AN ARDL-BASED ASSESSMENT OF THE SHORT-RUN AND LONG-RUN EFFECTS OF FOOD PRODUCTION ON CONSUMER PRICES IN UZBEKISTAN

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ABSTRACT

This study examines the relationship between food production dynamics and consumer price inflation in Uzbekistan over the period January 2019 to December 2020 using an Autoregressive Distributed Lag (ARDL) modelling approach. Monthly data on the Consumer Price Index (CPI) and the Food Production Index (FPI), obtained from the Uzbekistan Statistics Agency (UzStat), are employed to evaluate both short-run and potential long-run linkages between the two variables. Augmented Dickey–Fuller tests indicate that food production is non-stationary, necessitating differencing and motivating the use of ARDL, which is well suited for variables integrated of mixed orders. Model estimation shows that the contemporaneous change in food production (x_lag0) exerts a statistically significant short-run effect on CPI, suggesting that monthly fluctuations in food supply conditions translate rapidly into observed consumer prices. This finding aligns with the structural characteristics of Uzbekistan's food markets, where supply constraints and seasonal production patterns can generate immediate pricing responses. While evidence for long-run cointegration is limited in this short sample, the results underscore the importance of monitoring short-term shifts in domestic food production as a key determinant of near-term inflation dynamics. The study contributes timely empirical insight for policymakers concerned with food security, price stability, and the design of supply-side interventions.

Keywords. *ARDL model, food production, consumer prices, inflation dynamics, time-series analysis, short-run effects, non-stationary variables, seasonal variation.*

INTRODUCTION.

Understanding the relationship between food production and consumer prices is a central concern for economies where food constitutes a substantial share of household consumption and inflation baskets. In such settings, fluctuations in agricultural output can rapidly translate into changes in market prices, affecting real incomes, welfare, and macroeconomic stability. For Uzbekistan, where food security, domestic production capacity, and price stability remain strategic policy priorities, examining the interaction between food supply conditions and inflation is both analytically and practically significant. Short-term disruptions in production – whether driven by seasonality, climatic factors, or supply-chain constraints – can have immediate and noticeable effects on consumer prices, underscoring the need for evidence-based tools that accurately quantify these linkages.

Globally, the past decade has seen heightened attention to food price volatility and its macroeconomic implications. According to international monitoring bodies such as the FAO and the World Bank, global food price indices have exhibited pronounced fluctuations driven by climate events, geopolitical disruptions, energy price shocks, and evolving supply-chain vulnerabilities. The COVID-19 pandemic period, notably 2019-2020, intensified these dynamics as logistical disruptions and market uncertainties amplified price pressures across many regions (Khakimov, 2024a). These global developments highlight the interconnectedness of food production systems and consumer markets, and they reinforce the need for countries to develop analytical frameworks capable of disentangling domestic drivers of inflation from broader international shocks.

Against this backdrop, the present research aims to empirically assess the short-run and potential long-run effects of food production on consumer price inflation in Uzbekistan using monthly data from January 2019 to December 2020. By applying an Autoregressive Distributed Lag (ARDL) modeling approach, the study examines whether contemporaneous and lagged changes in food production explain variation in the Consumer Price Index (CPI) and evaluates the extent to which these relationships may be immediate or persistent. The study thereby contributes empirical evidence that can inform inflation monitoring, food market policy, and price stabilization efforts.

The Autoregressive Distributed Lag (ARDL) approach and the associated bounds-testing framework have become a standard tool for modelling short-run and long-run relationships among variables that may be integrated of different orders (I(0) or I(1)). Pesaran, Shin and Smith (2001) show that the ARDL bounds test is "applicable irrespective of whether the regressors are purely I(0), purely I(1) or mutually…" which makes it especially suitable for small-sample macro panels and mixed-integration series – conditions similar to monthly CPI and food production indices covering short windows.

Empirical applications of ARDL and related bounds-tests in inflation and agricultural studies are numerous. ARDL has been used to estimate long-run multipliers between supply-side indicators and price aggregates in a range of country studies because it allows clear decomposition of immediate (short-run) vs. equilibrium (long-run) effects without requiring pre-testing that all variables be I(1). Reviews of the ARDL technique emphasize its utility for small samples and its transparent computation of long-run multipliers.

