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Asymmetric Effect of Oil Prices on Kazakhstan's Stock Market Index and Exchange Rate

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ABSTRACT

In this study, the asymmetric effect of oil prices in Kazakhstan on the exchange rate (USD/KZT) and Kazakhstan stock market index (KASE) returns was analyzed using the non-linear ARDL cointegration (NARDL) method with monthly data for the period January 2010-February 2024. As a result of the findings of the study, both positive and negative changes in oil prices statistically affect stock returns and exchange rates in the long term. The estimated long-term positive (0.115982) and negative (0.111234) coefficients of oil prices on KASE returns were found to be statistically significant at the 5% significance level. Thus, in the examined period, the KASE variable gave different reactions to positive or negative shocks in the oil price. In the model where the exchange rate is the dependent variable, the estimated long-term positive (−0.093875) and negative (−0.092918) coefficients of oil prices were found to be statistically significant at the 95% reliability level.

Keywords: Oil Prices, Stock Returns, Exchange Rate, Kazakhstan, NARDL
JEL Classifications: C32, C87, G15

1. INTRODUCTION

The fact that oil is an indispensable source of input in many sectors is important for the progress of the economic process. The increase and decrease in oil prices must be followed carefully as they constitute a major cost factor. According to the classical supply-side approach, the increase in oil prices causes the production costs of enterprises to increase and the output to decrease. As a result of this situation, the general level of prices increases. The increase in oil prices creates cost inflation, causing a decrease in purchasing power, and this decrease in purchasing affects demand negatively, and investments decrease. This cost inflation caused by oil prices is controlled by central banks by increasing interest rates. Increases in interest rates direct investors towards different areas and cause a decrease in the demand for stocks, which in turn causes a decrease in stock prices. Finally, investors have recently evaluated oil as an alternative investment tool, increasing the impact of oil on the economy. Economic structures carefully follow oil prices when making investment decisions. For these reasons, cyclical movements in oil prices have significant effects on stock markets and should be carefully monitored by market leaders because they are an alternative investment tool.

The theoretical structure of the transmission mechanism of oil price shocks on the exchange rate and other variables can be explained as follows: Initially, increasing oil prices increase inflationary pressures and reduce the real incomes of households, and as a result, consumption expenditures are suppressed. In addition, total production may be negatively affected by the gradual weakening of domestic demand and the decrease in company profits. A significant number of studies have shown that the increase in oil price affects production and the domestic price level, and that the decreasing level of demand is offset by counter-monetary policies pursued by central banks. On the other hand, an increase in oil price leads to a transfer of income from an oil-importing country to an oil-exporting country. For example, increases in oil prices have different effects on oil exporting countries. An increase in the price of oil may lead to an increase in both exports and imports due to the appreciation of the foreign currencies of oil exporting countries. This situation can be evaluated as welfare transfer or income transfer (Krugman, 1983). As mentioned above, oil prices are determined in international markets, so changes in oil prices are considered an external shock. These shocks can have different effects on the economy, the increase in oil prices can disrupt the foreign trade balance and cause portfolio distribution.

In this study, the effect of oil prices on KASE stock index returns and exchange rate in Kazakhstan, an oil exporting country, is investigated. For this purpose, the non-linear ARDL (NARDL) method was used in the study. The study consists of 5 chapters. Following the introduction, literature on the subject is included. In chapter 3, the data set and econometric methodology used in the study are explained. The empirical findings are then discussed. The study ends with the conclusion section.

2. LITERATURE REVIEW

Fluctuations in oil prices, which are described as the "blood" of the industry and play an important role in supporting the functioning of the socioeconomic system, undoubtedly create significant effects on economic and financial variables. For example, an increase in oil prices will increase inflation, reduce economic growth, and negatively affect the supply side of the economy by increasing the cost of goods and services produced depending on oil. On the other hand, changes and instabilities in oil prices can affect stocks and exchange rates in the stock market positively or negatively. For example, oil prices may affect the cash flows examined as a result of economic growth, or the negative impact of oil prices on inflation may distort the discount rate applied to stocks in the stock market. On the other hand, the direction of the relationship between oil prices and exchange rate is not known with certainty in the studies. In his study, Hamilton (1996) claimed that changes in oil prices have an impact on production and price levels, and for this reason, the central banks of the countries in question try to maintain price balance with the help of monetary policies. Krugman (1980) and Chaudhuri and Daniel (1998) stated in their studies that the increase in oil prices may cause income transfer. The increase in oil prices may result in the appreciation of the currencies of oil exporting countries.

