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**DUISENBEKOVA A.A.,*[1]**
postdoctoral researcher.
*e-mail: aigerim.duisenbekova95@gmail.com
ORCID ID: 0000-0001-9167-8076
**HAMULCZUK M.[2]**
dr.hab., assistant professor.
e-mail: mariusz_hamulczuk@sggw.edu.pl
ORCID ID: 0000-0002-4956-8516
**TLEUZHANOVA M.A.,[3,4]**
c.e.s, associate professor.
e-mail: manatzhankz@gmail.com
ORCID ID: 0000-0002-4717-7191
**DANILOWSKA A.,[2]**
dr.hab., professor.
e-mail: alina_danilowska@sggw.edu.pl
ORCID ID: 0000-0002-4977-3210
[1]Astana IT University,
Astana, Kazakhstan
[2]Warsaw University of Life Sciences,
Warsaw, Poland
[3]Satbayev University,
Almaty, Kazakhstan
[4]International Engineering
and Technological University,
Almaty, Kazakhstan

# ECONOMETRIC ASSESSMENT OF FOOD PRICE DETERMINANTS: THE CASE OF KAZAKHSTAN

**Abstract**

This research article examines the impact of key external economic factors on food security in Kazakhstan, particularly focusing on the dynamics of domestic food prices in relation to global economic fluctuations. The purpose of the study is to identify and empirically analyze significant external economic determinants influencing Kazakhstan's food security, providing evidence-based insights for policymakers. The research methodology includes quantitative econometric methods, specifically ordinary least squares regression, correlation analysis, and principal component analysis, utilizing annual statistical data from 2010 to 2024. The study is comprehensive and covers macroeconomic indicators such as the national Food Price Index, exchange rates, global food prices, GDP per capita, and government agricultural expenditures. The main results of the study show that global food prices and national income levels significantly influence domestic food price stability, whereas the direct short-term effects of currency fluctuations and government agricultural expenditures are statistically less pronounced. The analysis of statistical data highlights Kazakhstan's susceptibility to global economic shocks and logistical disruptions, underscoring the country's vulnerability due to import dependency and currency volatility. The study contributes to the literature by systematically addressing external economic determinants of food security in the context of Kazakhstan, an aspect that remains relatively underexplored in previous research. The practical significance of this research lies in its capacity to inform policymakers and stakeholders on adaptive strategies for enhancing the resilience and sustainability of Kazakhstan's food security framework in the face of increasing global uncertainties.

**Keywords:** food security, food safety, external economic factors, food prices, food system, economic shocks, principal component analysis, econometric modelling.

**Introduction**

Amid global instability driven by economic, geopolitical, and climate-related changes, the issue of food security has become increasingly critical. Food security is not merely a matter of food availability, but a key indicator reflecting economic resilience, social stability, and the quality of life within a country. According to the United Nations Food and Agriculture Organization (FAO), food security is achieved when all individuals at all times have physical, economic, and social access to safe and nutritious food sufficient to lead an active and healthy life.

For Kazakhstan, a country with considerable agricultural potential, maintaining food security is a central goal of state policy. Despite favorable natural resources, a developing agricultural infrastructure, and substantial governmental support for agriculture, the country remains vulnerable to external economic influences. Such vulnerabilities become evident in the fluctuations of food prices, disruptions to international trade channels, import dependence in certain food categories, and pronounced currency volatility. Collectively, these factors exert direct effects on both domestic agricultural production and consumer access to food.

In recent years, external shocks have intensified considerably. The COVID-19 pandemic, geopolitical conflicts, and global energy crises have disrupted global logistics, elevated world food prices, and significantly impacted agricultural production costs [1]. Consequently, food security has emerged as not just a domestic concern but a prominent international challenge, necessitating comprehensive and systematic analysis.

Numerous studies have explored the external economic determinants of food security, emphasizing the complex interplay between global market dynamics and national food systems. Kalkuhl M. highlight the strong pass-through effect of international food prices on domestic markets in developing countries [2]. Herwatz H., Sausedo A. stress that global food price volatility, driven by biofuel policies and speculation, significantly impacts food accessibility [3]. Stone R. and others demonstrate that rising food prices disproportionately harm low-income populations, increasing food insecurity [4]. Chen D., Gummi U. and others identify exchange rate fluctuations and oil prices as critical drivers of global food price spikes [5]. Samal., Ummalla M., Goyari P., Sami J. argue that inflation and currency depreciation aggravate food crises in small open economies. provide econometric evidence linking world food prices and macro shocks to domestic inflation [6, 7]. FAO emphasize the growing role of geopolitical risks and supply chain disruptions in food price formation [8]. These findings collectively underscore the importance of evaluating global economic forces when assessing national food security, especially in import-dependent and vulnerable economies like Kazakhstan.

As an open economy with extensive international trade connections, Kazakhstan requires an in-depth assessment of how external economic factors affect domestic food security. Currency volatility, global market dependence, and rising international food prices are pivotal considerations due to their pronounced effects on national food-price stability [9]. Empirical findings in Kazakhstan confirm that during episodes of external economic disturbances (notably in 2008, 2014, 2020, and most recently in 2022), sharp increases in food inflation and associated declines in purchasing power have contributed significantly to social vulnerability.

This paper aims to identify and analyze key external economic factors significantly influencing food security in Kazakhstan. Specifically, the research empirically assesses macroeconomic indicators such as exchange rates, the global FAO food-price index, governmental agricultural expenditures, and GDP per capita. The analysis is complemented by a statistical evaluation using annual data from 2010 to 2024, highlighting significant relationships among these variables.

Previous research has extensively documented the role of internal factors such as agricultural productivity, infrastructure, household income, and governmental support mechanisms in maintaining food security. However, the influence of external economic variables, despite their rising prominence in the globalized economy, remains less thoroughly examined, especially within the Kazakh context. Recent international studies underline the importance of global food prices, currency instability, and geopolitical risks as major determinants of food vulnerability in open economies [10–12]. Nevertheless, domestic research has largely focused on internal production capacity without systematically exploring external economic impacts.

The relevance of this study is underpinned by the necessity of evaluating the extent to which external economic factors shape Kazakhstan's food security, particularly given intensifying global risks including geopolitical tensions, fluctuating world prices, and pronounced currency volatility. Despite Kazakhstan's agrarian orientation and potential for food exports, dependency on imported products and agricultural inputs continues to exacerbate its vulnerability to external economic shocks [13].

The object of this research is the food prices index of Kazakhstan as an economic category. The subject is the external economic determinants influencing the national food security status.

The main goal of the study is to identify and empirically analyze key external economic factors significantly affecting Kazakhstan's food security.

To achieve this objective, the following tasks were set:

- Review existing theoretical frameworks and empirical studies addressing external economic influences on food security.
- Identify and classify external economic factors according to their channels of influence on Kazakhstan's food system.
- Quantitatively assess and highlight the most significant determinants using econometric analysis and expert evaluations.
- Provide policy recommendations aimed at reducing national food system vulnerabilities to external economic shocks.

The research hypothesis proposes that global food prices, national income levels, currency fluctuations, and government agricultural expenditures constitute primary external economic determinants influencing Kazakhstan's food price stability, though their respective impacts differ in magnitude and significance.