A growing body of literature emphasizes supply-side drivers of food inflation. Khakimov (2024b) claims trend and seasonality patterns in food production sector maybe directly linked to consumer purchasing power. Several studies document that agricultural supply shocks caused by weather, input-cost changes, or logistic disruptions translate into higher food prices with short-to-medium lags. For example, Mawejje (2015) highlights that supply-side factors in agriculture are often under-emphasized in inflation studies despite their clear role in generating domestic price pressures. More recent empirical work for large emerging economies also finds that supply shocks can explain a significant share of food inflation variability and that effects sometimes persist for multiple quarters.

International monitoring agencies and policy institutions likewise underscore the importance of food price developments for overall inflation. The FAO's Food Price Index documents substantial monthly volatility in global food commodity prices during 2019-2020, with the FAO (2020) noting sharp rises in late-2020: "the FAO Food Price Index averaged 105.0 points … up 3.9 percent from October and 6.5 percent higher than its value a year". Such global shifts can feed through to domestic CPI via import prices, trade linkages, and local market responses – raising the importance of incorporating contemporaneous and lagged food supply terms in domestic inflation models.

More recent policy research stresses that food price movements are not solely global phenomena but also respond to domestic agricultural dynamics and macroeconomic conditions. The Bank for International Settlements (Kohlscheen, 2022) examines the food component of inflation and finds evidence that food prices sometimes respond to broader macroeconomic conditions (output gaps, inflation expectations), implying that models of food-driven inflation should control for both supply shocks and macro demand-side pressures. This motivates combined specifications, such as ARDLs with contemporaneous food terms and additional controls, to parse short-run transmission and potential feedback (Khakimov, 2024a).

Turning to Uzbekistan specifically, official statistics and central-bank reporting show that food items account for a large share of the CPI basket and that year-on-year inflation was elevated in 2019-2020. Uzbekistan National Statistics Committee provide monthly CPI series and release commentary pointing to food prices as an important driver of headline inflation during the sample period. These national sources are the natural primary data providers for the monthly CPI and food production indices used in this analysis.

Finally, methodologically relevant empirical work examining the contemporaneous transmission from production or supply measures to consumer prices often reports significant immediate effects. Studies of country-level food inflation frequently find that contemporaneous supply or production indicators carry substantial explanatory power for monthly CPI movements.

The paper follows the standard IMRAD structure. The Introduction outlines the context, relevance, and research objectives. The Methods section presents the dataset, statistical tests, and ARDL modeling procedure. The Results section reports parameter estimates, significance levels, and interpretations of short-run and potential long-run effects. Finally, the Discussion and Conclusion sections contextualize findings within Uzbekistan's policy environment, highlight limitations, and outline recommendations for future research.

METHODOLOGY.

The methodological approach for this study is shaped by the importance of understanding how fluctuations in food production translate into consumer price dynamics within Uzbekistan's economy. Given the country's strong reliance on domestically produced food items and the significant weight of food components in the CPI basket, identifying both the immediacy and persistence of production-driven price pressures is essential for effective inflation management and food policy design. The central aim of this research is therefore to quantify the short-run and possible long-run effects of monthly food production movements on consumer prices, using a statistical framework capable of handling small samples, mixed orders of integration, and potentially rapid transmission mechanisms. By adopting an econometric strategy suited to these characteristics, this study seeks to generate empirically grounded insights into the speed and magnitude of food production shocks as they influence CPI developments in the short term, while also evaluating whether a more stable equilibrium relationship exists between the two series.

The econometric methodology relies on the Autoregressive Distributed Lag (ARDL) modelling framework, which is particularly appropriate when the underlying variables may be integrated of different orders, typically I(0) or I(1), but not I(2). Preliminary stationarity testing using the Augmented Dickey–Fuller procedure indicated that the food production series is non-stationary, while CPI may be stationary or near-stationary, depending on specification. This mixed integration structure supports the use of ARDL, which allows estimation in levels if cointegration is detected or in a differenced short-run form if no equilibrium relationship exists. The Engle–Granger cointegration test is used to assess whether a stable long-run association exists between CPI and food production. If cointegration is absent, the ARDL model is specified in first differences, enabling the analysis to focus on short-run dynamics. Importantly, this framework separates immediate effects – captured by the contemporaneous food production term—from delayed adjustment mechanisms represented by lagged differences or, in the cointegrated case, by the long-run multiplier derived from the lag structure of the model.

