Agniyazov, Birzhan; Baimaganbetov, Sabit; Pazilov, Galimzhan et al.

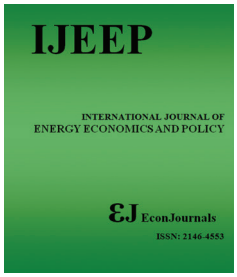
Periodical Part

Analyzing the effects of oil price volatility on agricultural pricing and outsourcing dynamics : a vector autoregression approach

International Journal of Energy Economics and Policy

Provided in Cooperation with:
International Journal of Energy Economics and Policy (IJEEP)

Reference: In: International Journal of Energy Economics and Policy Analyzing the effects of oil price volatility on agricultural pricing and outsourcing dynamics : a vector autoregression approach 15 (2025).
https://www.econjournals.com/index.php/ijeep/article/download/18056/8525/41359.
doi:10.32479/ijeep.18056.



International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2025, 15(1), 429-436.

Analyzing the Effects of Oil Price Volatility on Agricultural Pricing and Outsourcing Dynamics: A Vector Autoregression Approach

Birzhan Agniyazov[1], Sabit Baimaganbetov[2]*, Galimzhan Pazilov[3], Borash Myrzalyiev[2], Dariga Zhoshybaeva[3], Abylaykhan Duisenbekuly[3], Raikhan Tazhibayeva[2], Zhanat Turebayeva[4]

[1]Khoja Akhmet Yassawi International Kazakh-Turkish University, Turkestan, Kazakhstan, [2]International University of Tourism and Hospitality, Turkestan, Kazakhstan, [3]Mukhtar Auezov South Kazakhstan University, Shymkent, Kazakhstan, [4]Miras University, Shymkent, Kazakhstan. *Email: sabit.baimaganbetov@iuth.edu.kz

Received: 14 September 2024 **Accepted:** 28 November 2024 **DOI:** https://doi.org/10.32479/ijeep.18056

ABSTRACT

The investigation delved into the dynamic interplay between oil price fluctuations and their ramifications on the pricing of agricultural products, employing the Vector Autoregression methodology. The dataset spanned 3 months, commencing from January 2010 and concluding in December 2022. Upon subjecting the data to an in-depth analysis, it was ascertained that it possesses a unit root, indicating an integrated order of one (I [1]), and achieves stationarity subsequent to the first-order differencing. The findings of the inquiry revealed that the paramount driver influencing agricultural product prices is the inherent volatility within the agricultural sector itself. Contrary to initial expectations, the impact of oil price fluctuations on agricultural prices was discerned to be comparatively modest. Intriguingly, the outcomes underscored that the preeminent factor contributing to fluctuations in agricultural product prices is the influence wielded by oil prices. This implies that alterations in oil prices exert a more pronounced effect on the variability in agricultural product prices as opposed to the overall revenue generated from agricultural endeavors.

Keywords: Oil Prices, Kazakhstan, Volume of Agricultural Products, Vector Autoregression, Outsourcing Dynamics
JEL Classifications: C22, C54, Q43

1. INTRODUCTION

The oil sector stands as a pivotal cornerstone in the economic framework of Kazakhstan, serving as the primary category of exported goods. Notwithstanding its strategic significance, Kazakhstan, owing to its reliance on oil prices, grapples with recurrent oscillations in this economic parameter (Baimaganbetov et al., 2019; Aidarova et al., 2024). The consequential challenge manifests prominently in the agricultural sector of Kazakhstan, where it exerts discernible influence on agricultural productivity. Consequently, a comprehensive examination is imperative to delineate the intricacies and assess the ramifications of these oscillations in oil prices on the productivity levels within the agricultural domain of Kazakhstan.

The predominant demographic of Kazakhstan resides in rural regions, where currently, 43% of the population is situated (Kelesbayev et al., 2020). The developmental status of agricultural production plays a pivotal role in determining the living standards of not only those directly engaged in agricultural activities but also individuals with various affiliations to this industry. Consequently, the degree of advancement in agricultural production bears a direct correlation to the overall well-being of a substantial majority of the Kazakhstani populace.

The agro-industrial sector in the Republic of Kazakhstan stands as a pivotal cornerstone within its economic framework. Its sustained development not only plays a crucial role in securing

food resources but also significantly influences the progress of ancillary industries reliant on products originating from the national economy. The agro-industrial production in Kazakhstan manifests itself through three principal domains:

- Agriculture, encompassing land cultivation, livestock farming, forestry, and fisheries
- Processing Industries devoted to agricultural raw materials, food, light industry, as well as cotton and wool
- Industries engaged in the production of agricultural means and the processing of agricultural products.

Key challenges contributing to a diminished food security risk in Kazakhstan encompass several critical facets. Chief among them is the inadequacy in domestic production, particularly in the industrial agricultural domain. This deficiency amplifies reliance on foreign markets for ensuring food security (Baimaganbetov et al., 2021). Despite the apparent market saturation, the economic accessibility of food becomes compromised, especially amid the volatility of the national currency.

