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Article

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Impact of Oil Factor on Consumer Market: The Case of Azerbaijan

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ABSTRACT

This article investigates the long -term and short -term interactions between crude oil and oil products export, and consumer market, retail trade, public catering, paid services and retail trade turnover per person of population in Azerbaijan using annual data from 1997 to 2021. In this research, the ARDL model was used to assess co-integration and short-term relationships. In addition, this study used the FMOLS, DOLS, and CCR co-integration equations to explore long-term coefficients between variables. Granger causation tests were performed, Granger causation analysis was assessed using the Wald test (short -term or weak causation, long -term causation, and both short-term and long-term causation or strong causal relationship). The study proposed 5 hypotheses regarding the impact of oil and oil products export, and consumer market, retail trade, public catering, paid services and retail trade turnover per person of population. Some of the hypotheses were generally, if not completely, justified. Based on the established models and tests carried out, there are co-integrating relationships between the variables. Model coefficients are selected according to their economic and statistical significance.

Keywords: Oil and Oil Products Export, Consumer Market, ARDLBT, DOLS, FMOLS, Granger Causation
JEL Classifications: L81, Q30, Q35, Q37, Q38, Q39

1. INTRODUCTION

According to the Decree of the President of the Republic of Azerbaijan No. 1897 dated March 16, 2016, relevant tasks were given to prepare a Strategic Roadmap based on an in -depth analysis of the current state of the economy. This Strategic Roadmap contains a strategic vision for the development of the country's agricultural sector until 2020, a long -term vision for the period up to 2025 and a target vision for the period after 2025, including both medium and long -term goals, in the agricultural sector it also means that the state must have a clear roadmap, which must be implemented in stages in order to achieve strategic development goals in the long term. When analyzing the state of the consumer market, it is customary to use indicators of retail turnover directly. From this point of view, we addressed this in our study, including the retail turnover per capita. During the study period, these indicators continued to develop. As you know, the demand for goods in the consumer market depends on the income of the population. In this case, demand determines the structure and scale of production, and the profit of economic entities also depends on it. Since the income of the population also depends on the oil factor, the indicators for 2014-2015 are of particular importance. In 2014 and 2015, the growth rate of population income fell below 6% for the 1st time (106.3% in 2001, the highest growth was observed in 2007 and 2008, 142.7% and 142.4%, respectively). Thus, the increase in 2014 was 105.1% and in 2015- was 105.8%. However, as a result of the targeted policy, stabilization took place and growth accelerated. In 2016, 108.7% was recorded.

During these years, the decline in oil revenue has been reflected in the indicator of the physical volume of retail turnover of non -food products, and not food products.

It is true, although the index of the physical volume of the retail turnover of food products has already fallen significantly below the average growth rate (about 109.5%), which slowed down in 2011-2013, and was 102.3%, 102.5%, 102.7%, respectively. This indicator was also low in 2014, 103.9%. However, already in 2015 there was stability and the growth was 110.1%. During these years, the decline in oil revenue has been reflected in the indicator of the physical volume of retail turnover of non -food products, and not food products. Since food and food-related products are realized in the consumer market, for the analysis, we will analyze food products in the retail commodity circulation and imports.

The result of our reference to the indicators related to the import of food and food products was that the import of food and food products reached its maximum in 2013 at 1304379.7 million dollars, in 2014 it was 1257229.6 million dollars and in 2015 it was 1081359 million dollars down to the dollar. This is directly related to the 2-3 times drop in oil prices and, accordingly, the 2 times devaluation of the national currency, the manat. As one of the constituent parts of retail trade is paid services to the population, during these years, the first place in the impact on the General CPI or inflation belongs to the prices of paid services to the population, the second place belongs to the prices of non -food commodities, and the third place belongs to the prices of food commodities. The fact that the price of paid services on the population is 2-3 times higher can be attributed primarily to the conversion of many services into paid services, the increase in the quality of paid services and the complete renewal of their main funds. This, of course, is reflected in the circulation of paid services to the population and retail trade. Since the consumer market is a specific market, i.e., this market covers primary goods and services, it is difficult to say that its volume and turnover are highly dependent on the population's income and, of course, on the oil factor. So that, it is difficult to predict the decrease in the turnover of the consumer market against the background of lower oil prices and lower oil revenues. Even the decrease in the income of the population due to devaluation and the increase in the prices of imported food products did not reduce this turnover. However, it can be assumed that completely different results will be obtained in the expression of this turnover in foreign currency.

Hypotheses

$H1_0$: An increase in oil and oil products export increase consumer market

$H2_0$: An increase in oil and oil products export increase retail trade

$H3_0$: An increase in oil and oil products export increase public catering

$H4_0$: An increase in oil and oil products export increase paid services

$H5_0$: An increase in oil and oil products export increase retail trade turnover per person of population.

2. LITERATURE REVIEW

There was a certain difficulty in preparing a literature review of research related to the topic. In other words, research on the impact of oil prices on the domestic market, including the consumer market, is practically absent. From this point of view, we have had to be satisfied with the research works dedicated to the impact of oil prices on the economy of oil -exporting countries.

Carneiro (2007) in his article discusses some of the problems faced by oil-rich developing countries in their development, such as Dutch disease phenomena, macroeconomic instability, weak governance and obstacles to the development of institutional capacity, optimal management of oil revenues and negative externalities related to the paradox of abundance, discussed options for mitigating the effects and concluded that one of the surest ways for oil -rich developing country governments to avoid the oil curse is to insulate fiscal policy from oil price volatility.

Using the VAR structural approach, Mehrara and Oskoui (2007) investigated the sources of macroeconomic fluctuations in oil -exporting countries such as Iran, Saudi Arabia, Kuwait, and Indonesia, and concluded that although oil price shocks are the main source of output fluctuations in Saudi Arabia and Iran, they are not the same in Kuwait and Indonesia in their research.

Iwayemi and Fowowe (2011) using data from 1970 to 2006 and VAR model, the authors studied the effect of oil price shocks on macroeconomic variables in Algeria, Egypt, Libya and Nigeria, which are the largest oil exporters in Africa, concluded that oil price shocks have a significant impact on macroeconomic variables. although it has little short-term effect on the variables, according to the impulse response functions, shocks in oil prices cause variable reactions of macroeconomic variables, and in most cases, the initial reaction of macroeconomic variables to shocks in oil prices is negative.

Moshiri and Banihashem (2012) study oil and macroeconomics in the context of emerging oil exporting countries using the GARCH type of VAR model to estimate and test the asymmetric effects of oil shocks in the six major oil exporting members of OPEC over the period 1970-2009 looking at the relationship between them, they concluded that a fall in oil prices in oil -exporting developing countries would lead to a significant reduction in income and stagnation in the economy. However, higher oil prices and associated higher incomes do not lead to sustainable economic growth.