In their study, Korhonen and Juurikkala (2009) investigated the relationship between oil prices and exchange rates using panel cointegration analysis with the help of OPEC member data covering the period 1975-2005. Within the scope of the analysis, panel cointegration and PMG method were used for long-term estimation in order to determine the long-term relationship. According to the results of the research, it has been proven that real oil prices directly affect the real equilibrium exchange rate. Farzanegan and Markwardt (2009) found a positive relationship between oil prices and exchange rates in the Iranian economy and attributed it to Dutch disease since the country in question is an oil exporter. In their study, Aziz and Bakar (2011) investigated the effect of the change in oil prices on the exchange rate for 8 countries, three of which are net oil exporters (Canada, Denmark and Malaysia) and five of which are net oil importers (Japan, Pakistan, the Republic of South Africa, Switzerland and the Republic of Ivory Coast). Three tests were applied during the panel cointegration analysis. Pedroni (1999) test results here show that there is no cointegration between the series forming the panel, while Madela and Wu (1999) and Kao (1999) tests show that there is cointegration.

In their study, Coleman et al. (2010) investigated the impact of oil price shocks on exchange rates with the help of 1970:1 and 2004:4 quarterly data of 13 African countries. Nonlinear dynamics and cointegration techniques are used within the scope of the research. According to the results, it is revealed that the changes in the real oil price differ from country to country. For example: While there is a long-term relationship between oil prices and exchange rates in Burkina, Faka, Cameroon, Morocco and Kenya, this relationship is weak in other countries. It can be said that the main reason why the effects of real oil prices on the real exchange rate differ is the difference in the economic structures of the countries in question.

Ramos and Veiga (2013) investigated whether oil price changes create asymmetric effects on stock prices for oil importing/exporting countries. As a result of the research, it was determined that increases in oil prices negatively affected the stock prices of oil-importing countries, while this effect was positive for oil-exporting countries.

Habib et al. (2016) investigated the effect of oil prices on the exchange rates of oil exporting countries (Norway, Saudi Arabia and Russia). Within the scope of the research, an analysis was made within the framework of the error correction model with the help of data between 1980 and 2006 for Norway and Saudi Arabia and between 1995 and 2006 for Russia. According to the results, while there is a long-term relationship between oil prices and exchange rates for Russian data, this relationship does not exist in other countries.

In their study, Kaplan and Aktaş (2016) examined the effect of real oil prices on the real exchange rate in oil-dependent countries. In the study, research was conducted within the framework of panel data analysis using data covering the period 1995-2014 with the help of data from 5 oil-dependent countries. According to the results, it has been determined that the increase in real oil prices has a positive effect on the real exchange rates of oil-dependent countries. On a country basis, it was concluded that while the increase in oil prices had no effect on the USA and China, it had a positive effect on Canada and Mexico and a negative effect on Russia.

Volkov and Yuhn (2016) contended that dramatic decrease in the oil prices in 2014 revived an interest in the interdependence between the oil prices and the exchange rates of emerging markets. Although many researchers have paid considerable attention to the linkage between oil and exchange rate, most of them addressed this issue only via time dimension, disregarding the frequency domain features, which is an important aspect for observation at different time horizons.

Hatemi-J et al.(2017) conducted symmetric and asymmetric causality tests for G-7 countries in their study. According to the symmetric causality test results, no effect of oil prices on stock market prices was found for G7 countries. However, according to the asymmetric causality test results, the increase in oil prices for the USA and Japan increases the stock market prices, while the decrease in oil prices for Germany reduces the stock market prices.

In their study on Iran, Jahangard et al. (2017) examined the relationship between crude oil prices and the Iranian rial using a monthly data set covering the years 1961-2014 and the ARDL method. The findings show that increases in crude oil prices increase the value of the Iranian rial. Yang et al. (2017) examined the issue with a daily data set and wavelet approach covering the period between 1999 and 2014 for 8 countries that are oil importers and exporters. The findings show that crude oil prices increase the exchange rate in oil exporting countries; However, it shows that crude oil prices have negligibly low effects on exchange rates in oil importing countries.