Currently, the practice of using outsourcing for agricultural development is becoming widespread (Mohammed and Kinyua, 2023). The growing scientific and practical importance of outsourcing in the management of enterprises engaged in agriculture is evidenced by the fact that today more than half of modern foreign enterprises use this approach to implement at least one business process. Another important point to note is that outsourcing in Kazakhstan is at an early stage of its development and mainly affects the development of the information technology market and the restructuring of the activities of business entities.

It is noteworthy that the adoption of outsourcing practices in rural regions has the potential to serve as a efficacious mechanism for agricultural enterprises. This extends beyond the mere acquisition of novel production and managerial technologies, encompassing a broader utility in augmenting production capacities.

The findings of this investigation hold significance for informing the formulation of robust and comprehensive public policies. These policies aim to systematically monitor and analyze the repercussions of oil price fluctuations on food prices, specifically within the context of their impact on the developmental trajectory of the agricultural sector.

1.1. Overview of the Evolutionary Trends in the Agricultural Development of Kazakhstan

The agricultural sector, commonly referred to as the agro-industrial complex, assumes a pivotal role in Kazakhstan's economic landscape. The Republic's diverse climatic conditions and extensive agricultural land facilitate the cultivation of a wide array of crops from the temperate thermal zone, coupled with the development of livestock farming. Within the overarching framework of economic activities outlined in the Republic of Kazakhstan's classifier, key industries of agricultural enterprises are categorized as follows:

- Industries involved in the production of means of production for agricultural enterprises, encompassing the provision of machinery, equipment, animal feed, plant and animal protection products, fertilizers, and those engaged in the production and technical maintenance of agricultural organizations.
- Industries engaged in the preparation, storage, processing of agricultural raw materials, and the subsequent sale of finished products.
- Crop production emerges as the cornerstone of agricultural enterprises in Kazakhstan. The cultivation of spring wheat, a commodity not only meeting domestic demand but also extending to international markets, stands out prominently. Additionally, the cultivation of crops such as rice, buckwheat, barley, oats, millet, and corn is prevalent. Arable land is allocated significantly to sugar beets and oilseeds (sunflower, rapeseed), with cotton and jute grown for the textile industry. Concurrently, the cultivation of potatoes, apples, melons, and grapes also commands attention.
- Beyond crop cultivation, the agro-industrial complex encompasses fisheries, forestry, and hunting.
- Noteworthy advancements are observed in livestock farming, spanning cattle breeding (meat and milk production), sheep, horses, camels, pigs, goats, and poultry, as elucidated in extant research.

This comprehensive overview underscores the multifaceted dimensions of Kazakhstan's agro-industrial complex, elucidating its intricate interplay with diverse agricultural activities.

As reported by the Bureau of National Statistics within the Agency of the Republic of Kazakhstan for Strategic Planning and Reforms, the trajectory of key indicators in agricultural production over the preceding 13 years is delineated on Figure 1.

Upon examination of the figured data, it becomes evident that the contribution of agricultural products to the gross domestic product (GDP) fluctuates within the range of 4.2-5.3%. Notably, the Figure 1 indicates a discernible upward trend in the percentage of agricultural products relative to the GDP in recent years.

On this occasion, Figure 2 presents the compositional breakdown of agricultural products, specifically delineating the proportions attributed to agriculture and crop production, denominated in percentages.

Figure 1: The share of agricultural enterprises in gross domestic product (as a percentage), The data was derived from the website https://stat.gov.kz/(Statistical Committee of the Republic of Kazakhstan)

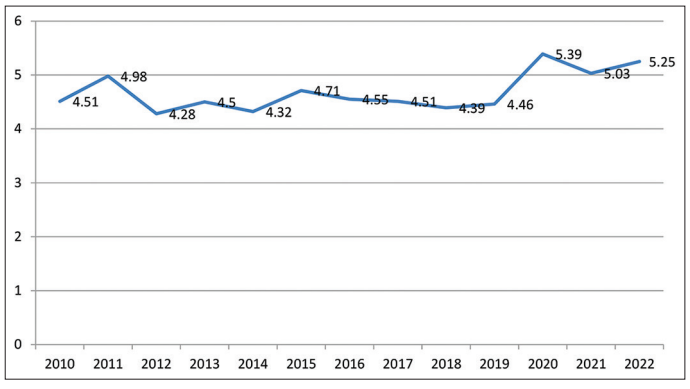
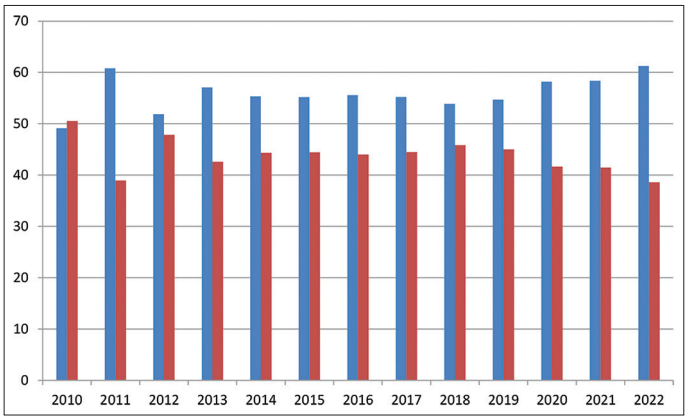


Figure 2: The compositional breakdown of agricultural products (as a percentage)



Concerning the aforementioned figure, it elucidates the composition of the farm structure. Analysis of the figure reveals that a predominant portion of the agricultural sector is constituted by crop production.