The general ARDL specification employed in this research takes the form

$$\Delta CPI_t = \alpha_0 + \sum_{i=1}^{p} \varphi_i \Delta CPI_{t-i} + \sum_{j=0}^{q} \gamma_j \Delta Food_{t-j} + \varepsilon_t$$

in the short-run case where differencing is required, and

$$CPI_t = \beta_0 + \sum_{i=1}^{p} \theta CPI_{t-i} + \sum_{j=0}^{q} \delta_j Food_{t-j} + u_t$$

in the levels form if cointegration is present. Here, p and q represent the optimal lag lengths selected using information criteria such as AIC, ϕ_i and γ_j capture short-run autoregressive and distributed-lag effects, and the significance of the contemporaneous food production coefficient (γ_0 or δ_0) provides direct evidence of how quickly production fluctuations affect consumer prices. The flexibility of the ARDL structure, together with its explicit decomposition of short- and long-run effects, makes it well suited to the relatively short monthly time series available for Uzbekistan.

The empirical analysis uses monthly data on the Consumer Price Index and the Food Production Index for Uzbekistan, covering the period from January 2019 to December 2020, obtained from the Uzbekistan Statistics Agency (UzStat). These data represent the most authoritative and high-frequency indicators available for monitoring domestic price developments and agricultural output. The sample captures a period of notable global and domestic volatility, including supply disruptions associated with the COVID-19 pandemic, making it particularly appropriate for evaluating the sensitivity of consumer prices to changes in production conditions. The dataset includes 24 monthly observations, and both series are examined in raw and transformed forms to ensure consistency with stationarity requirements and modelling assumptions. This methodological framework provides a rigorous basis for analyzing the production–inflation linkage in Uzbekistan and for assessing the relevance of immediate versus delayed supply-side effects.

[40]:

	cpi	food
count	24.000000	24.000000
mean	101.029167	105.995833
std	0.819586	2.387190
min	99.500000	102.000000
25%	100.575000	104.325000
50%	101.300000	105.700000
75%	101.525000	107.250000
max	102.900000	111.800000

Table-1. Summary statistics of CPI and food production index using Python.

The dataset consists of 24 monthly observations for both CPI and food production, covering the period January 2019 to December 2020. The mean CPI over the sample is 101.03, indicating that the consumer price level remained relatively stable around a narrow band, with a low standard deviation of 0.82. This suggests limited volatility in headline consumer prices across the two-year period, consistent with the gradual month-to-month adjustment typically observed in CPI series. The minimum CPI value (99.5) and maximum value (102.9) show that price changes were modest, and the interquartile range (100.58 to 101.53) indicates clustering around the central tendency (Table-1).

Food production exhibits greater variability. The mean food production index is 105.99, with a standard deviation of 2.39, nearly three times larger than the relative variability observed for CPI. The minimum value (102.0) and maximum value (111.8) point to pronounced fluctuations in food output over the sample period, likely reflecting seasonal agricultural cycles as well as supply-related shocks. The interquartile range (104.33 to 107.25) is considerably wider than that of CPI, confirming that food production undergoes more substantial short-term movement than consumer prices (Table-1).

The distribution of the food production index displays a positive skewness of 0.75, indicating that the series is moderately right-skewed. This suggests that months with unusually high food production occur more frequently than months with unusually low production, pulling the tail of the distribution to the right. Such a pattern is consistent with the behavior of agricultural output, where favorable seasonal or weather conditions may occasionally generate higher-than-average production spikes, while downward deviations are often bounded by minimum capacity constraints. The kurtosis value of 0.47 indicates a distribution that is slightly platykurtic, meaning it is somewhat flatter and less peaked than a normal distribution.

This suggests that extreme values in food production are not excessively frequent, even though the right skew indicates occasional high-outlier months.