Huang et al. (2017) found in their study that both the increase and decrease in oil prices had significant effects on stock returns in China. Additionally, compared to the exchange rate, changes in oil prices have a greater impact on the stock market. McLeod and Haughton (2018) re-evaluated the relationship between crude oil prices and exchange rate in the light of the monthly data set covering the period 1995-2016 in the USA. Analyzes conducted with TAR and M-TAR methods show that error correction coefficients are statistically significantly asymmetric, and declines in the US dollar lead to high crude oil prices.

Syzdykova (2018) examined the relationship between crude oil price shocks and stock prices in Russia, Kazakhstan and Ukraine in the period 2010:01-2017:04 using an autoregressive distributed lag cointegration test. Empirical results have shown that crude oil price shocks and stock price fluctuations are cointegrated. Nurmakhanova and Katenova (2019) investigated the connection between oil price, stock prices and exchange rate in Kazakhstan using monthly data from October 2007 to December 2017. Granger causality test results showed that stock prices and exchange rates in Kazakhstan were affected by the oil price. Khan and Ahmed (2024) findings suggest that Bangladesh's exports are negatively impacted by exchange rates over the long and short terms.

Al-Hajj et al. (2018) used the NARDL Boundary Test for Malaysia in their study. According to the findings, increases or decreases in oil prices have a negative impact on stock market returns in most cases. In his study for India, Kumar (2019) found that negative and positive changes in oil prices in the previous month had a positive effect on the exchange rate and a negative effect on stocks. Kang et al. (2017) found that oil price shocks have a negative impact on stock returns of oil and gas companies. Hashmi et al. (2022) found that the effect of Brent crude oil prices on the Chinese stock market is generally positive. Mandal and Datta (2024) analysis shows a feedback relation between low frequency (higher investment horizon) and the long-run asymmetric impact of oil prices on all sectors during all three periods.

Ji et al. (2020) show that the dependence between BRICS stock returns and oil shocks varies over time and exhibits different behavior depending on the types of shocks in the oil market. In the study in question, it was observed that there was a significant risk spillover from oil-specific demand shock to stock returns in all BRICS countries. In the same study, it was emphasized that in Brazil, Russia and India, there is a significant asymmetric effect between the upward and downward risk spread based on the oil total demand shock and the oil-specific demand shock. In their study, Abubakirova et al. (2021) examined the relationship between oil prices and stock prices with the data of BRICS-T countries between January 2010 and December 2019 with the Hatemi-J asymmetric causality test (2012). Hidden relationships that could not be detected with the symmetric causality test were revealed with the help of the asymmetric causality test.

Baek and Kim (2020) state that estimating the relationship with symmetric linear regression models may lead to potential problems, since it is expected that the effects of increases and decreases in crude oil prices and the magnitude of these effects on the exchange rate will be different. In their study of 11 sub-Saharan African countries, the authors worked with a monthly data set covering the period between 2000 and 2017 and estimated the relationship with the help of the NARDL model. The findings reveal that there is generally an asymmetric relationship between crude oil prices and exchange rates, and exchange rates are mostly affected by crude oil price increases. Baek (2021) examined the relationship between crude oil prices and exchange rate in Indonesia with a monthly data set covering the period between 1997 and 2017. In the study, the relationship was estimated with the QARDL method. The findings show that the relationship between the two is heterogeneous among quantiles. Therefore, it is claimed that there is an asymmetric relationship between crude oil prices and exchange rate in the short and long term. On the other hand, the study found that increases in crude oil prices had an increasing effect on the local currency only in the long term.

Alamgir and Amin (2021) examined the relationship between the stock market indices and oil prices of 4 South Asian countries for the period 1997-2018 with the NARDL model, and according to the analysis findings, there is a positive relationship between the oil price and the stock market index. In addition, the reaction of the stock market index to positive and negative oil price shocks has an asymmetric nature. The study also determined that the Efficient Market Hypothesis is not valid for South Asian countries.

Jawadi and Sellami (2021) examined the impact of the change in oil prices in the United States over the last decade on the stock market, exchange rate, and real estate market. It has been determined that during the Covid-19 period, oil prices caused significant effects on the US stock market and US dollar exchange rate, but did not have a significant impact on the US real estate market. The study also determined that the stock market gave a positive and significant reaction to an oil price shock, which can be explained by the effect of high oil financialization in the last decade.