1.2. Outsourcing Emerges as a Potent Instrument for Establishing an Agricultural Enterprise in the Context of Kazakhstan

To ensure stability and economic security, professionals should contemplate a development strategy that avoids escalating costs and domestic investments. A strategy of particular note is the utilization of outsourcing services for professionals and organizations (Anikin and Rudaya, 2024), "outsourcing is the contemporary paradigm for establishing a highly efficient and competitive organization." This approach provides strategic flexibility through outsourcing production, concurrently reducing costs for the local government. The key to business success lies in concentrating on core competencies, and outsourcing emerges as a prime solution in this regard. In recent years, outsourcing has become a prominent strategy, enabling businesses to channel their efforts toward core functions and organizational aspects. This approach not only curtails capital costs but also imparts flexibility to adapt to evolving market dynamics and changing customer expectations (Bals and Turkulainen, 2017). The emphasis on achieving efficiency in procurement and supply management underscores the organizational design and outsourcing as pivotal elements in contemporary business strategies.

Within the realm of scientific inquiry, efforts have been directed towards identifying strategies that businesses can employ to enhance efficiency, and strategic outsourcing has emerged as a pivotal response to the evolving dynamics and uncertainties within the business environment (Latif et al., 2018). Moreover, numerous studies recommend the adoption of strategic outsourcing to address productivity challenges within firms (Ugbomhe et al., 2021; Ramos, 2020; Latif et al., 2018). However, methodological gaps persist in many of these studies. For instance, a substantial portion of research on outsourcing and productivity is cross-sectional in nature, lacking a longitudinal perspective to trace the transformations occurring within enterprises over time. Investigation, for instance, scrutinized the short-term impact of outsourcing on a firm's performance, neglecting considerations of long-term effects. Contrarily, a longitudinal study conducted by Lacity et al. (2009) emphasized that the benefits of outsourcing may only manifest several years after the decision to outsource is enacted.

Furthermore, the predominant focus of numerous studies on the cost-saving dimension of outsourcing neglects other potential benefits. For example, Kedia and Mukherjee's (2009) research demonstrated that outsourcing can contribute to enhanced innovation, an aspect frequently overlooked in extant studies. Similarly, the study by Domberger (1998) posited that outsourcing does not significantly influence the activities of UK local authorities but fails to account for other potential advantages of outsourcing. These methodological gaps underscore the need for comprehensive and longitudinal investigations to ascertain the multifaceted impacts of outsourcing beyond immediate cost considerations.

Contemporary challenges faced by organizations in the agricultural sector of the economy stem, in part, from the ineffective utilization of market infrastructure and, on the other hand, from the absence of a well-established system of services for agricultural producers. Presently, a notable trend among organizations across diverse sectors, including the agro-industrial complex, involves the outsourcing of non-core assets and processes to external contractors.

The predominant reasons underlying the prioritization of judicious outsourcing by agro-industrial complex organizations, within the current framework of evolving market relations in Kazakhstan, encompass several key facets:

- A discernible albeit modest uptick in the emergence of advanced technical complexes and technological innovations.
- The ongoing process of globalizing the world market, coupled with Kazakhstan's membership in the World Trade Organization, contributes to an elevated emphasis on enhancing the quality of manufactured products, services, and executed work. This, in turn, serves as a catalyst for the motivation and aspiration to stabilize or reduce cost levels.
- Advancements in methodologies for identifying stages of high and low efficiency within the agro-industrial complex organizations during the research phase.
- The development of an extensive array of management techniques, software systems, and methodological frameworks tailored to the specificities of agro-industrial operations. These endeavors aim to augment the competitiveness of agricultural enterprise managers in optimizing organizational functionality.
- The cultivation of skills conducive to effective operations within the action system through specialized training centers. In certain instances, state financing may be involved to facilitate training programs, enabling managers to navigate complex decision-making processes.
- The potential for implementing agricultural machinery, the repair of agricultural and livestock complexes, and the maintenance of buildings, among other agro-technical measures, within periodic works.
- The creation of avenues for attracting additional equipment and personnel during peak periods of agricultural activity, particularly in the face of pronounced fluctuations in demand, under the purview of outsourcing conditions.

It is noteworthy that during the transformative phase and economic reforms in the agro-industrial complex of Kazakhstan, a focal emphasis was placed on the establishment of a smaller agricultural system anchored in individual family-oriented agricultural structures, such as household, peasant, and farms.

2. LITERATURE REVIEW

Lotfalipur and Ahmadi (2014) conducted an inquiry into the influence of oil revenue on the value added in the agricultural sector of the Iranian economy, employing autoregressive regression within the vector autoregression (VAR) and vector error correction model (VECM) frameworks. The application of the Johansen and Juselius approach unveiled a long-term equilibrium relationship among the variables under consideration. The findings substantiated the existence of both Dutch disease and de-agriculture phenomena, with the estimated long-term oil income ratio standing at −1.42. This outcome implies that a 1% increment in oil revenue is associated with a reduction of 1.42% in the added value of the agricultural sector.

