2 Spatial Distribution of Inflation Persistence

Figures 9 (AR1\_Map\_AllItems) and 10 (AR1\_Map\_Food) visualize the spatial structure of inflation persistence across Nigerian states.

For All-Items inflation (Figure 9), stronger negative persistence clusters are evident in parts of the North-West (Sokoto, Zamfara), South-West (Ekiti, Ogun, Oyo), and South-South (Rivers, Edo). These regions experience rapid correction following inflation shocks, consistent with inflation driven by transitory supply-side disturbances or policy-induced price adjustments rather than sustained inflationary pressure.

In contrast, the Food inflation persistence map (Figure 5.3) shows near-zero AR(1) coefficients across most states, with only isolated pockets of significant mean reversion (notably Sokoto and Nasarawa). This spatial pattern reinforces the interpretation that food inflation is largely driven by episodic shocks—including seasonal supply fluctuations, logistics bottlenecks, and climatic variability—rather than persistent inflation regimes.

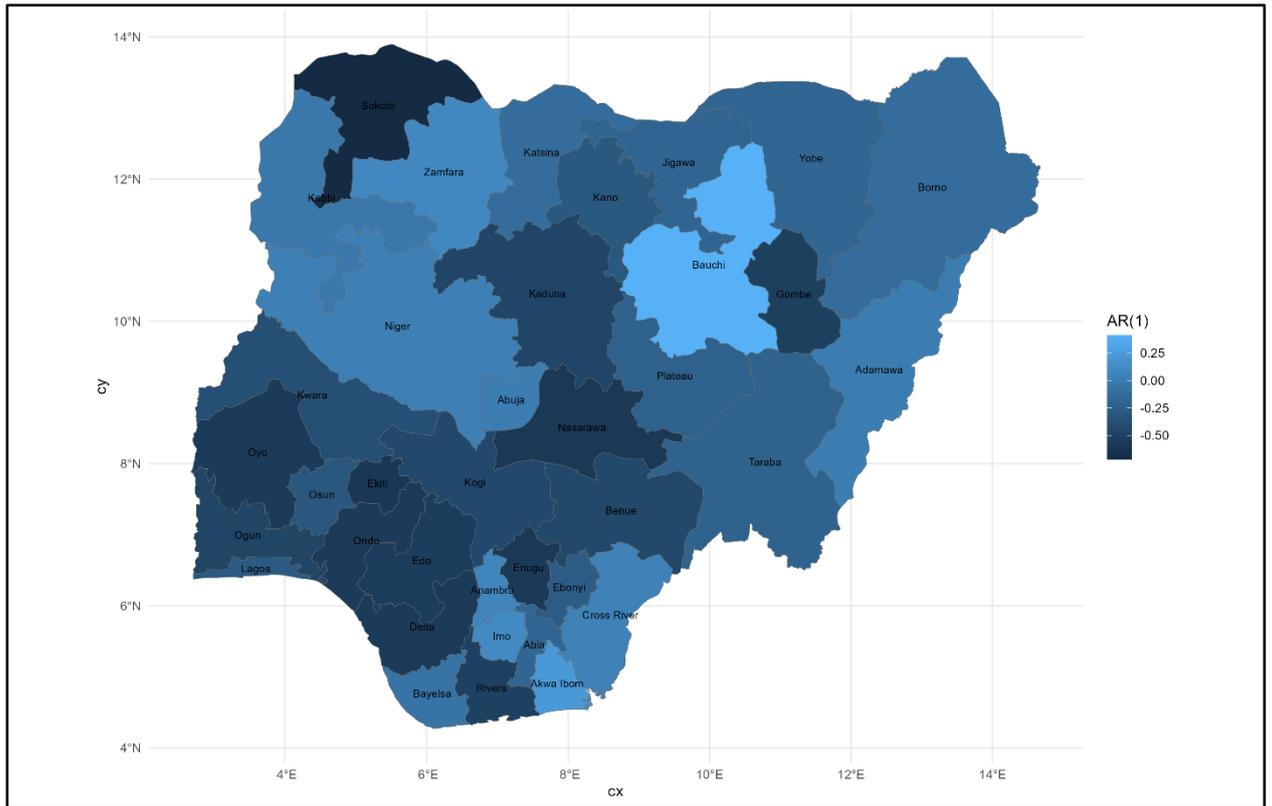


Figure 9. Spatial distribution of AR(1) inflation persistence for All-Items (headline) inflation across Nigerian states.