Using the TAR and M-TAR models, Mohammadi and Jahan-Parvar (2012), who examined the short-term dynamics and long-term relationship between real oil prices and the real exchange rate in a sample of 13 oil exporting countries, concluded that co -integration tests 13 indicate the possibility of the disease in 3 countries - Bolivia, Mexico and Norway. For these countries, oil prices have a long -term effect on exchange rates; exchange rates adjust more quickly to positive deviations from equilibrium; and there is no evidence of short -term causality between real exchange rates and real oil prices in any direction.

Moshiri, (2015) in his article investigated the non -linear effect of oil price shock on macroeconomic indicators in the context of two groups of oil exporting countries using VAR model with price shocks estimated by GARCH method. He included oil price and economic growth shocks as two main variables in his models, along with intermediate variables such as investment, exchange rate and inflation rates. The author, whose study covers nine major oil exporting countries, six developing countries and three developed countries, from 1970 to 2010, concludes that oil shocks have an asymmetric impact on developing oil exporting countries; low oil prices lead to significant reductions in incomes and subsequent stagnation in the economy, but higher oil prices and the accompanying higher incomes do not lead to sustainable economic growth; does not have a significant impact on economic growth in developed oil-exporting countries.

Using several trade statistics (export intensity index, terms of trade index, export sensitivity, Herfindahl-Hirschman index) and the Bennett method to measure the oil vulnerability of the 14 most important oil exporting countries, the researchers concluded that from the end of 2014 then, the impact of the rapid decline in crude oil prices on the world economy is mostly positive, but uncertainty (economic, social and political) has increased significantly in oil exporting countries (Nagy and Szep, 2016).

Hasanov et al. (2017) in their work, based on the data covering the period 2004q1-2013q4, referring to the ARDL model and investigating the role of oil prices in the dynamics of real effective exchange rates of the CIS countries, came to the conclusion that oil prices are undoubtedly the main driver of real effective exchange rate growth in the selected countries. Is the driving force, and performance may lead to a certain degree of cost overruns.

Oil price shocks have a large impact on the economic performance of African oil-exporting countries, and a significant response of macroeconomic indicators such as inflation, money supply, bank exchange rate, gross domestic product, unemployment, to oil price shocks has been shown by other researchers based on data for a period spanning 1980-2015 are proven using the P-SVAR model in their studies (Mathew and Ngalawa, 2017).

In their articles, the authors (Pavlova et al., 2017) examining the dependence of the Russian economy on world oil prices and the factors influencing the state of the world oil market, justify the increasing role of the financial market of oil contracts in the context of modern economic development, as well as the increase in the production and export of goods, a phenomenon called the "Dutch Disease." Characterized by, the flow of capital from exports stimulates consumer demand, but the industrial sector does not keep up with the increase in household incomes due to the pressure of this phenomenon, which increases inflation, that causes the production sector of the economy to lag behind the production sector.

Researcher (Oyewunmi, 2018) whose articles include critical analysis of the issues influencing bottom line performance of individual oil exporting economies, as well as other contextual factors, capacity shortages, oil industry transparency and governance imperatives, policy inconsistency, economic diversification, Corporate Social Responsibility and paying special attention to the issues related to the optimization of state regulation, he reflected the modern perspectives of resource management against the background of changing socio -economic dynamics, studied the applied conceptual and theoretical views, and discussed the practical results.

Based on annual data for the years 2006-2017, the researchers studied the impact of crude oil prices on global competitiveness in 60 oil-producing and oil-consuming countries by conducting fixed -effect panel data regression analysis and concluded that the annual growth rate of oil prices is higher than GDP growth. increasing the rate of growth more than doubles the growth rate of the Global Competitiveness index for oil-exporting countries compared to non-oil-exporting countries (Mukhamediyev and Temerbulatova, 2019).

Mukhtarov et al. (2019) investigated the effect of oil prices on economic growth, exports, inflation and exchange rate in Azerbaijan using Johansen cointegration and VECM methods based on the data covering the years 2005:01-2019:01 and came to the conclusion that the variables there is a long -term relationship between the impulse response and results decomposition tests show that oil prices have a positive and statistically significant effect on economic growth, exports and inflation, on the other hand, oil prices have a negative effect on the exchange rate.

Another study (Mohammed et al., 2020) assesses the impact of oil revenues on economic growth through the development channel of financial markets. Using the panel VAR model, the proportional contribution of public investment and private investment based on oil revenues between 1990 and 2015 was determined in 83 oils-producing countries. Moreover, the two-stage GMM system was used to estimate the impact of oil revenues on economic growth, conditional on the development of financial markets. It was determined that state investments of oil revenues have a positive effect on economic growth due to the development of the banking sector, but with the exception of the turnover ratio, it has no effect on the development of the stock market. The data obtained also give reason to say that private investments in oil revenues have a negative impact on economic growth, which depends on the development of the banking sector.

In their study, the authors (Jafari et al., 2020) who used GMM and ARDL models to study the impact of oil revenue on government spending and the size of individual oil exporting countries between 1980 and 2015 concluded that oil revenue in selected oil exporters has a significant positive effect on government spending and size. Moreover, in the case of Iran, an increase in oil revenues has significant short - and long-term effects on the size of government.

Researchers discussing the impact of oil price uncertainty on industrial production and exchange rates in oil-exporting Canada, Mexico, Norway and Russia using the SVAR model (Śmiech et al., 2021) found and noted that the reason for the steady decline in industrial production due to oil price uncertainty shocks is different. The exchange rate falls immediately in response to the shock of uncertainty in oil prices, but this reaction is only in developing countries - Mexico and Russia. Oil price uncertainty shocks are an important factor in industrial production changes in all oil -exporting countries, although the contribution of these shocks to exchange rate changes varies across countries, being highest in Mexico and lowest in Norway.

In their article (Kopytin et al., 2021), the authors applied the BVAR model to analyze the impact of world oil prices and exchange rate policy and interest rate on economic growth and consumer inflation in three posts -Soviet oil exporting countries: Azerbaijan, Kazakhstan and Russia in 2014-2015. It shows that the transition to the inflation targeting regime with a floating exchange rate has weakened the relationship between economic growth and world oil prices in Russia and Kazakhstan, while in Azerbaijan, a systematic relationship between GDP growth and world oil prices has emerged that did not exist before, and all three countries have actually changed from the freely floating exchange rate regime after 2017 they noted that he moved away.

In their article covering the period 2008-2016, the authors (Haque et al., 2021) apply a fixed effects model to a group of six oil -producing countries of the Gulf Cooperation Council and find that oil prices are negatively related to the terms of trade, albeit weakly.