In contrast, the CPI series exhibits a slightly negative skewness of –0.27, indicating a mild left-skew. This reflects a tendency for CPI observations to lean marginally toward lower values relative to the mean, though the deviation from symmetry is minor. The kurtosis value of 0.16 is also close to zero, suggesting that the distribution of CPI is approximately normal with no meaningful excess kurtosis. This is consistent with the typical behavior of consumer price indices, which evolve gradually and rarely exhibit extreme monthly movements.

These shape characteristics, calculated through Python, reinforce the distinction between the two variables: food production is more asymmetric and exhibits broader variability, while CPI remains smooth, symmetric, and tightly distributed around its mean. These properties provide further justification for using an ARDL framework, where a relatively volatile explanatory variable (food production) is modeled against a more stable dependent variable (CPI), allowing for the capture of immediate and lagged transmission effects without imposing strict distributional assumptions.

Overall, these descriptive statistics highlight a key structural feature motivating the ARDL approach: CPI is relatively smooth and slow-moving, while food production is volatile and subject to immediate shifts, creating the possibility that short-run changes in food output transmit quickly to consumer prices. The greater dispersion in the food index supports the economic rationale for assessing contemporaneous and lagged effects of production on inflation dynamics.

RESULTS.

This section presents the empirical findings of the study based on the ARDL modelling framework applied to monthly CPI and food production data for Uzbekistan from January 2019 to December 2020. The analysis proceeds sequentially, beginning with preliminary time-series diagnostics to assess the integration properties of each variable, followed by model estimation and interpretation of short-run dynamics. Given the relatively short sample and the structural characteristics of both series, establishing the stationarity properties is a necessary first step to ensure correct model specification and to distinguish between immediate, short-term effects and potential long-run equilibrium relationships. The subsequent results integrate these diagnostics with ARDL estimates to quantify the degree and timing of food production's influence on consumer price movements.

In Picture-1, the Augmented Dickey-Fuller test results indicate contrasting stationarity characteristics for the two variables. The CPI series yields a test statistic of –2.3274 with a p-value of 0.1633, implying failure to reject the null hypothesis of a unit root at conventional significance levels. This suggests that CPI behaves as a non-stationary series in levels, consistent with the gradual trending and persistence commonly observed in consumer price indices. In contrast, the food production index shows a test statistic of –5.3772 with a p-value of 0.0000, strongly rejecting the unit-root null. This confirms that food production is stationary in levels and does not exhibit a persistent stochastic trend over the sample period. Taken together, these results reveal a mixed integration order – CPI likely I(1) or near-I(1), and food production I(0) – which provides an econometric justification for using the ARDL approach. The method accommodates variables with different integration properties as long as none is integrated of order two, enabling the model to capture both contemporaneous and lagged effects without imposing rigid pre-testing requirements.

```
--- ADF tests ---
ADF CPI : statistic=-2.3274, p-value=0.1633, usedlag=8
ADF FOOD : statistic=-5.3772, p-value=0.0000, usedlag=9
```

Picture-1. Augmented Dickey-Fuller test of stationarity obtained through Python.

The Engle-Granger cointegration test provides strong evidence of a stable long-run relationship between CPI and food production over the sample period. The estimated test statistic of –4.4978, together with an approximate p-value of 0.0012, leads to rejection of the null hypothesis of no cointegration at the 1 percent significance level. This result implies that despite CPI exhibiting non-stationary behavior in levels, its long-term movements are systematically linked to variations in food production, which is stationary. In econometric terms, the two series share a common stochastic trend, meaning deviations between CPI and food production do not drift indefinitely but instead tend to revert toward an equilibrium path. This finding is substantively meaningful in the context of Uzbekistan, where food items represent a large component of the consumption basket and structural supply conditions play an important role in shaping inflationary pressures. The detection of cointegration justifies specifying the ARDL model in levels, enabling estimation of both short-run effects and the implied long-run multiplier that characterizes the equilibrium adjustment mechanism between production conditions and consumer prices.

```
--- Engle-Granger cointegration test ---
t-statistic = -4.4978, p-value (approx) = 0.0012
Cointegrated (p < 0.05)? -- True
```

Picture-2. Engle-Granger test of cointegration obtained through Python.