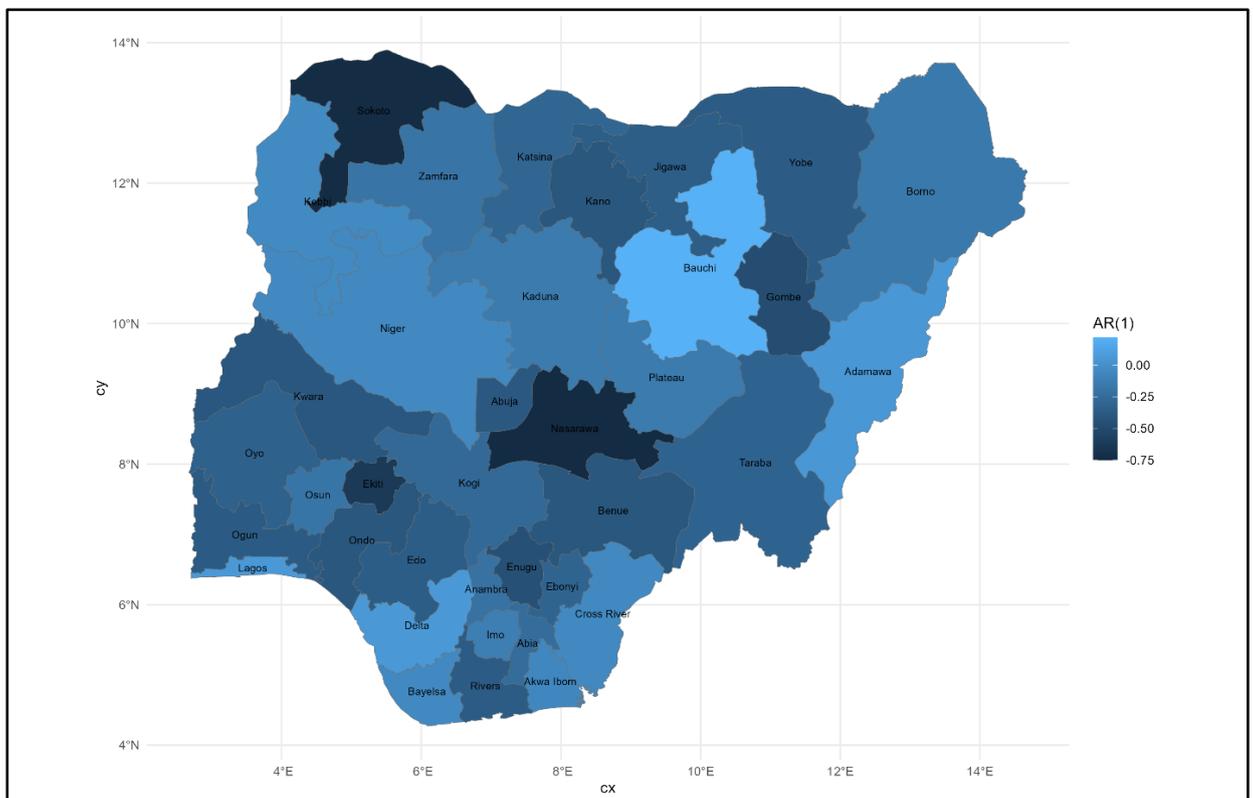
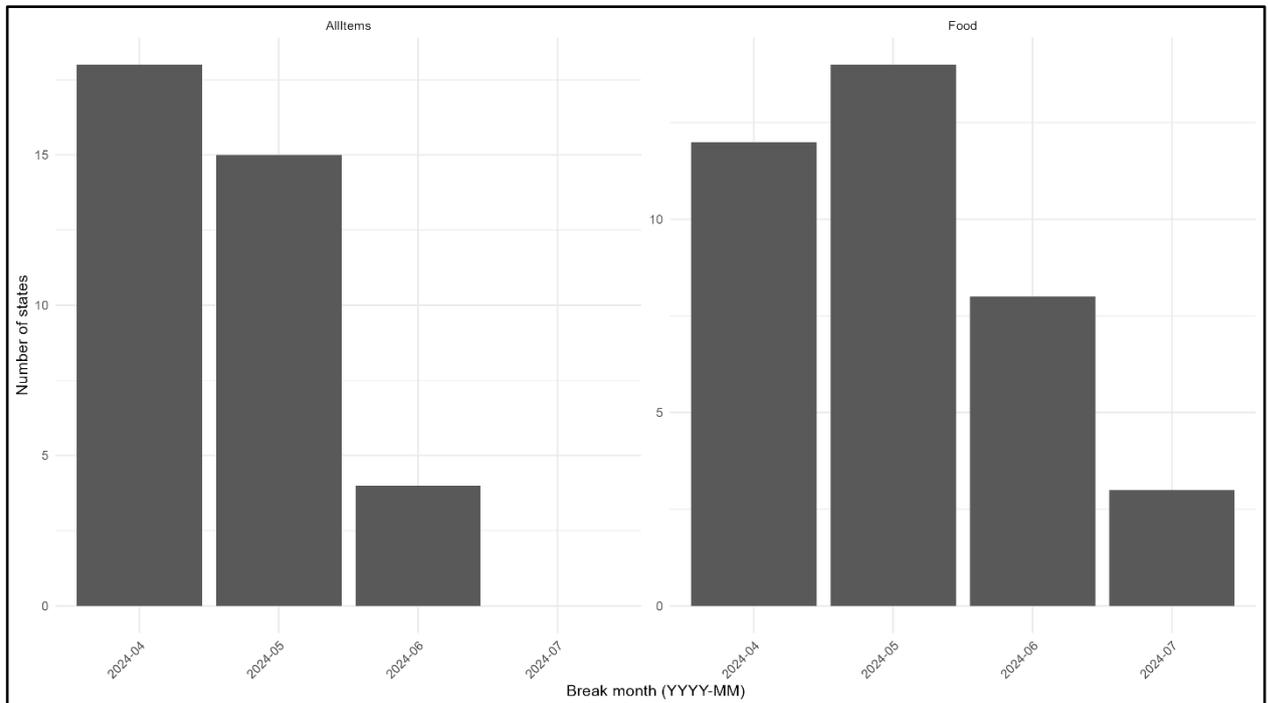