The purpose of their research is to study possible asymmetric relationships between oil prices and the real effective exchange rate in Kazakhstan from January 2010 to December 2020 based on the results obtained using the asymmetric causal analysis method developed by Hatemi and Roca (2014). Although there is a causal relationship between negative shocks and negative shocks of the real effective exchange rate in Kazakhstan, no causal relationship was found between positive spikes in oil prices and the real effective exchange rate (Abubakirova et al., 2021).

Yuen and Yuen (2022) explored the relationship between geopolitical risk and crude oil prices in major oil producing countries before and after the 2008 financial crisis based on the DOLS model. Saudi Arabia, Russia, the US and China caused changes in crude oil prices. The coefficients of the geopolitical indices of Canada, Russia, and China were significant until the 2008 financial crisis sample period, after which the coefficients for all geopolitical indices became insignificant.

3. DATA AND METHODOLOGY

3.1. Data

The information was obtained from Azerbaijan State Statistics Committee data on crude Oil and oil products export, oil exports Consumer market, Retail trade, Public catering, Paid services, Retail trade turnover on food products beverages and tobacco products, Retail trade turnover on non -food products. The data set is compiled annually and covers the period from 1997 to 2021 (Table 1 and Graph 1).

Table 1: Data and internet resource

Variables	Descriptions			Source
CM	Consumer market	million	manats	www.stat.gov.az
RT	Retail trade	million	manats	www.stat.gov.az
PC	Public catering	million	manats	www.stat.gov.az
PS	Paid services	million	manats	www.stat.gov.az
RTPPP	Retail trade turnover per person of population	million	manats	www.stat.gov.az
OOPE	Oil and oil products export	million	dollars	www.stat.gov.az

Before starting the ARDL co−integration assessment, several preparatory steps are contemplated. In the first stage, the data is analyzed by static and graphic methods.

Descriptive statistics of the variables (data) are given in Table 2. Here, all variable is normally distributed according to the Jarque-Bera criterion. Kurtosis (excess) range variables - Consumer market and Oil and oil products export are 2.9 (4.731686-1.815697), Retail trade and Oil and oil products export are 2.6 (4.731686-2.133018), Retail trade and Oil and oil products export are more than 3.0 (4.731686-1.462949), Paid services and Oil and oil products export are 2.5 (4.731686-2.024849) and Retail trade turnover per person of population and oil products export are 2.5 (4.731686-1.927124). Negative asymmetry not is present in variations, depending on their fluctuations (changes).

3.2. Methodology

The following equations were used to study the impact of oil and oil products export on consumer market, retail trade, public catering, paid services and retail trade turnover per person of population.

		Logarithmically	
$CM=f(OPPE)$	(1)	$LCM=\psi_0+\psi_1 LOPPE+\varepsilon$	(6)
$RT=f(OPPE)$	(2)	$LRT=\psi_0+\psi_1 LOPPE+\varepsilon$	(7)
$PC=f(OPPE)$	(3)	$LPC=\psi_0+\psi_1 LOPPE+\varepsilon$	(8)
$PS=f(OPPE)$	(4)	$LPS=\psi_0+\psi_1 LOPPE+\varepsilon$	(9)
$RTPPP=f(OPPE)$	(5)	$LRTPPP=\psi_0+\psi_1 LOPPE+\varepsilon$	(10)

3.3. URT − Stationary Time Series

Before conducting a co−integration test between the variables estimated in the model, it is important to determine the order of integration by checking the stability (stationarity) of the variables (series). The study will use the standard ADF (Dickey and Fuller, 1979), PP (Phillips and Perron, 1988), and Kwatkovski-Phillips-Schmidt-Shin (KPSS) tests (Kwiatkowski et al., 1992).

3.4. ARDL Bounds Test of Cointegration

In this study examining long and short -term interactions between crude Oil and oil products export (*OOPE*) and Consumer market, Retail trade, Public catering, Paid services, Retail trade turnover per person of population (*CM; RT; PC; PS and RTPPP*), Pesaran and Shin (1999), Pesaran et al. (2001) the ARDL Boundary Test (ARDLBT) approach was used to analyze co−integration between the variables being estimated.

Granger (1969) argued that measures of correlation between variables are insufficient to understand the relationship between