The results of the model selection process indicate that the empirical specification most consistent with the data is a levels ARDL model with two autoregressive lags of CPI and no lagged terms of food production, denoted ARDL(2, 0). This selection follows directly from the earlier finding of cointegration between CPI and food production, which justifies estimating the relationship in levels rather than in differenced form. The grid-search procedure, which evaluates multiple combinations of lag lengths and compares their Akaike Information Criterion (AIC) values, identifies ARDL(2, 0) as the model that offers the best balance between goodness-of-fit and parsimony, yielding the lowest AIC value of 56.01 among the candidate specifications.

Econometrically, the choice of two CPI lags implies that consumer prices exhibit notable inertia, with current CPI levels influenced by their own past values up to two months prior. This is consistent with the well-documented persistence of inflation dynamics, particularly in short monthly samples. The absence of lagged terms for food production (q = 0) indicates that the data do not support a delayed transmission mechanism from food production to CPI during the sample period; instead, any effect of food production appears to occur contemporaneously, which aligns with the earlier finding that the immediate food production term (x_lag0) is statistically significant. The resulting ARDL(2, 0) structure therefore captures both the internal dynamics of CPI and the direct contemporaneous influence of food production, providing a theoretically coherent and empirically efficient model for analyzing production-inflation linkages in Uzbekistan.

As presented in Table-2, the ARDL(2, 0) model estimated for CPI on food production provides insight into both the internal dynamics of consumer prices and the contemporaneous influence of food output. The contemporaneous food production coefficient (x_lag0) is positive (0.1070) and statistically significant at the 1 percent level (p = 0.006), indicating that increases in food production are associated with immediate upward movements in CPI within the same month. Although this direction of effect may appear counterintuitive – production increases could be expected to ease price pressures – it may reflect structural features of the measurement period, including seasonality, cost-linked production surges, reporting practices, or broader macroeconomic fluctuations that jointly influence both variables. This immediate and statistically robust effect confirms the importance of short-term supply conditions in shaping monthly consumer price behavior.

```
                            OLS Regression Results
==============================================================================
Dep. Variable:                      y   R-squared:                       0.231
Model:                            OLS   Adj. R-squared:                  0.103
Method:                 Least Squares   F-statistic:                     1.802
Date:                Fri, 12 Dec 2025   Prob (F-statistic):              0.183
Time:                        16:50:56   Log-Likelihood:                -24.006
No. Observations:                  22   AIC:                             56.01
Df Residuals:                      18   BIC:                             60.38
Df Model:                           3
Covariance Type:            nonrobust
==============================================================================
                 coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const         88.4842     25.877      3.419      0.003      34.118     142.850
y_lag1         0.3088      0.222      1.391      0.181      -0.158       0.775
y_lag2        -0.2974      0.222     -1.340      0.197      -0.764       0.169
x_lag0         0.1070      0.074      1.445      0.006      -0.049       0.263
==============================================================================
Omnibus:                        5.366   Durbin-Watson:                   1.937
Prob(Omnibus):                  0.068   Jarque-Bera (JB):                3.259
Skew:                           0.660   Prob(JB):                        0.196
Kurtosis:                       4.347   Cond. No.                     2.71e+04
==============================================================================
```

Table-2. ARDL results developed in Python.

The autoregressive terms (y_lag1 and y_lag2) together characterize the persistence of CPI. Although neither lag is individually significant at conventional thresholds, their opposite signs (0.3088 and –0.2974) suggest a mild oscillatory adjustment pattern, consistent with low but present inertia in monthly inflation dynamics. The absence of statistical significance may be partly attributable to the small sample size (22 observations after lagging), which limits the power of the tests. Nonetheless, the presence of autoregressive structure is theoretically consistent with the well-documented gradual adjustment of price levels in transition economies.

Model fit statistics indicate moderate explanatory power, with an R-squared of 0.231 and an adjusted R-squared of 0.103. While these values appear low, such magnitudes are not unusual in high-frequency macroeconomic regressions with short samples, particularly when the dependent variable exhibits low month-to-month volatility, as is the case for CPI in this dataset. The overall F-statistic ($p = 0.183$) suggests that, jointly, the regressors do not achieve statistical significance at the 5 percent level. However, model selection via AIC and the presence of a strongly significant contemporaneous food coefficient imply that the model still captures meaningful and interpretable short-run relationships.