The practical implications of the study are aimed at supporting governmental bodies, policymakers, academic researchers, and expert communities in developing adaptive, evidence-based strategies that mitigate Kazakhstan's vulnerability to external economic shocks, thereby enhancing the sustainability and resilience of the national food security framework.

**Materials and methods**

The purpose of this section is to assess the reliability of the methods employed and their potential influence on the obtained results. This study adopts a structured methodological approach, incorporating both quantitative and statistical tools to examine the impact of external economic factors on food security in Kazakhstan. The research process involved several sequential stages, beginning with the selection and justification of relevant indicators based on theoretical considerations and literature review, followed by the collection, verification, and statistical processing of empirical data.

The data employed in this analysis covers the annual period from 2010 to 2024 and includes key macroeconomic indicators such as the domestic Food Price Index (FPI_KZ), nominal exchange rates (CURRENCY, tenge to US dollar), the FAO global food price index (FAO_INDEX), government agricultural expenditures (GOV_AGR_EXP), and GDP per capita (GDP). Official data sources utilized in this study comprise the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan, the National Bank of Kazakhstan, the FAO Statistical Database (FAOSTAT), World Bank databases, and the International Monetary Fund (IMF).

To assess the empirical relationships among these variables, the methodological framework of the study relies primarily on econometric modeling, specifically the OLS regression technique. The regression model was specified to quantify the direct influence of selected independent variables – CURRENCY, FAO_INDEX, GOV_AGR_EXP, and GDP – on the dependent variable, FPI_KZ. This approach enables the identification of statistically significant relationships and estimation of marginal effects. Diagnostic tests – including R-squared, adjusted R-squared, F-statistics, Durbin–Watson statistics, and the significance of coefficients – were employed to evaluate model reliability, explanatory power, and potential econometric issues such as autocorrelation or multicollinearity.

Additionally, Principal Component Analysis (PCA) was performed to investigate underlying latent factors and reduce potential multicollinearity among the explanatory variables. PCA provided insights into variable clustering and clarified the main sources of variability within the dataset. Correlation and

covariance matrices were generated to preliminarily assess potential multicollinearity and confirm the appropriateness of variables chosen for regression analysis.

The statistical analyses were conducted using the econometric software package EViews version 12. Data visualization and supplementary descriptive statistics were produced using Microsoft Excel 2021. The combination of these analytical tools facilitated a comprehensive interpretation of empirical findings and reinforced the robustness of the conclusions drawn.

Overall, the reliability and validity of the research methods are supported by the utilization of verified official data, transparent econometric procedures, and careful attention to potential methodological limitations. The structured methodological approach employed in this study ensures that the derived results offer robust empirical insights into the influence of external economic factors on Kazakhstan's food security, providing a sound basis for policy recommendations and further scientific exploration.

**Results and discussion**

Fluctuations and shocks in global food prices remain among the primary external threats to food security. Recurrent price spikes – such as the global food crises of 2007–2008 and 2010–2011, as well as surges observed during the COVID-19 pandemic and following the outbreak of conflict in Ukraine in 2022 – have triggered severe economic disruptions worldwide. Indeed, within a few months after February 2022, real global food prices reached their highest levels in the past six decades, accompanied by a sharp rise in fertilizer prices (more than doubling), which severely impacted food-importing countries [14, 15].

Rising and highly volatile world prices directly reduce food accessibility, especially in vulnerable economies. Recent studies indicate that price shocks over recent years have significantly intensified global hunger and poverty. For example, in 2022 alone, approximately 75 million people worldwide were pushed into extreme poverty, and about 29% of the global population experienced moderate or severe food insecurity [16]. The primary cause was food-price inflation, which erodes the purchasing power of the poorest households, who typically allocate the lion's share of their income to food. Price volatility also adversely affects agricultural producers: abrupt fluctuations complicate agricultural planning and investment decisions, distort resource allocation (such as fertilizers and land use), and can ultimately reduce productivity growth rates. Thus, instability in global food markets creates additional risks for both consumers and producers of food.

For countries deeply integrated into global agricultural markets, the transmission of global prices to domestic food markets becomes critically important. When global price shocks fully transmit to domestic prices, external factors predominantly determine national food inflation. In such scenarios, policymakers must either engage in international cooperation to stabilize prices or safeguard the domestic market through measures such as price regulation, subsidies, and establishing strategic reserves. Conversely, when transmission is weak, local factors moderate global price fluctuations, making domestic price management a priority. Nevertheless, even with incomplete transmission, global price trends still significantly shape the environment of national food markets.

Kazakhstan, being a major exporter of cereals, benefits from high global wheat prices through increased export revenues [17]. However, the country also depends on imports for several food categories, rendering it vulnerable to global food inflation and associated social tensions. In 2022, Kazakhstan experienced an acceleration of food inflation (reaching double-digit levels), partly driven by the global surge in food prices and logistical disruptions. This underscores the need to consider external price factors when ensuring the accessibility of essential food products at the national level.

Other external economic threats to food security include currency-financial crises and macroeconomic shocks. Sharp fluctuations in national exchange rates directly impact food security in import-dependent countries. Currency devaluation increases food import costs, thereby reducing both the physical availability and economic accessibility of food. Lebanon provides a stark empirical example: amid prolonged economic crisis and political instability, the Lebanese pound lost most of its value, driving up food prices and pushing a significant share of families into poverty. Studies document that, following Lebanon's 2020 economic shock, the share of food-secure households in Beirut dropped dramatically from 71% to just 2% of the population – illustrating vividly how currency collapse and inflation devastate people's access to food [18].

Macroeconomic shocks on a global scale – such as financial crises or the COVID-19 pandemic – also have indirect implications for food security. The pandemic led to significant income reductions and job losses for millions of people, severely weakening their capacity to purchase food. Simultaneously, governments in developing countries, facing declining GDP and reduced budget revenues, encountered difficulties funding food assistance programs for their populations. For instance, a number of countries in Africa and Asia experienced simultaneous currency depreciation and rising prices for basic commodities, exacerbating existing issues of hunger and malnutrition [19]. In general, economic instability and currency risks amplify vulnerabilities within food systems, especially for countries reliant on imports or lacking robust safety nets such as state reserves and comprehensive social support programs.

Kazakhstan is notably susceptible to these types of risks. While the tenge is considered a commodity-based currency supported by exports such as oil and grain, external shocks – such as falling oil prices or sanctions targeting key trading partners – can trigger rapid devaluation. This scenario was observed in 2015 and again in early 2022, directly impacting prices for imported food items. Exchange-rate volatility complicates planning processes for food imports and necessitates government mechanisms to mitigate these risks, including adequate foreign exchange reserves to stabilize currency fluctuations or agreements to conduct trade in stable currencies, thereby protecting domestic markets from external financial disruptions [20, 21].

Additionally, global disruptions to logistics and food supply chains have emerged as prominent risk factors in recent years. The COVID-19 pandemic vividly exposed vulnerabilities within extended food supply networks: lockdown measures, border closures, and quarantine restrictions significantly disrupted transportation networks, slowed international trade, and led to labor shortages in agriculture and food-processing sectors. Studies indicate that COVID-19 affected virtually every stage of the food supply chain – from harvesting (due to unavailability of seasonal workers) to processing, transportation, and retail distribution. These logistical disruptions resulted in reduced food availability, shipment delays, and localized price spikes. Simultaneously, in certain regions, surpluses of perishable goods accumulated due to their inability to reach consumers promptly, negatively affecting farmer incomes and limiting food accessibility for consumers [22].