Ahmed and Mohammad (2022) comparatively analyzed the relationship between daily returns in the Pakistan Stock Exchange and oil prices for the pre- and post-Covid-19 period. VAR analysis and Granger Causality Test were applied in the study, and according to the analysis findings, oil shocks are inversely proportional to daily company stock returns and the reverse effect increases even more during the epidemic period. It has also been determined that stock prices have no effect on oil prices.

Thuy Tien (2022) examined the asymmetric relationships between global oil prices and selected Vietnamese macroeconomic indicators. The author determined that there is a strong relationship between the macroeconomic factors examined and changes in oil prices. Moreover, according to the analysis findings, it has been determined that oil prices have a positive effect on exchange rate, inflation, GDP and stock market prices.

3. DATA AND ECONOMETRIC METHODOLOGY

In this study, the asymmetric effect of Brent oil price on USD/KZT and KASE index returns was examined using monthly data between 2010:01 and 2024:02 (170 observations in total). The return variables used in the study were calculated by following the studies in the literature and with the help of the formulas in equations 1, 2 and 3.

$$RKASE_t = \frac{KASE_t - KASE_{t-1}}{KASE_{t-1}} \quad (1)$$

$$RUSD/KZT_t = \frac{USD/KZT_t - USD/KZT_{t-1}}{ER_{t-1}} \quad (2)$$

$$ROILp_t = \frac{OIL_t - OIIL_{t-1}}{OIL_{t-1}} \quad (3)$$

$RKASE_t$, $RUSD/KZT_t$ and $ROILp_t$ are the monthly returns on KASE, exchange rate and oil prices, respectively; $KASE_t$, USD/KZT_t and $OILp_t$ represent the closing value of the series in month t; $KASE_{t-1}$, USD/KZT_{t-1} and $OILp_{t-1}$ refer to the closing value of the indices in the previous month.

In the study, Nonlinear Distributed Lag Autoregressive Model (NARDL) developed by Shin et al. (2014) was used to test whether there is a short- and long-term asymmetric pass-through from oil prices to exchange rate and KASE index. Shin et al. (2014) developed the NARDL model, which provides significant advantages over traditional cointegration approaches, to examine the asymmetric (non-linear) and cointegration dynamics between variables in a single step and to improve the performance of the cointegration test even in small samples. Moreover, in the NARDL approach, there is no requirement for regressors to be integrated to the same degree, that is, at both the I(0) and I(1) level of the variables (except for I(2)).

Equations (4) and (5) were created to examine the asymmetric effect of oil prices on the KASE index and exchange rate.

$$RKASE_t = \beta_0 + \beta_1 ROILp_t + \varepsilon_t \quad (4)$$

$$RUSD/KZT_t = \alpha_0 + \alpha_1 ROILp_t + \vartheta_t \quad (5)$$

Following the method in Shin et al. (2014) study, the following models were established using the NARDL method for the relationship between explanatory variables and explained variables:

$$\text{Model 1: } RKASE_t = \gamma_0 + \gamma_1 ROILp_t^+ + \gamma_2 ROILp_t^- + \tau_t \quad (6)$$

$$\text{Model 2: } RUSD/KZT_t = \delta_0 + \gamma\delta_1 ROILp_t^+ + \delta_2 ROILp_t^- + \varepsilon_t \quad (7)$$

In the equations, $\gamma = (\gamma_0, \gamma_1, \gamma_2)$ and $\delta = (\delta_0, \delta_1, \delta_2)$ refer to long-term parameters (or cointegration vectors), and τ_t and ϵ_t refer to random error terms.

Then, in equations (6) and (7), $ROILp_t^+$ and $ROILp_t^-$ show the partial sum processes of the "positive" and "negative" changes occurring in $ROILp_t$ respectively, and expressed as follows using equations (8) and (9).

$$ROILp_t^+ = \sum_{t=1}^{t} \Delta ROILp_t^+ = \sum_{t=1}^{t} max(\Delta ROILp_{t,} 0) \quad (8)$$

$$ROILp_t^- = \sum_{t=1}^{t} \Delta ROILp_t^- = \sum_{t=1}^{t} min(\Delta ROILp_{t,} 0) \quad (9)$$

Finally, when equations (4) and (5) are associated with the ARDL(p, q) model, the following asymmetric error correction models (AECM) are obtained.