Graph 1: Indicators of variables

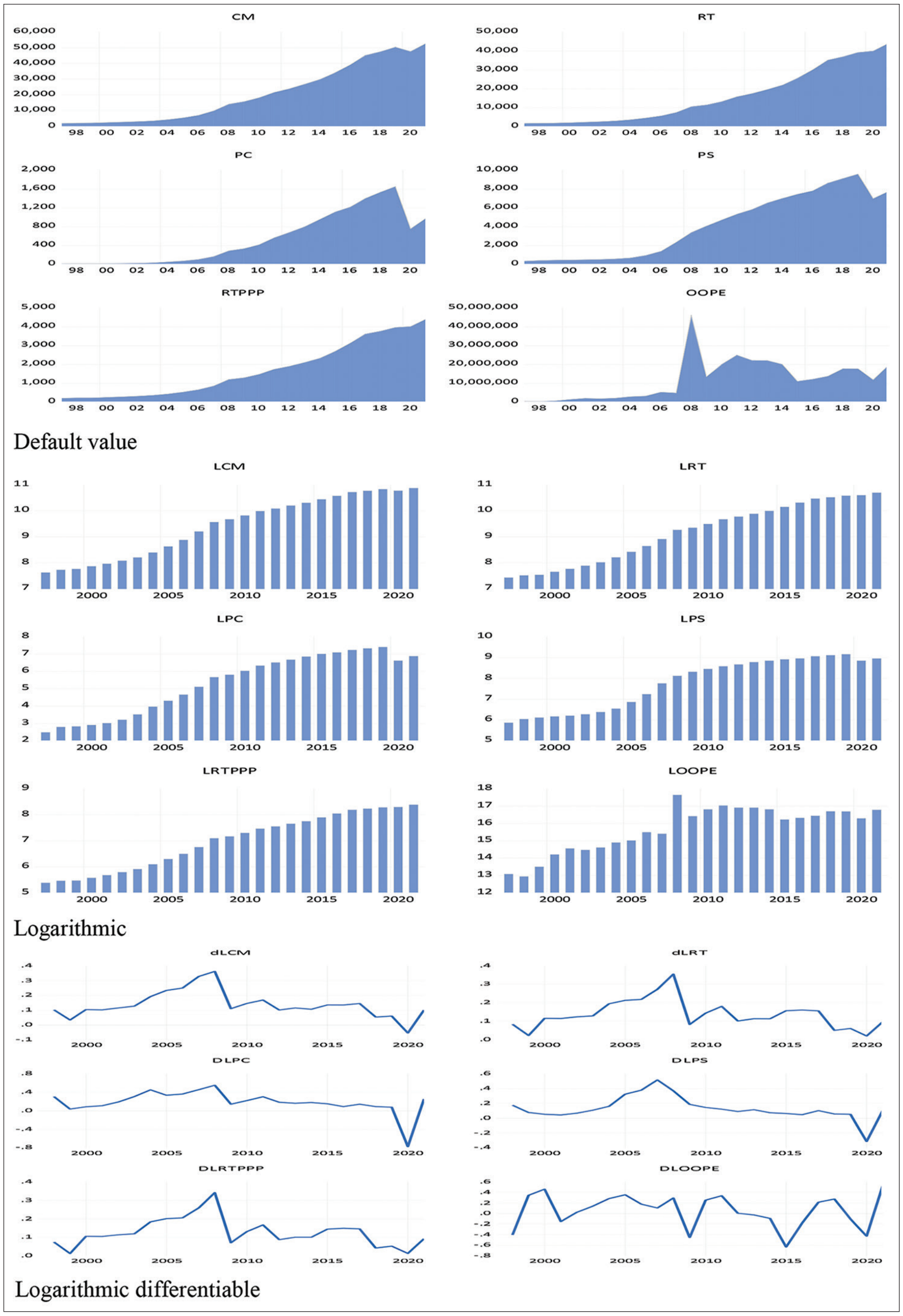

Table 2: Descriptive statistics for the variables

	CM	PC	PS	RT	RTPPP	OOPE
Mean	20624.47	529.7560	4121.768	15972.95	1689.300	12019865
Median	15916.70	335.1000	4088.200	11493.40	1302.000	11981306
Maximum	52954.80	1655.200	9607.300	44217.50	4413.900	46362868
Minimum	2049.900	12.00000	352.8000	1685.100	218.3000	417854.0
Std.	18039.17	541.8215	3333.423	14350.63	1428.176	10949379
Skewness	0.538412	0.680949	0.171632	0.670562	0.594409	1.169638
Kurtosis	1.815697	2.133018	1.462949	2.024849	1.927124	4.731686
Jarque-Bera	2.668880	2.715025	2.583705	2.864097	2.671199	8.823903
Probability	0.263306	0.257300	0.274761	0.238819	0.263000	0.012131
Sum	515611.8	13243.90	103044.2	399323.7	42232.50	3.00E+08
Sum Sq. Dev.	7.81E+09	7045693.	2.67E+08	4.94E+09	48952475	2.88E+15
Observations	25	25	25	25	25	25

them due to the lack of an indirect relationship with the third variable in the structure. Various approaches, such as Engle and Granger (1987), Johansen and Juselius (1990) approaches to cointegration, are applied to investigate the long−term relationship between evaluated variables. While these methods can be applied to sequences that have a unique integration rule, the ARDL boundary test approach is more flexible compared to more traditional cointegration methods. This approach can be applied to any series (variables) with a mixed integration rule. However, it is necessary to ensure that none of the variables is I(2) and that the dependent variable is I(1). The ARDL model for a standard logarithmic functional specification between Oil and oil products export (*OOPE*) and Consumer market, Retail trade, Public catering, Paid services, Retail trade turnover per person of population (*CM; RT; PC; PS and RTPPP*) is as follows.

$$\Delta LCM_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LCM_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LOOPE_{t-i} + \lambda_1 CM_{t-1} + \lambda_2 LOOPE_{t-1} + \varepsilon_{t1} \quad (11)$$

$$\Delta LRT_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LRT_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LOOPE_{t-i} + \lambda_1 LRT_{t-1} + \lambda_2 LOOPE_{t-1} + \varepsilon_{t2} \quad (12)$$

$$\Delta LPC_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LPC_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LOOPE_{t-i} + \lambda_1 LPC_{t-1} + \lambda_2 LOOPE_{t-1} + \varepsilon_{t3} \quad (13)$$

$$\Delta LPS_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LPS_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LOOPE_{t-i} + \lambda_1 LPS_{t-1} + \lambda_2 LOOPE_{t-1} + \varepsilon_{t4} \quad (14)$$

$$\Delta LRTPPP_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LRTPPP_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LOOPE_{t-i} + \lambda_1 LRTPPP_{t-1} + \lambda_2 LOOPE_{t-1} + \varepsilon_{t5} \quad (15)$$

Where − ε_{t1}, (1,2.,5) is the error term that must be white noise, Δ is the first di erence operator. *p* is the lag order, which is usually calculated by *AIC* or *SBC* criterion; λ_{1i} and λ_{2i} is the long-term coefficient between variables; ψ_{1i} and ψ_{2i} is the short-term coefficient between variables. ψ_0 – free number. *L* – logarithm sign.

A boundary test will be applied to analyze co−integration between given variables. The co−integration bounds test is based on joint statistics or the Wald test, which is used to test the null hypothesis (hypothesis) of the absence of co-integration, H_0: $\lambda_{1i} = \lambda_{2i} = 0$; H_1: $\lambda_{1i} \neq \lambda_{2i} \neq 0$. The Wald test is applied when the same variable has more than one short-term coefficient. The value of the *F*- statistic will be compared with the critical values of the upper and lower bounds. If the calculated value of the *F*- statistic is above the critical values of the upper bounds, the null hypothesis of no co-integration is rejected. If the value of the *F*- statistic lies between the critical values of the upper and lower bounds, the null hypothesis of the absence of co-integration is equal to zero.

In this case, Kremers et al. (1992) and Banerjee et al. (1998) suggested that the decision to have a long-term relationship would be based on the error correction time frame. If the error correction term (*ECT*) is negative and significant, this implies the existence of a long-term relationship between the estimated variables. However, if the value of its statistic is below the critical value of the lower bounds, this indicates a lack of co-integration between the variables being estimated. After co-integration is confirmed, the short-term model is evaluated using the following equation.

$$\Delta LCM_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LCM_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LOOPE_{t-i} + \mu ECT_{t-1} + \varepsilon_{t1} \quad (16)$$

$$\Delta LRT_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LRT_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LOOPE_{t-i} + \mu ECT_{t-1} + \varepsilon_{t2} \quad (17)$$

$$\Delta LPC_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LPC_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LOOPE_{t-i} + \mu ECT_{t-1} + \varepsilon_{t3} \quad (18)$$

$$\Delta LPS_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LPS_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LOOPE_{t-i} + \mu ECT_{t-1} + \varepsilon_{t4} \quad (19)$$

$$\Delta LRTPPP_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LRTPPP_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LOOPE_{t-i} + \mu ECT_{t-1} + \varepsilon_{t5} \quad (20)$$

As the next step, the Engle-Granger (*EG*) co −integration test is applied. This test is mostly used to check long -term relationships. However, it also provides an opportunity to explore short -term relationships and identify interactions between variables. The regression equation is estimated for the variables in the first step of the *EG* co −integration test. Thus, the following equations for two variables are given (equations 21−25).