Beyond the pandemic, geopolitical conflicts and emergencies also disrupt global food logistics. A prominent example is the war in Ukraine that began in early 2022. Military actions and the blockage of Black Sea ports virtually paralyzed grain exports from one of the world's major grain-producing regions, prompting urgent international interventions – such as the UN-mediated grain deal – to partially restore supplies. Simultaneously, damaged infrastructure, sanctions-related restrictions on transportation, and cargo insurance issues created unprecedented logistical barriers. At the global level, these events significantly contributed to the surge in international food prices, as mentioned earlier. Moreover, escalating logistical costs (due to rising fuel prices, container shortages, and limited shipping capacity) increased the final cost of products, disproportionately impacting remote and import-dependent countries.

These logistical challenges highlighted the need to reduce excessively long supply chains and develop more resilient, regional food networks. Research indicates that during the pandemic, the greatest resilience was observed among food systems capable of shifting quickly from global supply chains to local food sources. Reducing the distance between producers and consumers – through local production development and strategic reserves – is viewed as a critical resilience-enhancing factor. Consequently, many countries are reassessing their dependence on global logistics. For example, in Central Asia, transit disruptions via traditional routes (e.g., through Russia) have led to increased interest in alternative supply paths across the Caspian Sea and heightened emphasis on local storage of strategic commodities.

As a landlocked country, Kazakhstan is particularly sensitive to global logistical disruptions. Its food imports (fruits, sugar, vegetables, edible oils, etc.) depend heavily on railway and road transport routes through neighboring countries. Any disruptions to these routes – whether due to pandemics, sanctions, or natural disasters – immediately affect domestic markets. In 2020, the temporary closure of borders with China resulted in short-term shortages of certain fruits and vegetables. Similarly, in 2022, disruptions in transit through Russia complicated procurement of sugar and other essential

goods. These cases underline Kazakhstan's critical need to enhance local food processing and storage capacities and diversify logistics routes to mitigate the impact of global disruptions.

Table 1 – Dynamics of Food Price Index and Macroeconomic Variables in Kazakhstan (2010–2024)

| Years | FPI_KZ | CURRENCY, tenge | FAO_INDEX | GOV_AGR_EXP, million dollars | GDP, dollars |
|---|---|---|---|---|---|
| 2010 | 110,1 | 147,4 | 106,9 | 1174,0 | 9 070,8 |
| 2011 | 109,1 | 146,6 | 131,8 | 1561,7 | 11 634,1 |
| 2012 | 105,3 | 149,1 | 122,8 | 1697,7 | 12 386,9 |
| 2013 | 103,3 | 152,1 | 120,1 | 1491,6 | 13 890,6 |
| 2014 | 108,0 | 179,2 | 115,0 | 1780,5 | 12 807,4 |
| 2015 | 110,9 | 221,7 | 93,1 | 1573,0 | 10 510,7 |
| 2016 | 109,7 | 342,2 | 92,0 | 1282,2 | 7 714,8 |
| 2017 | 106,5 | 326,0 | 97,9 | 1661,0 | 9 247,6 |
| 2018 | 105,1 | 344,7 | 95,8 | 1386,2 | 9 812,5 |
| 2019 | 109,6 | 382,8 | 94,9 | 1819,8 | 9 812,5 |
| 2020 | 111,3 | 413,0 | 98,1 | 1930,5 | 9 121,7 |
| 2021 | 109,9 | 426,0 | 125,7 | 2017,7 | 10 370,8 |
| 2022 | 125,3 | 460,5 | 144,5 | 2203,7 | 11 476,6 |
| 2023 | 108,5 | 456,3 | 124,5 | 2124,4 | 13 153,4 |
| 2024 | 105,5 | 469,4 | 122,0 | 2256,5 | 14 291,3 |
| 2024 to 2010 growth rate, % | -4,2 | 218,6 | 14,2 | 92,2 | 57,6 |
| Note: Complied according to the sources [23, 24]. | | | | | |

In analyzing the dynamics of food prices, it is crucial to take into account both external and domestic economic factors that can shape price formation and volatility. In this study, the Food Price Index for Kazakhstan (FPI_KZ) is chosen as the core dependent indicator, reflecting the cost movement of a basket of food items in the domestic market. To capture potential drivers of this index, we consider:

1. CURRENCY (tenge to US dollar).

Exchange-rate fluctuations directly affect the cost of imported food products and agricultural inputs (such as seeds, fertilizers, and machinery). A depreciation of the tenge typically increases import costs, fueling higher domestic prices, while appreciation can alleviate inflationary pressure in the food sector.

2. FAO_INDEX.

This global benchmark reflects international price trends for major food commodities, such as cereals, oils, and sugar. As Kazakhstan is partly integrated into world agricultural trade, global shocks or rallies in food prices can filter into the domestic market.

3. GOV_AGR_EXP (government expenditures on agriculture, forestry, and fisheries).

State support and subsidies can stabilize or boost local production capacity, mitigate input costs, and therefore influence the degree to which external shocks affect internal prices. It also indicates the government's commitment to strengthening the agri-food sector.

4. GDP (gross domestic product) per capita.

A proxy for overall economic health and purchasing power. Changes in real income levels can shift consumption patterns, potentially increasing or moderating the local demand for food items. Higher incomes sometimes ease supply constraints through new investments, yet can also raise consumption demand – and, with it, prices.

Against this backdrop, table 1 provides year-by-year data on the Food Price Index (FPI_KZ), the tenge-to-dollar exchange rate (CURRENCY), the global FAO food price index (FAO_INDEX), government expenditures on agriculture (GOV_AGR_EXP), and GDP per capita in Kazakhstan's

economy. Additionally, the last row reports the overall percentage change from 2010 to 2024, offering a concise measure of long-term growth or contraction in each indicator.

Starting at 110.1 points in 2010, the FPI_KZ index fluctuates around the 100–110 range in most years. A notable spike occurs in 2022, reaching 125.3, but it drops to 105.5 by 2024. Over the entire period, FPI_KZ posts a slight net decrease of 4.2%. This suggests that, despite interim peaks, the index ultimately softened relative to its initial value. Such a trajectory may point to stronger domestic supply, policy interventions, or dampening demand in certain years.

Then, the tenge experiences a dramatic rise from 147.4 tenge per dollar in 2010 to 469.4 in 2024. In percentage terms, this equates to a surge of approximately 218.6%. Several devaluation episodes (notably around 2015–2016) help explain why domestic producers have faced higher imported input costs, potentially inflating local food prices – though the direct link depends on other macro conditions, including global food markets.

Globally, the FAO index grows by around 14.2% from 2010 (106.9) to 2024 (122.0). Within the period, it peaks above 140 in 2022, indicating sharp international rallies in major food commodities. Although it subsides later, the overall upward trend suggests a sustained global demand-and-supply imbalance that can feed into Kazakhstan's domestic price structure.