Wei and Chen (2016) conducted a study with the primary objective of examining the interrelationship between crude oil futures and agricultural grain commodity futures, specifically focusing on soybeans, wheat, and corn. The research utilized daily data obtained from the Chicago Board of Trade for soybeans, wheat, and corn, while crude oil price data was sourced from the New York Commodity Exchange. The study period spanned from January 3, 2006, to February 22, 2012. Employing the Vector Auto Regression (VAR) model, the investigation aimed to discern the intricate relationships between crude oil and agricultural grain commodity futures. The results from the VAR model indicated that fluctuations in each of the agricultural grain commodities are significantly influenced by changes not only in crude oil but also in other agricultural grain commodities.

Adedokun (2018) conducted an investigation into the repercussions of oil shocks on government spending and revenues in Nigeria. Employing the Structural Vector Autoregressive (SVAR) and Vector Error Correction (VEC) methodologies, the author demonstrated that the influence of oil shocks significantly impacts policy indicators in the short term, with consequential effects extending to other macroeconomic variables over the long term. In a parallel study, Asaleye et al. (2019) delved into the impact of oil shocks on macroeconomic variables, with a specific focus on employment metrics within Nigeria. Utilizing the Structural Vector Autoregressive (SVAR) approach, the researchers discerned a negative association between employment and both the exchange rate and oil prices over the long term. Furthermore, the study revealed a positive correlation between the Consumer Price Index, the credit commission, and employment.

In a research conducted in 2018 (Adedokun, 2018), the economic repercussions of oil price volatility on developing countries were explored, with a particular focus on Nigeria. The researchers employed the simple least squares method (OLS) in their analysis. The study revealed a discernible linear relationship between oil price volatility and key macroeconomic variables, including foreign direct investment, balance of payments, interest rates, and gross domestic product per capita. Despite numerous investigations into the impact of oil prices, a notable gap in the literature pertains to its influence on agricultural productivity. Consequently, the distinctive contribution of this study lies in its endeavor to analyze the effects of oil price shocks on agricultural productivity in the context of Nigeria.

Abdlaziz et al. (2018) aimed to investigate the enduring relationship between oil prices and the value-added share of agricultural GDP across 25 oil-exporting nations. The study employed panel heterogeneous cointegration tests and utilized the completely modified simple least squares (OLS), dynamic OLS, and combined average group methods to scrutinize the long-term influence of real oil prices and real exchange rates on the agricultural sector. The outcomes of the Pedroni co-integration analysis indicated a sustained relationship between the variables under examination. Panel co-integration assessments revealed a substantial and adverse impact of oil prices and exchange rates on the value added in agriculture. These findings affirm the prevalence of Dutch disease and de-agriculture phenomena in oil-exporting countries. This study contributes to the existing body of literature focused on Dutch disease and de-agriculture by systematically analyzing the enduring effects of real oil prices and real exchange rates on the agricultural sector in both the long and short term within oil-exporting developing nations.

In the research conducted by Baimaganbetov et al. (2021), the VAR method was employed to empirically analyze the impact of real oil prices on food inflation in Kazakhstan utilizing monthly data spanning from 2004 to 2019. Traditional unit root tests were deemed unreliable in the presence of structural increments, leading to the adoption of the Zivot and Andrews (1992) unit root test. The Zivot and Andrews (1992) test results indicated that the price of food demonstrated an integrated order of 1 (i.e., i[1]), corroborated by the ADF test affirming i (0). Subsequent steps involved the causality test for the variables, revealing a two-way causal relationship between the prices of oil and food. To examine the short-term effects, the VAR model was employed. The outcomes demonstrated that the price of crude oil exerts an indirect influence on the price of food.

Aye and Odhiambo (2021) delved into the discernible relationship between oil prices and agricultural products. The investigation posited that oil prices possess the potential to precipitate a decline in income, thereby influencing the cost dynamics of agricultural products. Consequently, the study sought to ascertain whether oil prices indeed exerted a detrimental impact on income derived from agricultural products in South Africa. Through the application of a marginal regression model for agricultural growth, both real West Texas Intermediate (WTI) and Real Brent oil prices were examined, both in dollars and utilizing the rand as marginal variables. The findings unveiled a noteworthy outcome, indicating that the escalation in oil prices significantly and negatively influences the growth trajectory of agriculture in South Africa.

Hung (2021) presents an analysis examining the distribution effects and time-frequency relationship between crude oil prices and agricultural commodity markets, utilizing the distribution

index and the wave coherence model developed by Diebold and Yilmaz (2012). The results provide insights, highlighting a more pronounced spread of returns during the Covid-19 crisis compared to the pre-Covid-19 period. However, the intensity levels of this relationship exhibit variations across the study period, with intervals displaying both negative and positive interactions. Notably, the findings reveal a substantial heterogeneity in the impact of crude oil prices on agricultural commodity markets over time, enhancing our comprehension of the economic channels interconnecting these markets. Importantly, certain models demonstrate significant dependency on the dissemination of information within the crude oil and agricultural commodity markets, implying potential significant consequences for portfolio managers, investors, and government agencies.