$$LCM_t = \psi_0 + \lambda_1 LOOPE_t + \varepsilon_t \quad (21)$$

$$LRT_t = \psi_0 + \lambda_1 LOOPE_t + \varepsilon_t \quad (22)$$

$$LPC_t = \psi_0 + \lambda_1 LOOPE_t + \varepsilon_t \quad (23)$$

$$LPS_t = \psi_0 + \lambda_1 LOOPE_t + \varepsilon_t \quad (24)$$

$$LRTPPP_t = \psi_0 + \lambda_1 LOOPE_t + \varepsilon_t \quad (25)$$

Table 3: Results of unified root tests

Model	Variable	ADF	PP	KPSS
With intercept only	At level form			
	LCM	−1.146110	−0.952843	0.710065**
	LRT	−0.874173	−0.750253	0.716799**
	LPC	−1.775709	−1.644933	0.684304**
	LRTPPP	–0.859400	−0.747054	0.715296**
	LPS	−1.187803	−1.317886	0.677253**
	LOOPE	–2.491777	−1.998861	0.600543**
	At first differencing			
	Δ*LCM*	–2.241605	−2.241605	0.204338
	Δ*LRT*	–2.665280*	−2.665280*	0.207747
	Δ*LPC*	–3.696098**	−3.689494**	0.373044*
	Δ*LRTPPP*	–2.719556*	−2.719556*	0.203927
	Δ*LPS*	–2.277903	−2.253998	0.244339
	Δ*LOOPE*	–7.140122***	−7.140122***	0.249204
With intercept and trend	At level form			
	LCM	–1.514771	−0.916940	0.136692*
	LRT	–0.367711	−1.033787	0.130520*
	LPC	0.136962	0.308365	0.160474**
	LRTPPP	–0.411906	−1.055486	0.131089*
	LPS	–1.505098	−0.647376	0.144162*
	LOOPE	–2.038583	−1.808602	0.178231**
	At first differencing			
	Δ*LCM*	–2.553079	−2.389514	0.141864*
	Δ*LRT*	–2.756855	−2.639171	0.165043**
	Δ*LPC*	–4.065896**	−4.059243**	0.176366**
	Δ*LRTPPP*	–2.802826	−2.726915	0.162057*
	Δ*LPS*	–2.405162	−2.366311	0.127015**
	Δ*LOOPE*	–7.841267***	−8.507878***	0.100826
No intercept and No trend	At level form			
	LCM	1.576304	4.255039	N/A
	LRT	1.982079	5.270625	N/A
	LPC	−0.351313	2.057936	N/A
	LRTPPP	1.939606	4.838593	N/A
	LPS	1.112540	2.220451	N/A
	LOOPE	1.643784	1.460237	N/A
	At first differencing			
	Δ*LCM*	–1.158641	−1.010564–	N/A
	Δ*LRT*	–1.146216	−0.930552	N/A
	Δ*LPC*	–1.074388	−2.676853**	N/A
	Δ*LRTPPP*	–1.220595	−1.012372	N/A
	Δ*LPS*	–1.791570*	−1.707064	N/A
	Δ*LOOPE*	–6.546414***	−6.409529***	N/A
LCM				I (1)
LRT				I (1)
LPC				I (1)
LPS				I (1)
LRTPPP				I (1)
LOOPE				I (1)

ADF denotes the Augmented Dickey-Fuller single root system respectively. PP Phillips-Perron is single root system. KPSS denotes Kwiatkowski-Phillips-Schmidt-Shin single root system. ***, ** and * indicate rejection of the null hypotheses at the 1%, 5% and 10% significance levels respectively. The critical values are taken from MacKinnon (*Mackinnon*, 1996). Assessment period: 1997-2021. Legend: N/A-Not Applicable

Here ψ_0, λ_1 - are regression coefficients, *LCM*, *LRT, LPC*, *LPS* and *LRTPPP* dependent variables as mentioned above, while*LOOPE* are independent variables, explanatory variables. ε– is error (is white noise), t –is time. After estimating the regression equation, the reliability of $\varepsilon -$ is checked. When ε is stationary, it is said that there is a co -integrating relationship between the variables. Based on these, it is also proved that these equations (21−25) are long -term equations.

3.5. FMOLS, DOLS and CCR (Long−run Elasticities)

For the analysis of long-term relationships, one common vector will be evaluated. In this regard, there are many econometric methods that can be applied to explore long-term relationships between the variables being estimated. In this regard, the paper uses the fully modified ordinary least squares (FMOLS) method developed by Phillips and Hansen (1990), as well as the dynamic ordinary least squares (DOLS) estimator developed by Stock and Watson (1993), and the canonical co-integrating method. The regression method (CCR) developed by Park (1992) is used. These methods make it possible to achieve asymptotic efficiency by taking into account the effect of serial correlation and checking the homogeneity that occurs in the presence of links (Aliyev et al., 2016).

Table 4: VAR lag order selection criteria

Endogenous variables: F_{LCM}(LCM/LOOPE)						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	−53.21440	NA	0.417115	4.801252	4.899991	4.826084
1	14.01808	116.9261	0.001712	−0.697225	−0.401009	−0.622727
2	22.50055	13.27691*	0.001172*	−1.087005*	−0.593312*	−0.962842*
Endogenous variables: F_{LRT} (LRT/LOOPE)						
0	−53.88170	NA	0.442035	4.859279	4.958017	4.884111
1	17.33200	123.8499	0.001284	−0.985392	−0.689176	−0.910894
2	24.95197	11.92691*	0.000947*	−1.300172*	−0.806479*	−1.176009*
Endogenous variables: F_{LPC} (LPC/LOOPE)						
0	−59.96382	NA	0.750147	5.388158	5.486897	5.412991
1	−10.25927	86.44269*	0.014138*	1.413850*	1.710066*	1.488347*
2	−8.593883	2.606698	0.017513	1.616859	2.110553	1.741022
Endogenous variables: F_{LPS} (LPS/LOOPE)						
0	−50.95410	NA	0.342686	4.604705	4.703443	4.629537
1	0.045785	88.69546	0.005770	0.517758	0.813974	0.592255
2	6.357006	9.878433*	0.004773*	0.316782*	0.810475*	0.440944*
Endogenous variables: F_{LRTPPP} (LRTPPP/LOOPE)						
0	−51.84203	NA	0.370194	4.681916	4.780655	4.706748
1	17.68868	120.9230	0.001244	−1.016407	−0.720191	−0.941910
2	25.14067	11.66397*	0.000932*	−1.316580*	−0.822887*	−1.192417*

*Indicates lag order selected by the criterion. 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