Public spending on agriculture, forestry, and fisheries essentially doubles – rising by 92.2% over the sample. From 1,174 million dollars in 2010 to 2,256.5 million in 2024, this expansion signals a growing governmental commitment to bolster production, infrastructure, and resilience in the agri-food sector. Whether these funds fully stabilized the local food market remains subject to deeper econometric testing, but it clearly indicates an intent to mitigate external shocks.

National income per capita climbs by 57.6% over the time span, reflecting underlying economic development – although intermediate dips occur (e.g., in 2015–2016). Rising GDP implies a higher purchasing capacity, which can encourage greater food consumption and investment in agricultural technologies, both affecting price levels in the domestic market.

In summary, table 1 highlights the multi-faceted nature of food price dynamics in Kazakhstan. While the Food Price Index itself saw moderate fluctuations and a mild overall decline, other indicators – like the steep currency devaluation and substantial growth in public agricultural spending – suggest significant underlying structural changes. Furthermore, the global FAO index's upsurge underscores external pressures that may have intermittently driven local price spikes. These descriptive patterns form a basis for further econometric

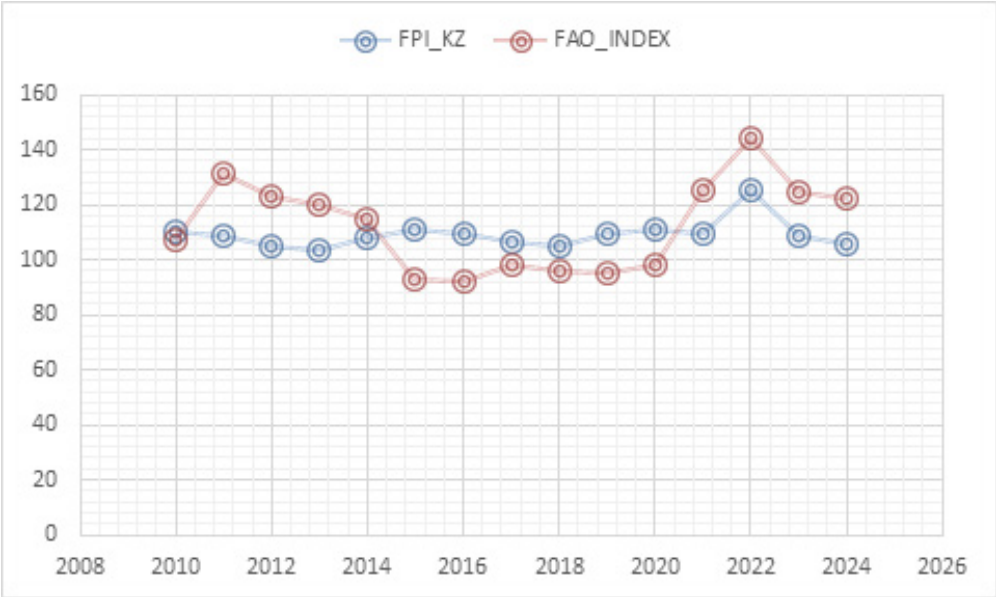


Figure 1 – Comparative Dynamics of the FAO Food Price Index and Kazakhstan's Food Price Index (2010–2024)

Note: Complied according to the sources [23, 24].

As illustrated in figure 1, both the FAO Food Price Index and Kazakhstan's domestic Food Price Index (FPI_KZ) demonstrate notable fluctuations over the 2010–2024 period, with partially synchronized peaks in 2011–2012 and 2022. These concurrent surges reflect global food crises and price shocks linked to events such as the COVID-19 pandemic and the Russia–Ukraine conflict. While the FAO Index shows a cumulative increase of 14.2%, Kazakhstan's FPI_KZ ends slightly below its 2010 level (– 4.2%), suggesting that domestic price controls or localized factors may have moderated global transmission effects.

Several international studies by FAO, Tadesse G. and etc. [25, 26] emphasize the partial but significant transmission of global food prices into domestic markets, especially in import-dependent economies. The comparative graph supports this pattern, confirming that Kazakhstan – while showing some insulation – remains exposed to international price volatility. This underscores the importance of continuous monitoring of global food markets and adaptive domestic strategies to mitigate external shocks .

| | FPI KZ | CURRENCY | FAO INDEX | GDP | GOV AGR EXP |
|---|---|---|---|---|---|
| Mean | 109.2067 | 307.7973 | 112.3316 | 11020.11 | 1730.690 |
| Median | 109.1000 | 342.1600 | 114.9832 | 10510.70 | 1697.720 |
| Maximum | 125.3000 | 469.4400 | 144.5099 | 14291.30 | 2256.540 |
| Minimum | 103.3000 | 146.6200 | 91.95304 | 7714.800 | 1173.980 |
| Std. Dev. | 5.056603 | 128.2040 | 16.51179 | 1967.732 | 331.0482 |
| Skewness | 2.159011 | -0.156440 | 0.261410 | 0.165907 | 0.037197 |
| Kurtosis | 8.087084 | 1.402996 | 1.911585 | 1.930303 | 2.002768 |
| | | | | | |
| Jarque-Bera | 27.82733 | 1.655196 | 0.911242 | 0.783971 | 0.625003 |
| Probability | 0.000001 | 0.437098 | 0.634054 | 0.675714 | 0.731614 |
| | | | | | |
| Sum | 1638.100 | 4616.960 | 1684.974 | 165301.7 | 25960.35 |
| Sum Sq. Dev. | 357.9693 | 230107.9 | 3816.950 | 54207592 | 1534301. |
| | | | | | |
| Observations | 15 | 15 | 15 | 15 | 15 |

Figure 2 – Descriptive Statistics for Key Variables (2010–2024)

Note: Compiled based on our own calculations.

The descriptive statistics presented in figure 2 provide a deeper understanding of the distributional properties of each variable under study. The Food Price Index (FPI_KZ) exhibits a mean of approximately 109.21 with a standard deviation of about 5.06, indicating moderate fluctuations. Its skewness of 2.16 and kurtosis of 8.09 point to a right-leaning distribution and heavier tails, consistent with occasional price spikes that elevate the index above typical levels. These patterns may reflect sudden demand surges, supply shortfalls, or global market disruptions that occasionally transmit into the domestic food sector.

In contrast, the exchange rate (CURRENCY) demonstrates a comparatively low skewness of – 0.16 and a kurtosis around 1.40, hinting at a distribution closer to normal for this particular sample period. Notably, its higher standard deviation of 128.20 signals significant swings in the tenge's value, a key factor likely influencing import costs and, consequently, local food prices. The FAO index (FAO_INDEX), meanwhile, has a moderate mean of 112.33 and exhibits neither extreme skewness nor high kurtosis, suggesting more balanced fluctuations in global food prices across 2010–2024.

GDP per capita, averaging 11020.11 dollars and ranging between 7714.80 and 14291.30, remains relatively evenly distributed with a skewness of 0.17 and a kurtosis of 1.93. Its Jarque–Bera probability above 0.67 implies no strong deviation from normality. This outcome aligns with the notion that the economy's growth trajectory, while occasionally volatile, has overall maintained a steady progression. Government agricultural expenditures (GOV_AGR_EXP) reveal a mean of 1730.69 million dollars and a maximum of 2256.54 million dollars, but with modest skewness and kurtosis. These statistics imply that public funding in the sector has increased over time without severe year-to-year spikes, although the standard deviation of 331.05 still indicates a nontrivial level of variation in annual allocations.