Porteous (2022) highlights the imperative for trade sectors in oil-exporting countries to diversify beyond oil revenues, particularly in the wake of the decline in oil revenues since 2014. The author underscores the pivotal role of agriculture as one of the initial industries that should be developed. Employing an open economy model incorporating domestic and foreign trade costs, the study explores the potential for Dutch disease in African countries. It establishes that reducing trade costs and enhancing agricultural productivity can mitigate the impact of diminished oil revenue resulting from lower prices. The research underscores a noteworthy shift in African countries rich in oil reserves, transitioning from exporting to importing agricultural products. This shift is attributed to the predominant allocation of investments to the oil sector rather than the development of agricultural products. In a related study, Ebaidalla (2014) delves into the ramifications of oil price volatility on the Sudanese economy, investigating the relationship between fluctuations in crude oil prices and Sudan's economic performance. The utilization of variance decomposition (VDC) and impulse response functions (IRFs) reveals an asymmetric effect, with negative oil price shocks exerting a more substantial impact on macroeconomic variables than positive shocks. Conversely, Thankgod and Maxwell (2013) scrutinize the macroeconomic impact of oil price levels and volatility in Nigeria. Employing the ARCH (GARCH) model, their findings indicate that oil price volatility does not significantly affect government spending, production, and inflation rates in Nigeria.

Popoola et al. (2022). The dominance of the oil sector in Nigeria is evident as it stands as the country's primary exported commodity. However, the inherent vulnerability of Nigeria, being heavily dependent on oil, becomes apparent in the face of frequent fluctuations in oil prices. These fluctuations present significant challenges to Nigeria's agricultural sector, consequently impacting agricultural productivity. Recognizing the imperative to explore the repercussions of oil price shocks on agricultural productivity in Nigeria, this study employed Hodrick-Prescott's data filtering method to examine the fluctuations in oil prices. The findings revealed discernible fluctuations in Nigerian oil prices from 2018 to the present. The study established a long-term connection using the Structural Vector Auto Regression (SVAR) method and the normalized equation. The outcomes unveiled a negative relationship between agricultural productivity, oil prices, and the real exchange rate. Conversely, a positive relationship was observed between agricultural productivity, the Consumer Price Index, and oil production. While fluctuations in oil prices affected various variables, oil price shocks exhibited more pronounced variations over time in relation to agricultural productivity. In light of these findings, the study concludes that the stress induced by oil prices exerts a negative impact on Nigeria's agricultural productivity. Consequently, the government is urged to implement policies and programs that act as shock absorbers for oil prices to safeguard and sustain agricultural productivity.

Humbatova et al. (2022) conducted a comprehensive study to ascertain the influence of macroeconomic factors on agriculture in Nigeria. The research specifically delved into the examination of the impact of macroeconomic elements, namely the exchange rate and crude oil prices, on agricultural exports within the timeframe of 1981-2016. The study employed autoregressive distributed lag analysis, given that not all macroeconomic series used exhibited stationary uniformity. Furthermore, the Granger causality test was applied to investigate the predictive power of crude oil prices for agricultural exports. The findings revealed a significant relationship between agricultural exports and the exchange rate, with the latter being the dependent variable. In conclusion, the study established the existence of a long-term relationship between exchange rates and agricultural exports in Nigeria.

3. METHODS

In the analysis of a time series, if the characteristics such as mean, variance, and covariance remain constant over the observed period, the series is termed as stationary. It implies that the differences between two consecutive values in a stationary series do not vary systematically with time but only with the time interval. When undertaking any empirical analysis, it is essential that the values exhibit stationarity. If dealing with non-stationary series, the regression results become unreliable and may yield spurious relationships between the variables in the regression. The necessary conditions for a stochastic process to maintain a stationary structure over a specified period are outlined below.

$E(Y_t) = \mu$ Mean value

$Var\ (Y_t) = E(Y_t - \mu)^2 = \delta^2$ Dispersion

$Y_k = [E(Y_t - \mu)\ (Y_{t+k} - \mu)]$ Covariance

If any of the conditions mentioned above are not satisfied, the series is deemed non-stationary. Time series lacking a stationary structure are characterized by the presence of unit roots. The count of unit roots in a time series corresponds to the number of differencing operations needed to fulfill the requirement of stationarity (Gujarati and Porter, 2009).

When employing the Dickey-Fuller unit root test, the term "error" signifies the absence of autocorrelation in εt, assuming that the Yt series adheres to the AR(1) model. However, it is conceivable that the series may conform to autoregressive processes other than the AR(1) model. Specifically, if the Yt time series, following an AR(p) process, is erroneously labeled with the AR(1) model,

the error term encompasses autocorrelation, thereby invalidating the Dickey-Fuller distributions set under the assumption of autocorrelation-free error terms. Consequently, the study opted for the Extended Dickey Fuller test presented as follows:

$$\Delta Y_t = \delta Y_{t-1} + \sum_{i=2}^{p} \beta_i \Delta Y_{t-i} + \in_t$$

$$\Delta Y_t = a + \delta Y_{t-1} + \sum_{i=2}^{p} \beta_i \Delta Y_{t-i} + \in_t$$

$$\Delta Y_t = a + \delta Y_{t-1} + \sum_{i=2}^{p} \beta_i \Delta Y_{t-i} + \gamma T + \in_t$$