Table 5: Models

Model 1	F_{LCM} (LCM/LOOPE)	ARDL (1,0) C (AIC) C2
Model 2	F_{LRT} (LRT/LOOPE)	ARDL (1,0) C (AIC) C2
Model 3	F_{LPC} (LPC/LOOPE)	ARDL (1,0) C (AIC) (AS) C2
Model 4	F_{LPS} (LPS/LOOPE)	ARDL (1,0) C (AIC) C2
Model 5	F_{LRTPPP} (LRTPPP/LOOPE)	ARDL (1,0) C (AIC) C5

AS−Automatic selection C2−Case 2: Restricted Constant and No Trend, C5−Case 5: Unrestricted Constant and Unrestricted Trend

FMOLS, DOLS, and CCR can only be used if the cointegration condition between the I(1) variables is met. Therefore, in our study, long-term elasticity will be assessed using FMOLS, DOLS, and CCR. Further analysis of the results of the Angle-Granger analysis is also very useful in the research process (Musayev and Aliyev, 2017). Because the ARDLBT approach to collaborative integration allows for more robust analysis by reviewing the results multiple times. Engle-Granger and Phillips-Ouliaris (Phillips and Ouliaris, 1990) co-integration tests were used to test all regression equations estimated in the FMOLS, DOLS, and CCR models.

3.6. Granger Causality

Although ARDL methods and co-integration tests confirm the presence of a long-term relationship between the variables being assessed, they do not determine causality. If evidence of co-integration in the series is not supported, causality can be examined using a variance variable in a restricted VAR setting. However, if the co-integration tests support a long-run relationship between the variables, Granger-type causality can be confirmed by supplementing the model with a one-period lagged error correction term (ECT_{t-1}). This is also important because Engle and Granger (1987) warned that first difference VAR estimation can be misleading in the presence of first-order co-integrated series. Vector error correction (VEC) in this study can be modeled similarly as follows:

$$\Delta LCM_t = \sigma_0 + \sum_{i=1}^{p} \sigma_{1i} \Delta LCM_{t-i}$$

$$+ \sum_{i=0}^{q} \sigma_{2i} \Delta LOOPE_{t-i} + \tau_1 ECT_{t-1} + \theta_{t1} \tag{26}$$

$$\Delta LRT_t = \sigma_0 + \sum_{i=1}^{p} \sigma_{1i} \Delta LRT_{t-i}$$

$$+ \sum_{i=0}^{q} \sigma_{2i} \Delta LOOPE_{t-i} + \tau_2 ECT_{t-1} + \theta_{t2} \tag{27}$$

$$\Delta LPC_t = \sigma_0 + \sum_{i=1}^{p} \sigma_{1i} \Delta LPC_{t-i}$$

$$+ \sum_{i=0}^{q} \sigma_{2i} \Delta LOOPE_{t-i} + \tau_3 ECT_{t-1} + \theta_{t3} \tag{28}$$

$$\Delta LPS_t = \sigma_0 + \sum_{i=1}^{p} \sigma_{1i} \Delta LPS_{t-i}$$

$$+ \sum_{i=0}^{q} \sigma_{2i} \Delta LOOPE_{t-i} + \tau_4 ECT_{t-1} + \theta_{t4} \tag{29}$$

$$\Delta LRTPPP_t = \sigma_0 + \sum_{i=1}^{p} \sigma_{1i} \Delta LRTPPP_{t-i}$$

$$+ \sum_{i=0}^{q} \sigma_{2i} \Delta LOOPE_{t-i} + \tau_5 ECT_{t-1} + \theta_{t5} \tag{30}$$

Here, σ_0, σ_{1i}, σ_{2i} and τ_1, τ_2, τ_3, τ_4, τ_5 are coefficients. p – is the optimal lag and ε is the white noise error of the model. They define the mutual relations among variables. The regression equation is evaluated for variables in the first stage of the *EG* cointegration test. For example,

Table 6: Results from bound tests

Panel A. Results F−bounds test and T−Bounds test					
Estimated model	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
F-St.(Bound-test)	37.73068***	47.55860***	11.34503***	11.75536***	9.803039***
T-St.(Bounds-test)	NA	NA	NA	NA	−2.500161
R^2	0.996714	0.997392	0.987037	0.989019	0.997368
$Adj\text{-}R^2$	0.996401	0.997144	0.985802	0.987973	0.996973
F-statistic	3184.927	4015.510	799.4693	945.6721	2526.234
Prob (F-statistic)	0.000000	0.000000	0.000000	0.000000	0.000000
D-W stat	1.000175	1.065897	1.837420	1.266214	1.046992
		Co−integration	Co−integration	Co−integration	Co−integration

Panel B. Critical values F –statistic and t –statistic								
Critical values	**10%**		**5%**		**2.5%**		**1%**	
	C2	**C5**	**C2**	**C5**	**C2**	**C5**	**C2**	**C5**
Lower Bounds I(0)								
n=1000	3.02	5.59	3.62	6.56	4.18	7.46	4.94	8.74
n=35	3.223	5.95	3.957	7.21	NA	NA	5.763	10.365
n=30	3.303	6.01	4.09	7.36	NA	NA	6.027	10.605
t –st	NA	−3.13	NA	−3.41	NA	−3.65	NA	−3.96
Upper Bounds I(1)								
n=1000	3.51	6.26	4.16	7.3	4.89	8.27	5.58	9.63
n=35	3.757	6.68	4.53	8.055	NA	NA	6.48	11.295
n=30	3.797	6.78	4.663	8.265	NA	NA	6.86	11.65
t –st	NA	−3.4	NA	−3.69	NA	−3.96	NA	−4.22

***, ** and * indicate rejection of the null hypotheses at the 1%, 5% and 10% significance levels, respectively

Table 7: Estimated primary ARDL model

Variable	**Coefficient**				
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**
$LCM_{(-1)}$	0.902179***				
$LRT_{(-1)}$		0.919946***			
$LPC_{(-1)}$			0.825440***		
$LPS_{(-2)}$				0.841808***	
$LRTPPP_{(-1)}$					0.771041***
LOOPE	0.085618***	0.072693***	0.201878**	0.131578**	0.079614***
C	−0.303957	−0.285087	−2.093663*	−0.728455	0.6419
TREND					0.1219

***, ** and * indicate rejection of the null hypotheses at the 1%, 5% and 10% significance levels, respectively

if there is the cointegration relations, this dependency is evaluated. If the cointegration is stable, then ECT_{t-1} is negative in terms of statistical significance. This coefficient is usually between –1 and 0.

Using the above equations, Granger causality (first difference) can be estimated in three different ways (Muhammad et al., 2017; Menegaki, 2019, 2020).

- Short-term or weak causality (Asafu-Adjaye, 2000)
- Long-term causation (Masih and Masih, 1996)
- Short-term and long-term causation or strong causality (Asafu-Adjaye, 2000; Lee and Chang, 2008).