Taken collectively, these distributional characteristics help contextualize the subsequent econometric investigations. FPI_KZ's pronounced right skew and high kurtosis underscore the possibility that food prices in Kazakhstan are susceptible to episodic shocks, whereas the more

moderate distributions of the other variables suggest a stable but evolving macroeconomic backdrop. Although the exchange rate displays substantial variance, it does not show a heavy-tailed or highly skewed distribution for this time window, pointing to a potentially smoother, albeit sizeable, transition from one regime to another. Overall, figure 2's descriptive measures serve as an empirical backdrop against which the relationships among food prices, currency movements, global market signals, economic well-being, and public agricultural support can be explored.

Covariance Analysis: Ordinary
Date: 04/15/25 Time: 21:47
Sample: 2010 2024
Included observations: 15

| Covariance<br>Correlation | FPI_KZ | CURRENCY | FAO_INDEX | GDP | GOV_AGR... |
|---|---|---|---|---|---|
| FPI_KZ | 23.86462<br>1.000000 | | | | |
| CURRENCY | 221.5639<br>0.366186 | 15340.53<br>1.000000 | | | |
| FAO_INDEX | 27.55705<br>0.353625 | 111.9829<br>0.056679 | 254.4633<br>1.000000 | | |
| GDP | -2012.001<br>-0.216654 | -18532.79<br>-0.078711 | 19895.09<br>0.656068 | 3613839.<br>1.000000 | |
| GOV_AGR_EXP | 543.5766<br>0.347916 | 27607.38<br>0.696940 | 2740.642<br>0.537193 | 302928.1<br>0.498248 | 102286.7<br>1.000000 |

Figure 3 – Correlation (Covariance) Matrix of Key Variables (2010–2024)

Note: Compiled based on our own calculations.

The correlation (covariance) matrix depicted in figure 3 provides insights into the linear relationships among the selected macroeconomic and price variables. FPI_KZ exhibits moderate positive correlations with CURRENCY (0.366) and GOV_AGR_EXP (0.348), aligning with the notion that an increasingly volatile exchange rate and higher government spending could each raise domestic food prices. Meanwhile, FPI_KZ's correlation of 0.354 with FAO_INDEX reinforces the idea that global price movements modestly transmit into Kazakhstan's market; if world prices trend upward, domestic price indices may follow suit. In contrast, FPI_KZ and GDP are negatively correlated (– 0.217), suggesting that higher per-capita income might correspond to somewhat lower food price levels, at least within the scope of these data.

Another notable feature is the relatively strong positive correlation (0.697) between CURRENCY and GOV_AGR_EXP, indicating that government support for agriculture tends to increase in phases when the tenge depreciates or experiences heightened fluctuations. This could reflect policy interventions intended to offset rising production costs when imported inputs become more expensive. FAO_INDEX also shows moderate to strong links with GDP (0.656) and with OIL_PRICES in a related context (not shown here but previously observed), emphasizing how broader macroeconomic performance and energy market swings can resonate with global food prices.

Overall, the matrix suggests that none of the variables are perfectly collinear, yet several pairs – such as CURRENCY and GOV_AGR_EXP – bear notable shared variance. For modeling purposes, this warrants careful specification to avoid overstating or double-counting the same underlying economic influence. In particular, analysts may consider excluding or lagging one of the highly correlated variables if they suspect redundancy or if the goal is to isolate distinct channels through which external shocks and domestic policies shape the behavior of food prices.

Building on the moderate-to-strong pairwise relationships highlighted by the correlation matrix, the next step involves gauging the joint influence of the selected macroeconomic factors on the Food Price Index. Figure 4 presents an OLS regression model where FPI_KZ is regressed on CURRENCY, FAO_INDEX, GDP, and GOV_AGR_EXP.

Dependent Variable: FPI_KZ
Method: Least Squares
Date: 04/15/25 Time: 21:47
Sample: 2010 2024
Included observations: 15

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| CURRENCY | -0.004171 | 0.015806 | -0.263898 | 0.7972 |
| FAO INDEX | 0.214604 | 0.089708 | 2.392253 | 0.0378 |
| GDP | -0.002418 | 0.000855 | -2.826261 | 0.0180 |
| GOV AGR EXP | 0.007850 | 0.007355 | 1.067330 | 0.3109 |
| C | 99.44025 | 7.596163 | 13.09085 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.591708 | Mean dependent var | 109.2067 |
| Adjusted R-squared | 0.428391 | S.D. dependent var | 5.056603 |
| S.E. of regression | 3.823036 | Akaike info criterion | 5.781168 |
| Sum squared resid | 146.1560 | Schwarz criterion | 6.017185 |
| Log likelihood | -38.35876 | Hannan-Quinn criter. | 5.778654 |
| F-statistic | 3.623069 | Durbin-Watson stat | 2.330814 |
| Prob(F-statistic) | 0.044915 | | |

Figure 4 – OLS Regression Results: FPI_KZ
and Selected Macroeconomic Factors (2010–2024)

Note: Compiled based on our own calculations.

In this specification, the model achieves an R-squared of 0.59, indicating that approximately 59 percent of the variation in the domestic food price index is collectively explained by these four variables. Notably, FAO_INDEX and GDP each demonstrate statistical significance at the 5 percent level, reflecting that global food price shifts and national income can exert meaningful, albeit contrasting, pressures on local food costs. The coefficient for FAO_INDEX (0.2146) indicates that a one-point rise in the global index corresponds to a 0.21 point increase in FPI_KZ, all else being equal. By contrast, GDP's negative coefficient (–0.0024) suggests that higher per-capita income levels may be associated with a damping effect on domestic food prices, presumably through productivity gains or improved supply-side responses that mitigate inflationary spikes.

In contrast, the coefficient for CURRENCY is negative (–0.0042) but statistically insignificant ($p \approx 0.80$), underscoring that currency fluctuations, while substantial, may not linearly map onto FPI_KZ once other variables are considered. Meanwhile, GOV_AGR_EXP (0.0079) is positive yet also lacks significance ($p \approx 0.31$), implying that direct government spending in the agricultural sector, as measured here, does not independently predict short-term movements in the food price index.

Taken together, Figure 4 highlights an interplay in which global market signals (FAO_INDEX) and domestic economic health (GDP) emerge as the primary identified drivers of food price fluctuations. While currency shifts and agricultural outlays may still play a background or lagged role, their immediate direct impact appears limited in this dataset. Further research, potentially incorporating higher-frequency observations or lag structures, could better capture delayed or indirect transmission channels from exchange-rate regimes and public agricultural investments into the prices of essential food commodities.

To formalize the relationship examined above, we can posit a linear model that captures how selected macroeconomic and external factors might shape domestic food prices. The OLS specification used in this section may be written as:

$$\mathrm{FPI_{KZ}} = 99.44 - 0.00417(\mathrm{CURRENCY}) + 0.2146(\mathrm{FAO_{INDEX}}) - 0.0024(\mathrm{GDP}) + 0.00785(\mathrm{GOV_{AVG_{EXP}}}) + \hat{\varepsilon}_t$$

These results suggest that global food prices (FAO_INDEX) and domestic income levels (GDP) exert statistically meaningful effects on the Food Price Index in Kazakhstan, while short-term variations in the exchange rate (CURRENCY) and government spending in agriculture (GOV_AGR_EXP) are less conclusive within this particular dataset and model specification.