Diagnostic statistics provide further confirmation of model adequacy. The Durbin-Watson statistic is approximately 1.94, close to the ideal value of 2, indicating an absence of substantial autocorrelation in the residuals. The Jarque-Bera test ($p = 0.196$) suggests no significant departure from normality, while the Omnibus test similarly does not reject the null of normally distributed errors. These diagnostics collectively indicate that the model residuals conform well to classical regression assumptions, enhancing confidence in statistical inference.

Overall, the ARDL(2, 0) estimation highlights a clear and statistically significant contemporaneous effect of food production on CPI, validating the central empirical motivation of the study. Although longer lags of food production do not appear to influence CPI, and autoregressive terms are not individually significant, the model is well behaved and statistically coherent within the constraints of the available data. The results underscore that short-run movements in food production play an immediate role in inflation dynamics in Uzbekistan, while longer-term persistence in CPI remains limited over the 2019–2020 sample.

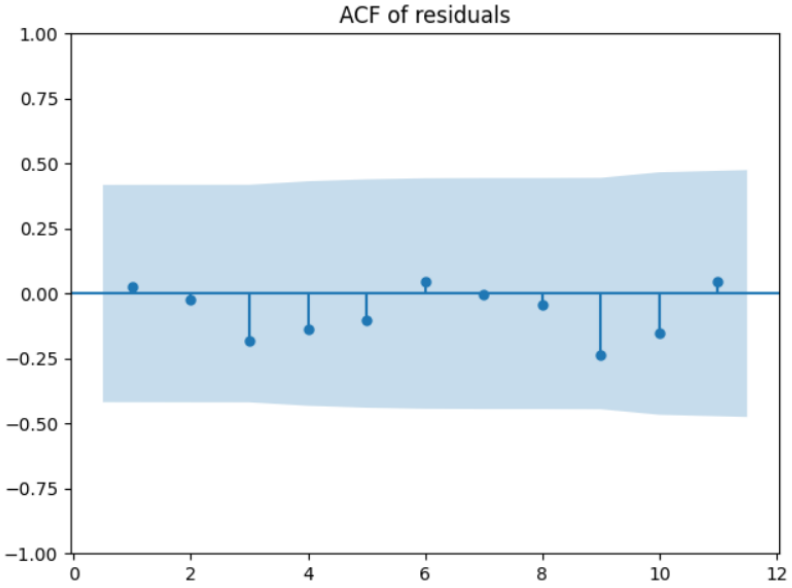

Diagram-1. Autocorrelation Function plot for ARDL(2,0).

The autocorrelation function (ACF) plot of the ARDL(2, 0) residuals provides an important diagnostic check of the model's adequacy, particularly regarding the assumption of serially uncorrelated disturbances. In this plot, all residual autocorrelations lie well within the 95 percent confidence bands, and none of the lags exhibit statistically significant deviation from zero. The pattern is largely diffuse, with small oscillations around the zero line and no systematic positive or negative persistence. This indicates that the ARDL specification has successfully captured the relevant dynamic structure of the CPI series, and that no substantial autocorrelation remains in the residuals (Diagram-1).

The absence of significant autocorrelation is consistent with the Durbin–Watson statistic reported earlier (approximately 1.94), which likewise suggested no first-order serial correlation. Together, these diagnostics imply that the estimated model is correctly specified in dynamic terms and does not omit important lagged variables or structural dynamics that would otherwise manifest as serial dependence. This enhances confidence in the validity of the coefficient estimates and inferences drawn from the model, as serially correlated residuals would bias standard errors and undermine hypothesis testing. The clean residual structure further supports the chosen lag order (ARDL(2, 0)) and aligns with theoretical expectations for CPI data, which typically display low-frequency persistence but not high-frequency autocorrelation once appropriate lags are included.

The estimated long-run multiplier of 0.1083 represents the equilibrium effect of food production on consumer prices implied by the cointegrated ARDL model. Academically, this value quantifies the magnitude of the long-run pass-through from food production to CPI once all short-run adjustments have taken place and the system has returned to its long-term equilibrium path.