$$\Delta RKASE_t = \mu + \mu_1 RKASE_{t-1} + \mu_2 \boldsymbol{A} + \mu_3 \boldsymbol{B} + \sum_{t=1}^{m} p_{1i} \Delta RKASE_{t-i} + \sum_{i=0}^{q} \boldsymbol{C} + u_t \quad (10)$$

$$\Delta RUSD/KZT_t = \lambda + \lambda_1 RUSD/KZT_{t-1} + \lambda_2 \boldsymbol{A} + \lambda_3 \boldsymbol{B} + \sum_{i=1}^{m} \sigma_{1i} \Delta RUSD/KZT_{t-i} + \sum_{i=0}^{q} \boldsymbol{C} + \varepsilon_t \quad (11)$$

Where

$$A = ROILp_{t-1}^+ ; B = ROILp_{t-1}^- \; and$$
$$C = (\theta_i^+ \Delta ROILp_{t-i}^+ + \theta_i^- \Delta ROILp_{t-i}^-)$$

As with the ARDL model, preliminary tests are carried out when creating the NARDL model. First, the order of integration of the variables is determined by using unit root tests. The important thing here is to determine that none of the series used in the model are integrated of order 2 or higher. In the second stage, equations (10) and (11) are estimated by the least squares method (OLS) and the most appropriate lag length for each model is determined by using the Akaike Information criterion (AIC). In the third stage, the following hypotheses are analyzed with the help of F-test to determine the existence of long-term cointegration among the variables in equations (4), (5), (6) and (7).

There is no long-run cointegration between variables:

H_0: $\mu_1 = \mu_2 = \mu_3 = 0$ and H_0: $\lambda_1 = \lambda_2 = \lambda_3 = 0$

There is long-run cointegration among the variables:

H_A: $\mu_1 \neq \mu_2 \neq \mu_3 \neq 0$ and H_A: $\lambda_1 \neq \lambda_2 \neq \lambda_3 \neq 0$

If the test results obtained show the existence of a long-term cointegration relationship between the variables, the long-term asymmetric relationship between the variables is estimated by the equations $\left(-\frac{\mu_2}{\mu_1} \neq \frac{\mu_3}{\mu_1}\right)$ and $\left(-\frac{\lambda_2}{\lambda_1} \neq \frac{\lambda_3}{\lambda_1}\right)$. On the other hand, in the short term, the asymmetric effect of oil prices $(OILp_{t-1}^{+}\ and\ OILp_{t-1}^{-})$ on the exchange rate and KASE is estimated by deriving the cumulative multiplier coefficient and the equality $\sum_{i=0}^{q}\theta_i^{+} \neq \sum_{i=0}^{q}\theta_i^{-}$ is examined with the help of the Wald Test. If the result is significantly important, it is concluded that there is an asymmetric relationship between the explanatory variable and the explained variable.

4. EMPIRICAL FINDINGS

Figure 1 shows the trends of Brent oil price, KASE and exchange rate (USD/KZT) returns over time.

4.1. Descriptive Statistics

Some descriptive statistics of the variables are given in Table 1. According to the descriptive statistics results, it is seen that the average value of KASE returns is the highest. When the skewness and kurtosis statistics of all series are examined in the examined time period, it is seen that the OIL_PRICE and USD_KZT series exhibit a left-skewed distribution, while the KASE series shows a right-skewed distribution. When the kurtosis coefficient is compared to 3, it can be seen that all variables are sharp. When we look at the Jarque-Bera statistics, which evaluates skewness and kurtosis simultaneously, the null hypothesis that "the data has a normal distribution" is rejected at a 99% confidence level for all series.

The correlation relationship between the series is presented in Table 2. Accordingly, while there is a negative relationship between the oil price and the dollar exchange rate, there is a positive relationship between the oil price and the KASE index. But the strength of the relationship is not strong for both series.

4.2. Unit Root Test Results

Before estimating the NARDL model, it should be ensured that the degrees of integration of the variables used in the model are not I(2), otherwise the estimated model results may be spurious. In Table 3, the estimated unit root test results of the relevant variables with constant, constant and trend models were analyzed with the help of Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests. According to the results obtained, it is seen that all variables are stationary at the level level.

4.3. NARDL Results

F-statistics and lower and upper limit values calculated to determine the existence of cointegration relationship are given in Table 4. According to these results, since the calculated F-statistics (29.048 and 10.363) are above the upper limits (5.61) for both models at the 1% significance level, the existence of a long-term relationship between the variables is accepted.