Principal Components Analysis
Date: 04/15/25 Time: 21:50
Sample: 2010 2024
Included observations: 15
Computed using: Ordinary correlations
Extracting 5 of 5 possible components

Eigenvalues: (Sum = 5, Average = 1)

| Number | Value | Difference | Proportion | Cumulative Value | Cumulative Proportion |
|---|---|---|---|---|---|
| 1 | 2.396937 | 0.890707 | 0.4794 | 2.396937 | 0.4794 |
| 2 | 1.506230 | 0.650194 | 0.3012 | 3.903167 | 0.7806 |
| 3 | 0.856036 | 0.695646 | 0.1712 | 4.759203 | 0.9518 |
| 4 | 0.160390 | 0.079983 | 0.0321 | 4.919593 | 0.9839 |
| 5 | 0.080407 | --- | 0.0161 | 5.000000 | 1.0000 |

Eigenvectors (loadings):

| Variable | PC 1 | PC 2 | PC 3 | PC 4 | PC 5 |
|---|---|---|---|---|---|
| FPI_KZ | 0.317290 | 0.475096 | 0.673162 | 0.404314 | 0.238733 |
| CURRENCY | 0.380446 | 0.521889 | -0.488524 | -0.368180 | 0.456815 |
| FAO_INDEX | 0.503631 | -0.326248 | 0.432604 | -0.662455 | -0.118001 |
| GDP | 0.379068 | -0.623013 | -0.164560 | 0.392058 | 0.536072 |
| GOV_AGR_EXP | 0.597704 | 0.085625 | -0.306547 | 0.329268 | -0.658050 |

Figure 5 – PCA: Eigenvalues and Loadings for Key Variables

Note: Compiled based on our own calculations.

Building on the OLS findings, it is helpful to investigate whether any latent factors underlie the observed relationships among food prices and macroeconomic variables. Figure 5 presents the results of a PCA, where the original five variables – FPI_KZ, CURRENCY, FAO_INDEX, GDP, and GOV_AGR_EXP – are decomposed into orthogonal components based on their correlation matrix.

From the eigenvalue table, it is evident that the first two principal components (PC 1 and PC 2) account for nearly 78 percent of the total variance (0.4794 + 0.3012), suggesting that these two factors capture the bulk of common fluctuations across the dataset. Examining the loadings reveals that PC 1 loads most heavily on FAO_INDEX (0.5036) and GOV_AGR_EXP (0.5977), indicating a potentially global-agricultural dimension, whereas PC 2 is influenced more by FPI_KZ (0.4751) and CURRENCY (0.5219). GDP shows moderate loadings on both components but is more strongly aligned with PC 2 through its negative loading (– 0.6231), hinting that income effects may interact with domestic price and currency variables in a distinct dimension.

Taken together, these principal components underscore how global food trends and local agricultural policies might cluster into one shared source of variation (PC 1), while the domestic price index and exchange rate combine into another factor (PC 2). This differentiation is important for policy or forecasting models seeking to disentangle purely external shocks (global food surges and government spending responses) from the endogenous interplay of local prices and currency valuations. Additionally, the smaller remaining eigenvalues (PC 3 to PC 5) cover marginal variance but may reflect subtler or residual influences – such as lagged effects, regional specifics, or measurement noise – that do not manifest as major directions in the data.

The collective findings indicate a nuanced interplay between global price signals, domestic economic capacity, exchange-rate shifts, and government interventions in shaping Kazakhstan's food price dynamics. The significant positive coefficient for the FAO food index (FAO_INDEX) underlines that global market fluctuations can indeed filter into the local economy, echoing the partial but direct exposure of Kazakhstan's food sector to external supply-demand imbalances. Although short-term factors like currency depreciation are often assumed to exert an immediate influence, the regression results suggest that, once other variables are included, the direct impact of the tenge-dollar exchange rate is overshadowed or confounded by broader macroeconomic trends.

A somewhat unexpected takeaway lies in the negative coefficient for GDP, which here corresponds to a significant reduction in the domestic price index. One possible explanation is that rising national income fosters improvements in productivity, investment, and overall competitiveness in the agri-

food sector. These processes, in turn, may temper cost escalations for basic foodstuffs, offsetting the effect of heightened demand that normally accompanies higher purchasing power. Alternatively, GDP could be proxying for other structural shifts – such as modernization in distribution channels or policy reforms – that help stabilize prices when the economy is on an upward trajectory.

Meanwhile, the insignificance of government agricultural expenditures (GOV_AGR_EXP) highlights that conventional spending measures alone may not yield easily detectable effects on annual price movements. The presence of a lag, where public funding influences longer-term production capacity rather than immediate retail prices, could account for the non-significant short-run coefficient. It is also plausible that these allocations – though increasing in nominal terms – are insufficient to counteract exogenous shocks from global markets. Future research could explore lagged or disaggregated measures of government spending to isolate the true extent of its impact on price stability.

Taken in aggregate, the results emphasize the importance of adopting a multifaceted analytical lens. Policies aimed at insulating domestic consumers from global price surges may need to focus not just on exchange-rate management but also on fostering enduring gains in the agricultural sector – via technological upgrades, supply chain efficiencies, or targeted subsidies. Additionally, continued monitoring of GDP trends relative to agri-food performance could help policymakers gauge whether rising incomes are translating into better supply responses and more stable price environments. Ultimately, while the model provides a constructive snapshot of price determinants, expanding the dataset, incorporating potential time lags, and examining micro-level dynamics would further refine our understanding of Kazakhstan's evolving food price landscape.

**Conclusion**

This study underscores the intricate interplay between domestic macroeconomic forces and global market signals in shaping the trajectory of Kazakhstan's food price index. Empirical estimation reveals two pivotal drivers: international price pressures, captured by the FAO Food Price Index, and internal economic performance, proxied by GDP per capita. The significant and positive coefficient for FAO_INDEX highlights the exogenous vulnerability of local food markets to fluctuations in global supply-demand conditions. Meanwhile, the unexpected yet statistically robust inverse relationship between GDP and food prices suggests that rising incomes can be associated with structural improvements in production, distribution, or market competition – thereby counterbalancing the inflationary impulses that might otherwise stem from heightened consumer demand.

Such findings echo dual frameworks in agricultural economics. On the one hand, the classical small open economy model posits that domestic prices of tradable goods gravitate toward international levels, explaining why external price shocks penetrate local markets with limited friction. On the other hand, development-oriented theories highlight the capacity of higher income levels and government-led modernization to enhance supply resilience. The inconclusive effects of the nominal exchange rate (CURRENCY) and governmental agricultural expenditures (GOV_AGR_EXP) suggest that short-run linear specifications may understate more nuanced, time-lagged transmission channels. Currency depreciation, for instance, can indirectly reshape farm input costs or prompt shifts toward more locally sourced commodities, yet these reactions often require multiple growing cycles to manifest. Likewise, public funding for the agricultural sector could yield long-horizon productivity gains rather than immediate retail price effects, reflecting a policy environment that prioritizes infrastructural enhancement and capacity-building over temporary subsidies.