The hypothesis formulated as H_0: $\delta = 0$, is central to the equation above. Based on this hypothesis, critical values for the test statistic are computed. If the null hypothesis H_0 is accepted, it implies that the series ΔY_t is non-stationary or possesses a unit root. In such a scenario, the values derived from ΔY_t or the first-order differences are subjected to another round of Unit Root Test. This methodology involves integrating the Y_t values through differencing. If the hypothesis H_0 is rejected as a result of the unit root test, the values are stationary, and this phenomenon is denoted by notation I(1) in the literature.

The VAR model, in its examination of selected variables, does not distinguish between internal and external variables, analyzing all variables within a unified system framework. In the construction of an econometric model, it operates independently of the principles outlined in economic theory. Consequently, certain assumptions and constraints prescribed by economic theory are not imposed on the model, preventing potential violations (Kelesbayev et al., 2022).

VAR models serve the purpose of assessing the dynamic repercussions of random shocks on variables and examining the interrelationships among macroeconomic variables. This modeling approach offers a multivariate framework wherein alterations in the variables under investigation are linked to changes in their respective lags (Adeniran, 2016).

The VAR model is formulated on the basis of the following equation:

$$Y_t = v + A_1 y_{t-1} + \cdots + A_p y_{t-p} + u$$

In this equation, the data matrix Y (y_1t,y_kt) of dimension K×1 represents the variables. A_i is a coefficient matrix, $v = v_1$, v_k is a constant vector, and $u = (u_1,u_k)$ denotes a white noise process of dimension K.

$$e(u_t) = 0$$

$$e(u_t u_t^{'}) = £_u$$

$$e(u_t u_t^{s}) = 0 \, s \neq 0$$

4. RESULTS

During the analysis of macroeconomic variables, the natural logarithms of the aforementioned variables were computed. In the subsequent phase of the investigation, a necessity arose for seasonal adjustment, and to fulfill this requirement, seasonal correction was applied utilizing the Taroma Seats method. Regarding the variables involved in the model, the agricultural variable is represented by the quantity of agricultural products, INF signifies fluctuations in the prices of agricultural products, and OP corresponds to indicators of Brent crude oil prices. Abbreviated names and sources of these mentions are detailed in Table 1.

Based on the outcomes of the Augmented Dickey-Fuller (ADF) unit root test in Table 2, it is evident that all variables under examination exhibit unit roots at the level. However, no unit roots are detected in the first-order differences. These findings indicate that the integration order for all variables is 1, implying that the non-stationary nature of the series at their levels becomes stationary when considering their first-order differences. Consequently, first-order differences in variables are deemed necessary for inclusion in the short-term Structural Vector Auto Regressive (SVAR) model.

Table 3 presents the sequentially modified likelihood ratio (LR) Test statistics and final prediction error (FPE) based on the Schwarz information criterion (SC) and Hannan-Quinn Information Criterion (HQ) for different lag lengths. The information criteria suggest that the optimal lag length is 0. Consequently, the VAR(0) model is employed based on this data.

According to the findings presented in Table 4, it is observed that in the initial period, the quantity of agricultural products was exclusively determined by its own past values (100%). However, from the second period onward, there is an influence of 18.7% from changes in the price of agricultural products and 5% from the price of oil. In the 10th period, 32.86% of the variability in the volume of agricultural products is attributed to changes in the price of agricultural products, while 12.14% is linked to the price of oil. This implies that, as short-term changes occur in the prices of agricultural products, there is a corresponding impact on the volume of agricultural products. Moreover, it was revealed that alterations in oil prices exert a significant influence, specifically affecting production volume through cost inflation.

Upon examining the outcomes presented in Table 5, it was discerned that in the initial phase, 11.3% of variations in the price of agricultural products were influenced by the volume of agricultural products, with no impact on changes in oil prices. Furthermore, it is evident that the influence of fluctuations in oil

Table 1: Model and variables

Variables	Full name of variables	Source
OP	Oil prices	International Energy agency
AGRO	Volume of agricultural products	Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan.
INF	Changes in prices for agricultural products	Bureau of National Statistics of the Agency for Strategic Planning and Reforms of the Republic of Kazakhstan.