The Granger cause-and-effect relationship for the short run is evaluated using *F* statistical or X_i -square statistical values by checking the statistical significance of the coefficients of all delayed first-order differences (all $\Delta LOOPE_{t-i}$ the null hypothesis suggests that *LOOPE* have short-term effects on *LCM*, *LRT*, *LPC, LPS* and *LRTPPP*.

Using the *t* test to check the Granger cause and effect relationship for the long run, the statistical significance of the coefficient ECT_{t-1} is checked. The null hypothesis for this (H_0: $\tau_1 = 0$, $\tau_2 = 0$, $\tau_3 = 0$, $\tau_4 = 0$ and $\tau_5 = 0$) needs to test. If, as a result, the null hypothesis is rejected, this long-run period shows that deviations from the equilibrium state have an effect on the dependent variable and will return to the equilibrium state over time.

A strong cause and effect relationship is, in fact, both a short-term and a long-term and-effect relationship. In other words, using the *F*–statistic or X_i–square statistical values through the Wald test as a null hypothesis for each variable taken (H_0: $\sigma_{2i} = \tau_1 = 0$; H_0: $\sigma_{2i} = \tau_2 = 0$; H_0: $\sigma_{2i} = \tau_3 = 0$; H_0: $\sigma_{2i} = \tau_4 = 0$; H_0: $\sigma_{2i} = \tau_5 = 0$, $i = 1 \ldots p$,) hypotheses are tested.

3.7. Diagnostics

In this study, both the Breusch-Godfrey LM test (Breusch, 1978; Godfrey, 1978), (Breusch-Godfrey [BG] Test) the heteroscedasticity test, and the Breusch-Pagan-Godfrey test (Breusch and Pagan, 1979), as well as the Autoregressive Conditional Heteroskedasticity test (Bollerslev, 1986), test ARCH (Engle, 1982) and Ramsey RESET Test (Ramsey, 1969, 1974) (statistical) check the stability of the ARDL model. The J–B Normality test (Jarque and Bera, 1980, 1981, 1987) will be

Table 8: The long−run and short−run coefficients

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Panel A. Long−run estimation					
$LCM_{(-1)}$	−0.097821***				
$LRT_{(-1)}$		−0.080054***			
$LPC_{(-1)}$			−0.174560***		
$LPS_{(-1)}$				−0.158192**	
$LRTPPP_{(-1)}$					−0.228959*
LOOPE	0.085618***	0.072693***	0.201878**	0.131578**	0.079614***
C	−0.303957	−0.285087	−2.093663*	−0.728455	0.197190
TREND					0.020243
Panel B: Short-run estimation					
C					0.197190***
TREND					0.020243***
CointEq(-1)	−0.097821***	−0.080054***	−0.174560***	−0.158192***	−0.228959***
R^2	0.467009	0.452275	0.395757	0.362965	0.509551
Adj-R^2	0.467009	0.452275	0.395757	0.362965	0.462842
F-statistic	NA	NA	NA	NA	10.90896
Prob (F-statistic)	NA	NA	NA	NA	0.000564
D-W stat	1.000175	1.065897	1.837420	1.266214	1.046992
Panel C: Diagnostics					
Breusch−Godfrey Serial Correlation LM Test:					
χ^2 *SERIAL*	6.315409	6.025019	0.049365	3.186212	5.806802
Prob.	0.0425	0.0492	0.9756	0.2033	0.0548
F−st.	3.392580	3.184297	0.019580	1.454277	2.872569
Prob.	0.0550	0.0642	0.9806	0.2584	0.0827
Heteroskedasticity Test: Breusch−Pagan−Godfrey					
χ^2	0.209567	0.419153	3.857122	0.896992	0.478118
Prob.	0.9005	0.8109	0.1454	0.6386	0.9237
F−st.	0.092493	0.186639	2.010625	0.407671	0.135510
Prob.	0.9120	0.8311	0.1589	0.6703	0.9377
Heteroskedasticity Test: ARCH					
χ^2 *ARCH*	3.26E−05	0.409764	0.107516	0.026508	0.316843
Prob.	0.9954	0.5221	0.7430	0.8707	0.5735
F−st.	2.97E−05	0.380919	0.098628	0.024231	0.293332
Prob.	0.9957	0.5437	0.7566	0.8707	0.5938
Ramsey RESET Test					
χ^2 *RESET* t−st	0.202759	1.809719	1.399324	3.227339	2.265024
Prob.	0.0218	0.0854	0.1770	0.0042	0.0354
F−st	6.187553	3.275082	1.958108	10.41572	2.265024
Prob.	0.0218	0.0854	0.1770	0.0042	0.0354
Jarque-Bera					
χ^2 *NORMAL*	3.191473	1.541809	38.33316	4.737405	2.881853
Prob.	0.202759	0.462595	0.000000	0.093602	0.236708
CUSUM	Stable	Stable	Stable	Stable	Stable
CUSUMSQ	Stable	Stable	No−Stable	Stable	Stable

***, ** and * indicate rejection of the null hypotheses at the 1%, 5% and 10% significance levels, respectively. Durbin-Watson stat (Durbin and Watson, 1971)

used to check the normal distribution of white noise error. The CUSUM and CUSUMSQ tests (Brown et al., 1975) are also used to investigate the stability of the ARDL model.

4. RESULTS AND DISCUSSION

4.1. Unit Root Tests Results

According to ADF test, with intercept only - *LCM*, *LRT*, *LPC*, *LRTPPP*, *LPS* and *LOOPE*- variables I(1), with intercept and Trend - Δ*LPC* and *LOOPE*- variables I(1) and No Intercept and No Trend- Δ*LPS* and *LOOPE*- variables I(1). According to PP test, with intercept only - *LCM*, *LRT*, *LPC*, *LRTPPP, LPS* and *LOOPE*- variables I(1), with intercept and Trend - Δ*LPC* and *LOOPE*- variables I(1) and No Intercept and No Trend- Δ*LPC* and *LOOPE*- variables I(1). According to KPSS test, with intercept only - *LCM*, *LRT*, *LPC, LRTPPP*, *LPS* and *LOOPE*- variables I(0), with intercept and Trend- Δ*LPC* and *LOOPE*- variables I(1) The ADF, PP, and KPSS unit root test evaluation results suggest that the ARDL method and the ARDL boundary - test approach can be used to evaluate the short-term and long-term associations between variables (Table 3).

4.2. VAR Lag Order Selection Criteria

Optimal lags for variables are determined based on AIC, which are automatically selected by the ARDL method built into Eviews_12. Given the use of annual data, the maximum lag initially applied to all variables is 1 and 2 (Tables 4 and 5).