Following the Shin et al. (2014) study, long-term and short-term NARDL models were estimated using the general to specific approach for each equation. The long- and short-term asymmetric effect results of the change in oil prices on the KASE return are given

Figure 1: Trends of series over time

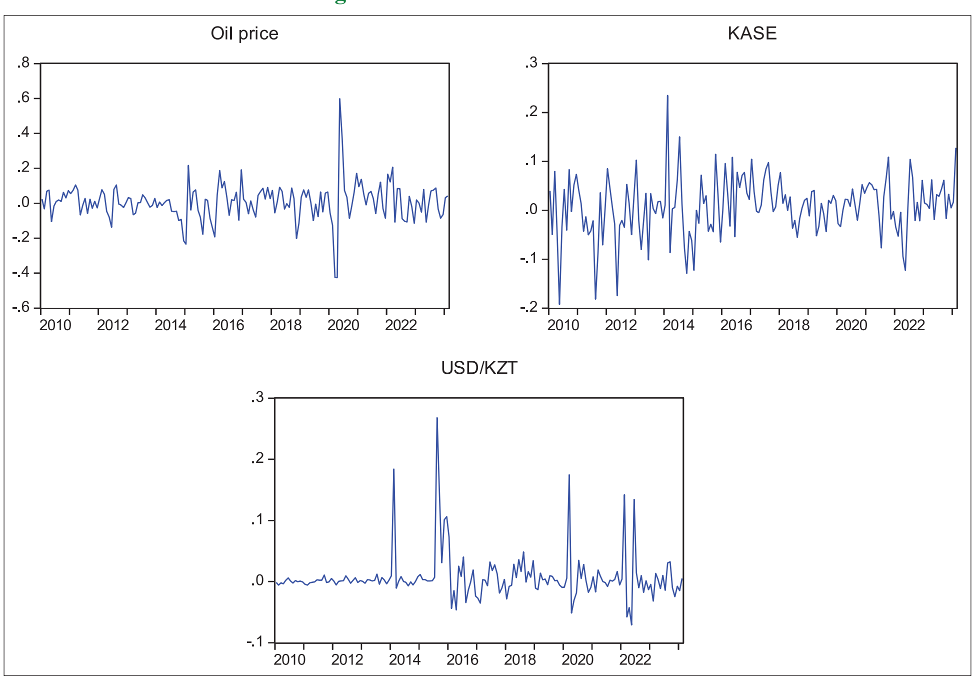


Table 1: Descriptive statistics of variables

Variables	OIL_PRICE	KASE	USD_KZT
Mean	0.006417	0.007648	0.007241
Median	0.014941	0.012020	0.001162
Maximum	0.598477	0.234832	0.267858
Minimum	−0.425804	−0.192420	−0.071038
Standard Deviation	0.106195	0.059095	0.039146
Skewness	0.358545	−0.249726	3.464596
Kurtosis	10.91338	4.944571	19.20641
Jarque-Bera	447.2116	28.55155	2200.518
Probability	0.000000	0.000001	0.000000
Observations	170	170	170

Table 2: Correlation between variables

Variables	OIL_PRICE	KASE	USD/KZT
OIL_PRICE	1	0.215580	−0.251910
KASE	0.215580	1	0.053022
USD/KZT	−0.251910	0.053022	1

Table 3: ADF and PP Unit Root Test Results

Variables	Deterministic components	ADF	PP
OIL	Intercept	−10.15034*	−9.898313*
PRICE	Trend and intercept	−10.13540*	−9.967843*
KASE	Intercept	−10.33618*	−10.34931
	Trend and intercept	−10.59793*	−10.61358
USD/KZT	Intercept	−11.04886*	−11.15534
	Trend and intercept	−11.02114*	−11.12738

*Is statistically significant at 99% confidence level

Table 4: NARDL cointegration test results

Test statistic	Oil price- KASE		Oil price- USD/KZT	
	Value	k	Value	k
F-statistic	29.04877	3	10.36359	3
Significance	Critical Value Bounds			
	I0 Bound		I1 Bound	
10%	2.72		3.77	
5%	3.23		4.35	
2.5%	3.69		4.89	
1%	4.29		5.61	

in Table 5. Since there was a structural break between 2014/07 and 2017/05, a dummy variable was added to the model. The estimated long-term positive (0.115982; 0.0153) and negative coefficients (0.111234; 0.0203) of oil prices were found to be statistically significant at the 5% significance level. Thus, in the examined period, the KASE variable gave different reactions to positive or negative shocks in the oil price. While a one-unit increase in oil price returns causes an increase of 0.115982 units in KASE index returns, a one-unit decrease in oil price returns causes a decrease of 0.111234 units. Positive and negative coefficients are quite close to each other. The error correction coefficient in the model has a negative sign and is significant at the 99% confidence level.