Table 2: ADF unit root test results

Variables	ADF test		First difference	
	Statistics	Probability	Statistics	Probability
Oil prices	−1.8606	0.3478	−7.1739	0.0000
Volume of agricultural products	4.9035	1.0000	−6.847169	0.0000
Changes in prices for agricultural products	0.751191	0.8731	−6.818534	0.0000

ADF: Augmented Dickey-Fuller

Table 3: Criteria for choosing a delay order

Lag	LogL	LR: Sequential modified LR test statistic (each test at 5% level)	FPE: Final prediction error	AIC: Akaike information criterion	SC: Schwarz information criterion	HQ: Hannan-Quinn information criterion
0	276.002	NA*	6.14e−10*	−12.69777	−12.57490*	−12.65246*
1	281.576	10.1124	7.21e−10	−12.53846	−12.04696	−12.35721
2	287.015	9.10677	8.57e−10	−12.37282	−11.51270	−12.05563
3	296.687	14.8448	8.45e−10	−12.40406	−11.17532	−11.95094
4	306.499	13.9013	8.35e−10	−12.44883	−10.85147	−11.85977
5	314.838	10.2838	9.15e−10	−12.41111	−10.44512	−11.68611
6	327.737	14.3986	8.30e−10	−12.59245	−10.25784	−11.73152
7	333.315	5.44759	1.10e−09	−12.43325	−9.730017	−11.43638
8	351.976	15.6233	8.40e−10	−12.88261*	−9.810752	−11.74981

Table 4: Dispersion decomposition of industrial production index

Period	Standard error	Volume of agricultural products	Changes in prices for agricultural products	Oil prices
1	0.015685	100.0000	0.000000	0.000000
2	0.020448	76.32742	18.66958	5.003008
3	0.021039	73.05541	20.65134	6.293256
4	0.022206	69.95929	23.80533	6.235381
5	0.023054	66.61768	22.08816	11.29416
6	0.024387	59.98243	28.98374	11.03383
7	0.024721	58.42366	29.08913	12.48721
8	0.025824	55.22599	31.56049	13.21352
9	0.026904	55.31962	32.45230	12.22808
10	0.027115	55.00469	32.86087	12.13444

Table 5: Dispersion decomposition of the real effective exchange rate

Period	Standard error	Volume of agricultural products	Changes in prices for agricultural products	Oil prices
1	0.004416	11.27717	88.72283	0.000000
2	0.006166	7.991240	92.00727	0.001490
3	0.006254	7.778218	89.78216	2.439626
4	0.006649	8.336568	80.52907	11.13436
5	0.007409	6.729444	69.88935	23.38121
6	0.008043	5.773412	61.08528	33.14131
7	0.008251	6.625629	58.83513	34.53924
8	0.008498	6.982640	57.08253	35.93483
9	0.008653	7.184483	57.29742	35.51810
10	0.008859	8.258164	57.83936	33.90247

prices becomes significant starting from the third stage. By the 10th period, it is observed that 8.3% of variations in the price of agricultural products are influenced by the volume of agricultural products, while 33.9% are attributed to the price of oil. In summary, the analysis underscores that the most crucial determinant for variations in the price of agricultural products is the price of oil.

5. CONCLUSION

From our perspective, although the active involvement of the state and local executive bodies in supporting domestic agriculture is deemed necessary, this approach lacks economic viability and can be characterized as a simplistic concept misaligned with market principles. The role of the state should not be to execute specific tasks of enterprises but rather to establish favorable conditions for their independent implementation. Moreover, agricultural enterprises operating under fixed purchase prices through long-term contracts may not necessarily require outsourcing of marketing services. Should such a need arise, specialized marketing consulting firms can operate with management flexibility, attentively monitoring the market dynamics.

In the initial period, the quantity of agricultural products was entirely determined by its own past values (100%). However, from

the second period onwards, 18.7% of the variation in the volume of agricultural products was attributed to changes in the price of agricultural products, and 5% to the price of oil. By the 10th period, 32.86% of the variability in the volume of agricultural products was influenced by changes in the price of agricultural products, while 12.14% was linked to the price of oil. This implies that a short-term increase in the price of agricultural products corresponds to an increase in the volume of agricultural products. Additionally, it was revealed that alterations in oil prices exert a significant influence, particularly impacting production volume through cost inflation.

It was identified that 11.3% of variations in the price of agricultural products are influenced by the volume of agricultural products and remain unaffected by changes in oil prices. Furthermore, the impact of oil price fluctuations becomes more pronounced from the third stage onwards. By the 10th period, it is observed that 8.3% of alterations in the price of agricultural products were attributed to the volume of agricultural products, while 33.9% were linked to changes in the price of oil. In conclusion, the study determined that the most influential factor in driving changes in the price of agricultural products is the price of oil.

REFERENCES

Abdlaziz, R.A., Ahmad, M.N.N., Slesman, L. (2018), Dutch disease effect of oil price on agriculture sector: Evidence from panel cointegration of oil exporting countries. International Journal of Energy Economics and Policy, 8(5), 241-250.

Adedokun, A. (2018), The effects of oil shocks on government expenditures and government revenues nexus in Nigeria (with exogeneity restrictions). Future Business Journal, 4(2), 219-232.

Adeniran, A.O., Azeez, M.I., Aremu, J.A. (2016), External debt and economic growth in Nigeria: A Vector Auto-regression (VAR) approach. International Journal of Management and Commerce Innovations, 4(1), 706-714.

Aidarova, A.B., Ramashova, A.N., Baisholanova, K., Jaxybekova, G., Imanbayev, A., Kenzhebekova, I., Kelesbayev, D. (2024), Relationship between oil price, inflation, and economic growth in BRICS countries: Panel cointegration analysis. International Journal of Energy Economics and Policy, 14(6), 24-31.

Anikin, B.A., Rudaya, I.L. (2024), Outsourcing and Outstaffing: High Management Technologies. Moscow: Infra-Market.