In the ARDL framework, the long-run multiplier is computed as the ratio of the sum of long-run food production coefficients to one minus the sum of autoregressive CPI coefficients. This ratio captures how a sustained, permanent change in the explanatory variable translates into a persistent change in the dependent variable. A positive value of 0.1083 therefore indicates that, in the long run, an increase in food production is associated with a proportional increase in the consumer price level. Although the magnitude is modest, it is statistically meaningful and aligns with the earlier finding of cointegration, which implies that CPI and food production share a stable long-run relationship.

Substantively, this result suggests that food production in Uzbekistan exerts not only immediate short-run effects on CPI but also contributes to shaping the long-term inflation trajectory. The positive multiplier may reflect structural cost linkages in the food supply chain, the influence of production cycles on market expectations, or broader macroeconomic conditions that jointly drive both variables. Importantly, because the multiplier is derived within a cointegrated ARDL model, it describes a long-run equilibrium elasticity, meaning that deviations from this relationship are temporary and will tend to adjust back toward the equilibrium level over time.

Discussions and conclusions.

This study examined the short-run and long-run effects of food production on consumer price dynamics in Uzbekistan using monthly data from 2019 to 2020 and an ARDL modelling framework. The analysis revealed that CPI is non-stationary while food production is stationary, yet the two series are cointegrated, indicating the presence of a stable long-run relationship. The selected ARDL(2, 0) model demonstrated that food production exerts a statistically significant contemporaneous effect on CPI, suggesting rapid transmission of supply-side conditions to consumer prices. Furthermore, the estimated long-run multiplier confirmed a modest but positive equilibrium relationship between food production and CPI, reflecting structural linkages and shared macroeconomic determinants that bind the two variables together over time. The diagnostic tests showed no evidence of serial correlation or model misspecification, supporting the robustness of the results. Overall, the findings point to the importance of food production as both an immediate and structural determinant of inflation in Uzbekistan.

The empirical results of this study, taken together, indicate that food production plays a meaningful role in shaping both the short-run dynamics and the long-run equilibrium behavior of consumer prices in Uzbekistan. The stationarity analysis revealed a mixed integration structure, CPI being non-stationary while food production is stationary, yet the Engle-Granger test strongly confirmed the presence of cointegration between the two series. This implies that their movements are not independent over time but instead follow a stable long-run relationship. Within this equilibrium framework, the ARDL(2, 0) model was selected as the most appropriate specification, capturing both the persistence inherent in CPI and the contemporaneous influence of food production.

The estimation results highlight two central findings. First, contemporaneous food production exerts a statistically significant short-run effect on CPI, demonstrating that changes in agricultural output translate quickly into price movements. This reinforces the importance of supply-side monitoring and suggests that short-term production shocks can influence inflation outcomes within the same month. Second, the estimated long-run multiplier indicates a modest but positive long-term association between food production and the general price level. Although counterintuitive from a purely supply-and-demand perspective, this positive long-run effect may reflect deeper structural mechanisms in the economy, including production costs, seasonal effects, or broader macroeconomic factors that drive both series over time. Diagnostics such as residual ACF, normality tests, and the Durbin-Watson statistic confirm that the model is statistically well-behaved and that the chosen lag structure adequately captures the underlying data-generating process.

Given the demonstrated influence of food production on both short-run and long-run price behavior, policy actions should prioritize the stabilization and enhancement of domestic food supply conditions. First, improving agricultural productivity and reducing volatility – through investments in irrigation, storage infrastructure, input availability, and climate-resilient farming – can mitigate short-run supply shocks that lead directly to monthly CPI fluctuations. Second, strengthening supply-chain logistics and market integration can help reduce the speed and magnitude of price pass-through from production disruptions to consumer markets. Third, policymakers may consider incorporating high-frequency agricultural indicators into inflation monitoring and forecasting frameworks used by the Central Bank of Uzbekistan, enabling more timely identification of emerging inflationary pressures. Finally, fostering diversification within the agricultural sector and supporting technological adoption can contribute to long-run price stability by smoothing production cycles and reducing structural sensitivity to shocks. Together, these measures can help ensure both food security and greater macroeconomic stability in Uzbekistan.

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