The long- and short-term asymmetric effect results of the change in oil prices on the exchange rate return are given in Table 6. Since there was a structural break between 2012/11 and 2015/07, a dummy variable was added to the model. According to the findings, the null hypothesis established to investigate long-term asymmetry is rejected. The estimated long-term positive (−0.093875; 0.0116) and negative coefficients (−0.092918; 0.0128) of oil prices were found to be statistically significant at the 5% significance level. Thus, in the examined period, the exchange rate variable gave different reactions to positive or negative shocks in the oil price. While a one-unit increase in oil price returns causes a 0.093875 unit decrease in exchange rate returns, a one-unit decrease in oil price returns causes an increase of 0.092918 units. Positive and negative coefficients are quite close to each other. The error correction coefficient in the model has a negative sign and is significant at the 99% confidence level.

To test the reliability of the models, Breusch-Godfrey Serial Correlation LM test, White Heteroscedasticity test and Normality test were used. According to the results of the diagnostic tests in question, there are no normality, autocorrelation and heteroscedasticity problems in the models at the 0.05 significance level. Finally, whether there is a structural break (stability of variables) in the examined models was examined by Brown et al. (1975) suggested in his study, the Cumulative Sum of the recursive residuals (CUSUM) and the Cumulative Sum of Consecutive Error Squares (CUSUMSQ) tests

Table 5: NARDL model estimation results (Dependent Variable: KASE)

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D (OIL_PRICE_POS)	0.099412	0.040665	2.444638	0.0156
D (OIL_PRICE_NEG)	0.095342	0.040733	2.340675	0.0205
D (DUMMY)	0.077763	0.039580	1.964711	0.0512
D (DUMMY(-1))	0.037606	0.055525	0.677291	0.4992
D (DUMMY(-2))	0.019852	0.055217	0.359522	0.7197
D (DUMMY(-3))	−0.098744	0.039892	−2.475263	0.0144
CointEq(−1)	−0.857133	0.076800	−11.160622	0.0000
Cointeq=KASE - (0.1160*OIL_PRICE_POS+0.1112, *OIL_PRICE_NEG+0.0206*DUMMY−0.0091)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
OIL_PRICE_POS	0.115982	0.047298	2.452155	0.0153
OIL_PRICE_NEG	0.111234	0.047426	2.345450	0.0203
DUMMY	0.020599	0.013231	1.556865	0.1215
C	−0.009127	0.009899	−0.921992	0.3579

Table 6: NARDL model estimation results (Dependent Variable: USD/KZT)

Cointegrating form				
Variable	**Coefficient**	**Standard Error**	**t-Statistic**	**Prob.**
D (USD_KZT(−1))	−0.090080	0.114255	−0.788412	0.4317
D (USD_KZT(−2))	−0.144006	0.092342	−1.559485	0.1210
D (USD_KZT(−3))	−0.201333	0.067780	−2.970384	0.0035
D (OIL_PRICE_POS)	−0.080337	0.029353	−2.736951	0.0069
D (OIL_PRICE_NEG)	−0.100485	0.043178	−2.327235	0.0213
D (OIL_PRICE_NEG(−1))	0.157554	0.058284	2.703198	0.0077
D (OIL_PRICE_NEG(−2))	−0.102453	0.043045	−2.380112	0.0186
D (DUMMY)	−0.125431	0.024376	−5.145646	0.0000
D (DUMMY(−1))	−0.049176	0.035827	−1.372585	0.1719
D (DUMMY(−2))	0.043506	0.035989	1.208874	0.2286
D (DUMMY(−3))	−0.061221	0.026779	−2.286184	0.0236
CointEq(−1)	−0.855790	0.132139	−6.476454	0.0000
Cointeq=USD_KZT - (−0.0939*OIL_PRICE_POS−0.0929), *OIL_PRICE_NEG+0.0084*SER01+0.0038)				
Long Run Coefficients				
Variable	**Coefficient**	**Standard Error**	**t-Statistic**	**Prob.**
OIL_PRICE_POS	−0.093875	0.036756	−2.553976	0.0116
OIL_PRICE_NEG	−0.092918	0.036899	−2.518179	0.0128
DUMMY	0.008382	0.009027	0.928521	0.3546
C	0.003829	0.007374	0.519202	0.6044