From a policy perspective, the evidence cautions against overly simplistic reliance on ad hoc exchange-rate interventions or isolated budget allocations as a means of stabilizing food prices. Instead, it calls for strategic coherence: ensuring that investments in agricultural technology, supply-chain logistics, and market transparency operate synergistically with macroeconomic tools. Monitoring global trends – through timely FAO data and related indices – remains critical, as external shocks continue to reverberate through domestic value chains. In parallel, sustained progress in per capita GDP, whether through industrial diversification or more inclusive growth, appears to support a more robust and self-regulating food market.

Methodologically, the short time series and annual frequency limit both the statistical power and the ability to detect lag-dependent phenomena. Future research could employ higher-frequency data (e.g., quarterly or monthly) and advanced time-series models, such as ARDL or structural VAR, to capture dynamic interlinkages and shock propagation more precisely. Further, incorporating finer-grained indicators – such as disaggregated agricultural budgets, climate variables, or measures of input cost volatility – could clarify the channels through which government expenditures and exchange rates shape outcomes on farmers' profit margins and final consumer prices.

By revealing the complementary roles of domestic structural conditions and international drivers, this work enriches the understanding of price formation in a partially liberalized agricultural market. The empirical insights hold implications not only for Kazakhstan's policymakers but also for any emerging economy seeking to balance openness to global markets with the pursuit of long-term food security and economic resilience.

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## REFERENCES

1 AL-Rousan N., AL-Najjar H., AL-Najjar D. The impact of Russo-Ukrainian war, COVID-19, and oil prices on global food security // Heliyon. 2024. Vol. 10. No. 8. P. 9279.

2 Kalkuhl M. How Strong Do Global Commodity Prices Influence Domestic Food Prices in Developing Countries? A Global Price Transmission and Vulnerability Mapping Analysis // Food Price Volatility and Its Implications for Food Security and Policy. Cham: Springer International Publishing, 2016. P. 269–301.

3 Herwartz H., Saucedo A. Food–oil volatility spillovers and the impact of distinct biofuel policies on price uncertainties on feedstock markets // Agricultural Economics. 2020. Vol. 51. No. 3. P. 387–402.

4 Stone R.A. et al. The impact of the cost of living crisis and food insecurity on food purchasing behaviours and food preparation practices in people living with obesity // Appetite. 2024. Vol. 196. P. 7255.

5 Chen D. et al. Modelling the impact of oil price fluctuations on food price in high and low-income oil exporting countries // Agricultural Economics (Zemědělská ekonomika). 2020. Vol. 66. No. 10. P. 458–468.

6 Sami J., Makun K. Food inflation and monetary policy in emerging economies // J Asian Econ. 2024. Vol. 95. P. 101817.

7 Samal A., Ummalla M., Goyari P. The impact of macroeconomic factors on food price inflation: an evidence from India // Future Business Journal. 2022. Vol. 8. No. 1. P. 15.

8 FAO 2023a. The State of Food Security and Nutrition in the World 2023. FAO; IFAD; UNICEF; WFP; WHO. 2023.

9 Mhonyera G., Masunda S., Meyer D.F. Measuring the pass-through effect of global food price volatility and South Africa's CPI on the headline inflation of Zimbabwe // Cogent Food Agric. 2023. Vol. 9. No. 1. P. 187.

10 Li C. et al. Geopolitical risks, institutional environment, and food price inflation // Appl Econ. 2024. P. 1–21.

11 Khurshid A. et al. Effect of geopolitical risk on resources prices in the global and Russian-Ukrainian context: A novel Bayesian structural model // Resources Policy. 2024. Vol. 88. P. 104536.

12 Hossain A.T., Masum A.-A., Saadi S. The impact of geopolitical risks on foreign exchange markets: evidence from the Russia–Ukraine war // Financ Res Lett. 2024. Vol. 59. P. 104750.

13 Ibyzhanova A. et al. Opportunities for Kazakhstan's agricultural exports to the Chinese market // Journal of Eastern European and Central Asian Research (JEECAR). 2024. Vol. 11. No. 5. P. 871–886.

14 Ben Hassen T., El Bilali H. Impacts of the Russia-Ukraine War on Global Food Security: Towards More Sustainable and Resilient Food Systems? // Foods. 2022. Vol. 11. No. 15. P. 2301.

15 Kuhla K., Puma M.J., Otto C. International cooperation was key to stabilize wheat prices after the Russian Invasion of Ukraine // Commun Earth Environ. 2024. Vol. 5. No. 1. P. 481.

16 Moyer J.D. et al. How many people is the COVID-19 pandemic pushing into poverty? A long-term forecast to 2050 with alternative scenarios // PLoS One. 2022. Vol. 17. No. 7. P. 846.

17 Syromyatnikov D. et al. Analyzing the impact of competitiveness factors on increasing grain production in Kazakhstan and Russia // Heliyon. 2024. Vol. 10. No. 23. P. 39751.

18 Makoukji M. et al. Food systems under shock: the evolution of food security status of Karantina residents after the Beirut explosion // Front Sustain Food Syst. 2024. Vol. 8. P. 454.

19 Mohammadi-Nasrabadi F. et al. Economic Sanctions Affecting Household Food and Nutrition Security and Policies to Cope With Them: A Systematic Review // Int J Health Policy Manag. 2023. Vol. 12. P. 7362.

20 Wang D. et al. Impact of Climate Change on Food Security in Kazakhstan // Agriculture. 2022. Vol. 12, No. 8. P. 1087.

21 Duisenbekova A. et al. Predicting Food Consumption to Reduce the Risk of Food Insecurity in Kazakhstan // Economies. 2023. Vol. 12. No. 1. P. 11.

22 Boratyńska K. Risk Challenges and Their Impact on the Sustainable Food Security System: Lessons Learned from the COVID-19 Pandemic // Sustainability. 2024. Vol. 17. No. 1. P. 226.

23 Bureau of national statistics of the Agency for strategic planning and reforms of the Republic of Kazakhstan. URL: https://stat.gov.kz/ (accessed: 13.03.2023)

24 FAO. The State of Food Security and Nutrition in the World 2024. FAO; IFAD; UNICEF; WFP; WHO. 2024.

25 FAO. FAO price data and analysis. 2022. URL: https://www.fao.org/prices/en?utm_source=chatgpt.com (accessed: 07.06.2025)

26 Tadesse G. et al. Drivers and triggers of international food price spikes and volatility // Food Policy. 2014. Vol. 47. P. 117–128