Figure 10. Spatial distribution of AR (1) inflation persistence for Food inflation across Nigerian states.

### 3.3.3 Structural Breaks and Inflation Regime Shifts

Evidence of regime instability is further supported by the structural break analysis. Figure 11 (First-Break\_Counts) illustrates the timing and concentration of first structural breaks in state-level inflation series.



**Figure 11.** Timing and frequency of first structural breaks in state-level inflation series following CPI rebasing. The left panel shows All-Items (headline) inflation, while the right panel presents food inflation.

For All-Items inflation, the dominant breakpoint occurs in April 2024, affecting 18 states, followed by May 2024 with 15 states. For Food inflation, April 2024 (12 states) and May 2024 (14 states) again dominate, with additional breaks extending into June–July 2024.

The pronounced synchronization of breakpoints across states suggests a nationwide inflation regime shift immediately following CPI rebasing, rather than idiosyncratic state-level structural changes. The clustering of breaks in early 2024 aligns with methodological recalibration effects and short-term price realignments, rather than gradual spatial diffusion of inflationary pressures.

### 3.3.4 Implications for Inflation Dynamics and Policy

Taken together, the AR(1) persistence estimates, spatial patterns, and breakpoint evidence indicate that Nigeria's post-rebasing inflation environment is characterized by low persistence, high volatility, and frequent regime shifts. Inflation shocks—particularly in food prices—do not propagate strongly over time, limiting the applicability of persistence-based inflation forecasting frameworks at the sub-national level.

From a policy perspective, these findings imply that short-horizon stabilization tools and shock-specific interventions (e.g., food supply logistics, seasonal buffer mechanisms, and targeted market interventions) may be more effective than policies aimed at suppressing long-run inflation inertia. This distinction is especially critical for food price management, where volatility dominates persistence.

## 5 Discussion

This study provides a comprehensive sub-national assessment of inflation dynamics in Nigeria following CPI rebasing, integrating spatial econometrics, convergence analysis, and time-series persistence diagnostics. The results collectively reveal a post-rebasing inflation environment

characterized by strong spatial interdependence, short-run divergence, weak temporal persistence, and synchronized structural breaks. These findings are consistent with recent advances in regional inflation analysis, which emphasize the role of spatial interaction and localized shock transmission in shaping sub-national price dynamics (Anselin, 2021; Rey & Montouri, 2021).

### 6.1 Spatial Dependence and Inflation Spillovers

The spatial autocorrelation results demonstrate that inflation in Nigeria is not spatially random. Significant Global Moran's  $I$  values for both headline and food inflation confirm the presence of spatial clustering, indicating that inflationary pressures spill over across neighboring states. Such patterns align with spatial price transmission theories highlighting the importance of geographic proximity, trade linkages, and shared institutional constraints in regional inflation dynamics (LeSage & Pace, 2022; Elhorst, 2022).

The identification of distinct hot-spots and cold-spots—particularly for food inflation—further supports evidence that regional exposure to insecurity, climatic stress, and transport disruptions amplifies localized inflationary pressures (Gbegbelegbe et al., 2022; Barrett et al., 2021). Moreover, the SAR and SDM results indicate that inflation spillovers extend beyond immediate neighbors, suggesting that regional trade flows and national policy shocks play a dominant role in inflation transmission rather than purely local dynamics (Montero & Vilar, 2023).

### 6.2 Inflation Convergence: Short-Run Divergence and Long-Run Catch-Up

The convergence analysis reveals a dual inflation dynamic.  $\sigma$ -convergence results show pronounced short-run divergence, particularly for food inflation, reflecting asymmetric exposure to shocks and localized market frictions. Similar short-term dispersion following structural or policy shocks has been documented in other large, heterogeneous economies (Hazell & Santos, 2022; Johnson et al., 2023).