Asaleye, A.J., Aremu, C., Lawal, A.I., Ogundipe, A.A., Inegbedion, H.E., Popoola, O.R., Obasaju, O.B. (2019), Oil price shock and macroeconomic performance in Nigeria: Implication on employment. International Journal of Energy Economics and Policy, 9(5), 451-457.

Aye, G.C., Odhiambo, N.M. (2021), Oil prices and agricultural growth in South Africa: A threshold analysis. Resources Policy, 73, 102196.

Baimaganbetov, S., Kelesbayev, D., Baibosynova, G., Yermankulova, R., Dandayeva, B. (2021), The impact of oil prices on the food inflation in Kazakhstan. International Journal of Energy Economics and Policy, 11(3), 73-79.

Baimaganbetov, S., Kelesbayev, D., Yermankulova, R., Izzatullaeva, B., Almukhambetova, B. (2019), Effects of oil price changes on regional real income per capita in Kazakhstan: Panel data analysis. International Journal of Energy Economics and Policy, 9(4), 356-362.

Bals, L., Turkulainen, V. (2017), Achieving efficiency and effectiveness in purchasing and supply management: Organization design and outsourcing. Journal of Purchasing and Supply Management, 23(4), 256-267.

Diebold, F.X., Yilmaz, K. (2012), Better to give than to receive: Predictive directional measurement of volatility spillovers. International Journal of Forecasting, 28(1), 57-66.

Domberger, S. (1998), The Contracting Organization: A Strategic Guide to Outsourcing. United Kingdom: Oxford University Press.

Ebaidalla, E.M. (2014), The effects of oil price volatility on the Sudanese economy. Eastern Africa Social Science Research Review, 30(1), 1-26.

Gujarati, D.N., Porter, D.C. (2009), Basic Econometrics. 5th ed. New York: McGraw Hill Inc.

Humbatova, S.I., Malik, M.M., Valiyev, J.K., Hajiev, N.G.O. (2022), Impact of oil exports on imports of food and agricultural products. International Journal of Energy Economics and Policy, 12(3), 135-150.

Hung, N.T. (2021), Oil prices and agricultural commodity markets: Evidence from pre and during COVID-19 outbreak. Resources Policy, 73, 102236.

Kedia, B.L., Mukherjee, D. (2009), Understanding offshoring: A research framework based on disintegration, location and externalization advantages. Journal of World Business, 44(3), 250-261.

Kelesbayev, D., Kozhabayev, H., Mombekova, G., Yermankulova, R., Dandayeva, B. (2020), An application for reduction of the non-value activities by Kaizen costing method in the Kentau transformer plant. Entrepreneurship and Sustainability Issues, 8(2), 182-194.

Kelesbayev, D., Myrzabekkyzy, K., Bolganbayev, A., Baimaganbetov, S. (2022), The effects of the oil price shock on inflation: The case of Kazakhstan. International Journal of Energy Economics and Policy, 12(3), 477-481.

Lacity, M.C., Khan, S.A., Willcocks, L.P. (2009), A review of the IT outsourcing literature: Insights for practice. The Journal of Strategic Information Systems, 18(3), 130-146.

Latif, K. (2018), Conceptual propensity of outsourcing success through robust model development. Arabian Journal of Business and Management Review (Kuwait Chapter), 7(4), 1-18.

Lotfalipur, M.R., Ahmadi, S.M.T. (2014), Investigation of the influencing mechanisms and short-term and long-term dynamism impact of Iran's oil revenues on value added in agriculture. Asian Research Consortium, 4(10), 184-193.

Mohammed, B.H., Kinyua, G.M. (2023), Understanding strategic outsourcing as an antecedent of firm performance. International Journal of Education and Research, 11(9), 21-46.

Popoola, O., Alege, P.O., Obindah, G., Kaladede, G. (2022), Oil price shock and agricultural productivity: Stylised evidence in Nigeria. International Journal of Energy Economics and Policy, 12(3), 490-496.

Porteous, O. (2022), Reverse Dutch disease with trade costs: Prospects for agriculture in Africa's oil-rich economies. Journal of International Economics, 138, 103651.

Ramos, P.C. (2020), Theoretical model to analyze the influence of outsourcing on industrial business value creation. Universal Journal of Management, 8(1), 1-11.

Statistical Committee of the Republic of Kazakhstan. (n.d.), Kazakhstan's Official Statistics. Available from: https://www.stat.gov.kz

Thankgod, A.O., Maxwell, E.O. (2013), Macroeconomic impact of oil price levels and volatility in Nigeria. Journal of Economics and Sustainable Development, 4(4), 73-83.

Ugbomhe, U., Olu, O., Monday, E. (2021), Strategic outsourcing and corporate performance in Nigerian banking industry. Journal of Business Theory and Practice, 9(2), 68-78.

Wei, C.C., Chen, S.M. (2016), Examining the relationship of crude oil future price return and agricultural future price return in the U.S. International Journal of Energy Economics and Policy, 6(1), 58-64.

Zivot, E., Andrews, D.W.K. (1992), Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis. Journal of Business and Economic Statistics, 10(3), 251-270.