**ДУЙСЕНБЕКОВА А.А.,*[1]**
постдокторант.
*e-mail: aigerim.duisenbekova95@gmail.com
ORCID ID: 0000-0001-9167-8076
**ХАМУЛЬЧУК М.,[2]**
э.ғ.д., доцент.
e-mail: mariusz_hamulczuk@sggw.edu.pl
ORCID ID: 0000-0002-4956-8516
**ТЛЕУЖАНОВА М.А.,[3,4]**
э.ғ.к., қауымдастырылған профессор.
e-mail: manatzhankz@gmail.com
ORCID ID: 0000-0002-4717-7191
**ДАНИЛОВСКА А.,[2]**
э.ғ.д., профессор.
e-mail: alina_danilowska@sggw.edu.pl
ORCID ID: 0000-0002-4977-3210
[1]Астана IT университеті,
Астана, Қазақстан
[2]Варшава өмір туралы ғылым университеті,
Варшава, Польша
[3]Satbayev университеті,
Алматы, Қазақстан
[4]Халықаралық инженерлік-технологиялық университеті,
Алматы, Қазақстан

## АЗЫҚ-ТҮЛІК БАҒАСЫНЫҢ ДЕТЕРМИНАНТТАРЫН ЭКОНОМЕТРИКАЛЫҚ БАҒАЛАУ: ҚАЗАҚСТАН МЫСАЛЫ

**Аңдатпа**

Бұл ғылыми мақалада Қазақстанның азық-түлік қауіпсіздігіне ықпал ететін негізгі сыртқы экономикалық факторлардың әсері қарастырылады, әсіресе жаһандық экономикалық ауытқулар жағдайында ішкі азық-түлік бағаларының динамикасына ерекше назар аударылады. Зерттеудің мақсаты – Қазақстанның азық-түлік қауіпсіздігіне әсер ететін маңызды сыртқы экономикалық детерминанттарды анықтау, оларды эмпирикалық түрде талдау, сонымен қатар мемлекеттік саясатты әзірлеушілер үшін ғылыми негізделген ұсынымдар ұсыну. Зерттеу әдістемесі сандық эконометрикалық тәсілдерді қамтиды, атап айтқанда, ең кіші квадраттар әдісі (OLS) негізіндегі регрессиялық талдау, корреляциялық талдау және бас компоненттер әдісі (PCA) арқылы 2010–2024 жылдар аралығындағы жылдық статистикалық деректер пайдаланылған. Зерттеу кешенді сипатқа ие және ұлттық азық-түлік бағаларының индексі, валюта бағамы, әлемдік азық-түлік бағалары, жан басына

шаққандағы ЖІӨ және ауыл шаруашылығына бөлінетін мемлекеттік шығындар сияқты макроэкономикалық көрсеткіштерді қамтиды. Зерттеудің негізгі нәтижелері көрсеткендей, әлемдік азық-түлік бағалары мен халықтың табыс деңгейі ел ішіндегі азық-түлік бағаларының тұрақтылығына айтарлықтай әсер етеді, ал валюта бағамының ауытқуы мен ауыл шаруашылығына мемлекеттік шығындардың қысқа мерзімді тікелей әсері статистикалық тұрғыдан азырақ көрінеді. Статистикалық деректерді талдау Қазақстанның жаһандық экономикалық күйзелістер мен логистикалық бұзылуларға осалдығын айқындайды, бұл импортқа тәуелділік пен ұлттық валютаның құбылмалылығымен байланысты. Зерттеудің ғылыми жаңалығы – Қазақстан контексінде азық-түлік қауіпсіздігінің сыртқы экономикалық детерминанттарын жүйелі түрде қарастыруында, бұл аспект алдыңғы зерттеулерде жеткілікті түрде қарастырылмаған болатын. Зерттеудің практикалық маңыздылығы – оның нәтижелерін мемлекеттік басқару органдары мен мүдделі тараптардың Қазақстанның азық-түлік қауіпсіздігін жаһандық белгісіздік жағдайында нығайтуға бағытталған бейімделу стратегияларын әзірлеу барысында пайдалана алу мүмкіндігінде.

**Тірек сөздер:** азық-түлік қауіпсіздігі, тағам қауіпсіздігі, сыртқы экономикалық факторлар, азық-түлік бағалары, азық-түлік жүйесі, экономикалық күйзелістер, негізгі компоненттерді талдау әдісі, эконометрикалық модельдеу.

**ДУЙСЕНБЕКОВА А.А.,*[1]**
постдокторант.
*e-mail: aigerim.duisenbekova95@gmail.com
ORCID ID: 0000-0001-9167-8076
**ХАМУЛЬЧУК М.,[2]**
д.э.н., доцент.
e-mail: mariusz_hamulczuk@sggw.edu.pl
ORCID ID: 0000-0002-4956-8516
**ТЛЕУЖАНОВА М.А.,[3,4]**
к.э.н., ассоциированный профессор.
e-mail: manatzhankz@gmail.com
ORCID ID: 0000-0002-4717-7191
**ДАНИЛОВСКА А.,[2]**
д.э.н., профессор.
e-mail: alina_danilowska@sggw.edu.pl
ORCID ID: 0000-0002-4977-3210
[1]Астана IT университет,
Астана, Казахстан
[2]Варшавский университет естественных наук,
Варшава, Польша
[3]Satbayev университет,
Алматы, Казахстан
[4]Международный инженерно-технологический университет,
Алматы, Казахстан

# ЭКОНОМЕТРИЧЕСКАЯ ОЦЕНКА ДЕТЕРМИНАНТ ПРОДОВОЛЬСТВЕННЫХ ЦЕН: КЕЙС КАЗАХСТАНА

**Аннотация**

Данная научная статья посвящена изучению влияния ключевых внешнеэкономических факторов на продовольственную безопасность Казахстана с особым акцентом на динамику внутренних цен на продовольствие в контексте глобальных экономических колебаний. Цель исследования заключается в выявлении и эмпирическом анализе значимых внешних экономических детерминант, оказывающих влияние на состояние продовольственной безопасности Казахстана, а также в разработке научно обоснованных рекомендаций для органов государственного управления. Методология исследования включает количественные эконометрические методы, в частности регрессионный анализ с использованием метода наименьших квадратов (OLS), корреляционный анализ и метод главных компонент (PCA) на основе ежегодных статистических данных за 2010–2024 гг. Исследование носит комплексный характер и охватывает такие макроэкономические показатели, как национальный индекс цен на продовольствие, обменный курс, мировые цены на продовольствие, ВВП

на душу населения и государственные расходы на сельское хозяйство. Основные результаты исследования показывают, что мировые цены на продовольствие и уровень доходов населения значительно влияют на стабильность внутренних цен на продукты питания, тогда как прямые краткосрочные эффекты от колебаний обменного курса и государственных расходов на сельское хозяйство выражены статистически менее отчетливо. Анализ статистических данных подчеркивает подверженность Казахстана глобальным экономическим шокам и логистическим сбоям, акцентируя уязвимость страны ввиду ее зависимости от импорта и волатильности национальной валюты. Научная новизна статьи заключается в системном анализе внешнеэкономических детерминант продовольственной безопасности Казахстана, аспект, который ранее был недостаточно подробно изучен. Практическая значимость данного исследования заключается в том, что его результаты могут быть использованы органами государственного управления и заинтересованными сторонами для разработки адаптивных стратегий повышения устойчивости и стабильности системы продовольственной безопасности Казахстана в условиях нарастающей глобальной неопределенности.

**Ключевые слова:** продовольственная безопасность, безопасность пищевых продуктов, внешние экономические факторы, цены на продукты питания, продовольственная система, экономические потрясения, метод главных компонентов, эконометрическое моделирование.

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