Figure 2: CUSUM and CUSUMQ test results for Model 1

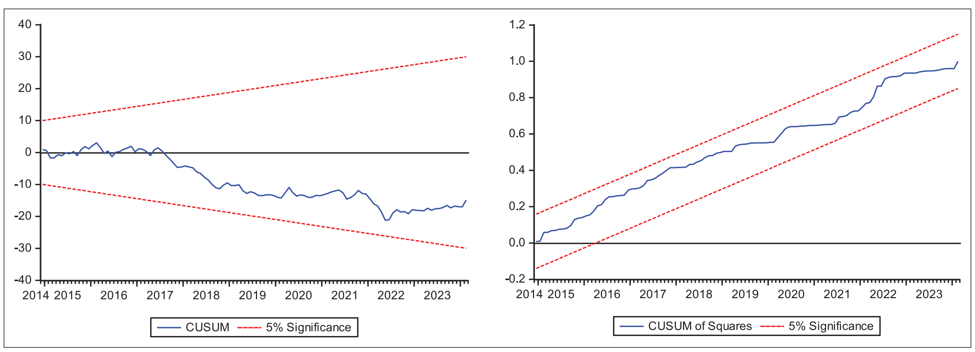
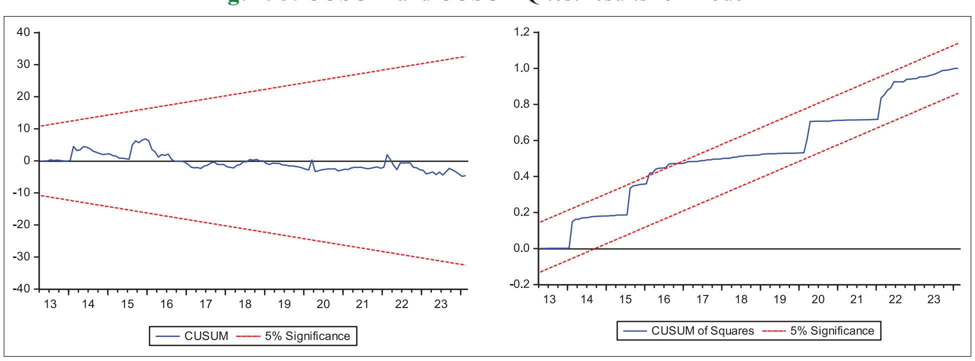


Figure 3: CUSUM and CUSUMQ test results for Model 2



were used, and the findings are shown in Figures 2 and 3. When the graphs are examined, it is seen that the residuals of the models remain between the critical limits corresponding to the 5% significance level and the estimated parameters are stable.

5. CONCLUSION

In this study, the asymmetric effect of oil prices on the KASE index and exchange rate was examined with the NARDL cointegration method, using monthly data for the period 2010:01-2024:02. According to the results obtained, it has been determined that the KASE index and exchange rate returns are sensitive in the long term to positive changes (increases) or negative changes (decreases) in oil prices for the period examined in Kazakhstan. The estimated long-term positive (0.115982; 0.0153) and negative coefficients (0.111234; 0.0203) of oil prices were found to be statistically significant at the 5% significance level. Thus, in the examined period, the KASE variable gave different reactions to positive or negative shocks in the oil price. While a one-unit increase in oil price returns causes an increase of 0.115982 units in KASE index returns, a one-unit decrease in oil price returns causes a decrease of 0.111234 units. The estimated long-term positive (-0.093875; 0.0116) and negative coefficients (-0.092918; 0.0128) of oil prices were found to be statistically significant at the 5% significance level. Thus, in the examined period, the exchange rate variable gave different reactions to positive or negative shocks in the oil price. While a one-unit increase in oil price returns causes a 0.093875 unit decrease in exchange rate returns, a one-unit decrease in oil price returns causes an increase of 0.092918 units.

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