In contrast, the  $\beta$ -convergence results provide robust evidence of long-run catch-up, with states exhibiting higher initial CPI levels recording lower cumulative inflation growth. This finding is consistent with modern convergence theory, which emphasizes distributional adjustment and price arbitrage as stabilizing forces over longer horizons (Quah, 2022; Phillips & Sul, 2022). The coexistence of  $\sigma$ -divergence and  $\beta$ -convergence highlights the importance of distinguishing between transitory volatility and structural adjustment mechanisms in inflation analysis.

### 6.3 Weak Inflation Persistence and Mean Reversion

The AR(1) persistence analysis shows that inflation persistence across Nigerian states is weak to strongly negative, especially for food inflation. This mean-reverting behavior suggests that inflationary shocks dissipate quickly once immediate drivers subside, challenging conventional persistence-based inflation forecasting frameworks (Stock & Watson, 2022). Similar findings have been reported in recent macroeconomic studies emphasizing the declining role of inflation inertia in environments dominated by supply-side and policy shocks (Bobeica et al., 2024).

Spatial clustering of negative persistence coefficients further reinforces the interpretation that regional inflation dynamics are governed by episodic shocks rather than self-reinforcing processes, particularly in food markets characterized by seasonality and logistical constraints (Hazell & Santos, 2022).

### 6.4 Structural Breaks and Regime Shifts after CPI Rebasing

The structural break analysis reveals strong synchronization of first breakpoints across states immediately following CPI rebasing, indicating a nationwide inflation regime shift rather than gradual, state-specific structural change. Such synchronized breaks are characteristic of methodological recalibrations and large policy adjustments, as documented in recent structural break literature (Bai & Perron, 2022; Castro & de Resende, 2024).

The persistence of additional breaks in food inflation underscores the sensitivity of food prices to post-rebasing adjustments and short-term supply disruptions, reinforcing the non-stationary and regime-dependent nature of inflation during statistical transition periods.

## 6.5 Policy and Analytical Implications

From a policy perspective, these findings suggest that uniform national inflation control measures may have uneven spatial effects due to strong spillovers and regional clustering. Targeted, region-specific interventions—particularly in food supply chains, transport infrastructure, and security—are therefore likely to be more effective in stabilizing localized inflation hot-spots (Barrett et al., 2021; Gbegbelegbe et al., 2022).

Analytically, this study demonstrates the value of integrating spatial econometrics, convergence diagnostics, and time-series methods when examining sub-national inflation. Reliance on a single analytical framework risks overlooking critical dimensions of inflation behavior, especially in large, heterogeneous federations such as Nigeria (Anselin, 2021; Elhorst, 2022).

## Conclusion

This study provides the first integrated sub-national analysis of inflation dynamics in Nigeria following CPI rebasing by jointly examining spatial dependence, convergence behavior, persistence, and structural breaks. The results show that inflation is spatially clustered, with clear evidence of cross-border spillovers, particularly for food prices, underscoring the importance of geographic interdependence in price formation. While short-run inflation paths diverge across states, strong  $\beta$ -convergence indicates long-run re-alignment of price levels, highlighting the coexistence of transitory volatility and structural adjustment. Inflation persistence is generally weak and mean-reverting, and structural break analysis reveals synchronized regime shifts immediately after rebasing, suggesting that recent inflation dynamics are driven primarily by short-lived shocks rather than self-reinforcing processes. Collectively, these findings emphasize the need for geographically targeted, short-horizon stabilization and food-price policies, and demonstrate the analytical value of combining spatial econometrics with convergence and time-series approaches for understanding inflation in large, heterogeneous economies like Nigeria.

**Supplementary Materials:** Available at <https://github.com/zubairgis/nigeria-hensard/blob/main/Inflation%20in%20Post-Rebasing%20Nigeria.csv>

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### Data Availability Statement

The data presented in this study are available from the corresponding author upon reasonable request.

### Conflicts of Interest

The authors declare no conflict of interest.

## Abbreviations

The following abbreviations are used in this manuscript:

Abbreviation	Full Meaning
ANOVA	Analysis of Variance
BH	Benjamini–Hochberg (False Discovery Rate adjustment)
CBN	Central Bank of Nigeria
CV	Coefficient of Variation
FDR	False Discovery Rate
FPPI	Food Price Pressure Index
FMAFS	Federal Ministry of Agriculture and Food Security
GDP	Gross Domestic Product
KW	Kruskal–Wallis Test
LMICs	Low- and Middle-Income Countries
MoM	Month-on-Month
NATIP	National Agricultural Technology and Innovation Policy
NBS	National Bureau of Statistics (Nigeria)
PCA	Principal Component Analysis
SDGs	Sustainable Development Goals
YoY	Year-on-Year

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