4.3. Cointegration Testing Results

The results of the ARDL boundary test are given in Table 6. In all ARDL equations (models) (Table 6) test result indicates the

Table 9: ARDL and ARDL−ECM coefficients

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Panel A. ARDL estimation					
LCM	−0.032472				
$\Delta LCM_{(-1)}$	0.556743				
LRT		−0.045736			
$\Delta LRT_{(-1)}$		0.374042			
LPC			−0.073180		
$\Delta LPC_{(-1)}$			0.280388		
LPS				0.005096	
$\Delta LPS_{(-1)}$				0.646006**	
LRTPPP					−0.046702
$\Delta LRTPPP_{(-1)}$					0.366268
LOOPE	0.032805	0.045425	0.121820	−0.002307	0.044531
$\Delta LOOPE$	−0.032472	0.064013	0.398812*	0.226531*	0.064728
C	−0.159596	−0.216116	−1.437873	0.022225	−0.298516
TREND					−0.000189
R^2	0.574619	0.459908	0.386831	0.542405	0.447940
Adj-R^2	0.480090	0.339888	0.250571	0.440717	0.285569
F-statistic	6.078748	3.831917	2.838918	5.334015	2.758749
Prob (F-statistic)	0.002814	0.020096	0.054909	0.005174	0.053014
D-W stat	1.511148	1.484637	1.947032	1.873545	1.478602
Panel B: ARDL-ECM estimation					
$\Delta LCM_{(-1)}$	0.650468**				
$\Delta LRT_{(-1)}$		0.534722*			
$\Delta LPC_{(-1)}$			0.185221		
$\Delta LPS_{(-1)}$				0.536536	
$\Delta LRTPPP_{(-1)}$					0.529766**
$\Delta LOOPE$	0.128336**	0.093842	0.459346**	0.238750**	0.088415
$ECM_{(-1)}$	−0.009361	−0.008329	−0.124099*	−0.082368**	−0.003595
C	0.037894	0.057351	0.107338	0.037274	0.060218
TREND					−0.000507
R^2	0.551072	0.378238	0.449631	0.603051	0.367883
Adj-R^2	0.480188	0.280065	0.362731	0.540375	0.227413
F-statistic	7.774335	3.852773	5.174104	9.621703	2.618937
Prob (F-statistic)	0.001381	0.026122	0.008790	0.000446	0.069462
D-W stat	1.664813	1.850710	1.817871	9.621703	1.838814
Panel C: Levels equation					
Model 1	*EC=LCM*–(0.8753* *LOOPE*–31073)				
Model 2	*EC=LRT*–(0.9080* *LOOPE*–3.5612)				
Model 3	*EC=LPC*–(1.1565* *LOPPE*–11.9940)				
Model 4	*EC=LPS*–(0.8318* *LOPPE*–4.6049)				
Model 5	*EC=LRTPPP* (0.3477* *LOOPE*)				

Table 10: Granger causality tests

Null hypothesis	Obs	F−statistic	Prob.
Pairwise granger causality tests			
LOOPE does not granger cause *LCM*	23	2.72872	0.0922
LCM does not granger cause *LOOPE*		3.11801	0.0688
LOOPE does not granger cause *LRT*	23	3.88367	0.0396
LRT does not granger cause *LOOPE*		2.08809	0.1529
LOOPE does not granger cause *LPC*	23	1.43054	0.2651
LPC does not granger cause *LOOPE*		0.19548	0.8242
LOOPE does not granger cause *LPS*	23	0.73220	0.4946
LPS does not granger cause *LOOPE*		3.35100	0.0579
LOOPE does not granger cause *LRTPPP*	23	3.84159	0.0408
LRTPPP does not granger cause *LOOPE*		2.08800	0.1529

existence of cointegration between the variables. Thus, there is a long–term relationship. According to Pesaran et al. (2001) and Narayan (2005), *F*-statistic is higher than upper bound at 5%.

4.4. ARDL Long Run and Short Run Results

Tables 7 and 8 (Panel A, B) presents the results of the long−term and short−term approach of ARDL.

4.5. Diagnostic Test Results

The Table 9 (Panel C) presents the results of diagnostic tests ARDL models. The evaluation results of the Breusha – Godfrey (BG) method confirmed that our ARDL model had no problems with sequential correlation. The results of the Breusha−Pagan−Godfrey (BFG) and ARCH methods later confirmed that heteroscedasticity was not a problem. According to the Ramsey RESET test, that the model is well defined. The table shows the total amount of recursive balances (CUSUM) and the squares of recursive balances (CUSUMQ) indicating that the ARDL model is constant during the sampling period (CUSUM). However, while CUSUM was stable in all models, CUSUMQ was unstable in model 3.

Table 11: FMOLS, DOLS, CCR results

Variable	Model 1	Model 2	Model 3	Model 4	Model 5
Fully modified least squares (FMOLS)					
LOOPE	0.818011***	0.790706***	1.234628***	0.888373***	0.169168**
C	−3.338350	−3.157435	−13.93261***	−6.076909**	2.884914***
TREND					0.118491***
R^2	0.748830	0.726697	0.787335	0.803198	−2.227159
Adj. R^2	0.737413	0.714275	0.777669	0.794252	−8.512390
Dynamic least squares (DOLS)					
LOOPE	0.824196***	0.784254***	1.268343***	0.942767***	−2.227159***
C	−3.465071	−3.080700	−14.48494***	−6.981246**	−8.512390***
TREND					−2.227159***
R^2	0.859106	0.838699	0.888384	0.906103	0.994519
Adj. R^2	0.825954	0.800746	0.862122	0.884010	0.992807
Canonical cointegrating regression (CCR)					
LOOPE	0.818041***	0.791292***	1.234898***	0.886614***	0.170171**
C	−3.334058	−3.162018	−13.93095***	−6.044060***	2.877772***
TREND					0.117819***
R^2	0.747932	0.725744	0.786592	0.802488	0.987601
Adj. R^2	0.736475	0.713278	0.776892	0.793511	0.986421
Cointegration test					
E–G					
tau–st.	−0.969060	−0.820365	−1.544146	−1.531388	−2.730797
z–st.	−2.755855	−2.285507	−4.965924	−4.875261	−35.26808***
Ph–O					
tau–st.	−1.801089	−1.596560	−2.314878	−2.507133	−2.227159
z–st.	−6.027351	−5.141579	−8.597337	−9.590357	−8.512390

***, ** and * indicate rejection of the null hypotheses at the 1%, 5% and 10% significance levels, respectively; E–G−Engle–Granger; Ph–O -Phillips–Ouliaris; tau–st.− tau–statistic; z–st.− z–statistic. period: 1997-2021

Table 12: Granger cause-and-effect analysis evaluation results. Wald test

Panel A. Wald test								
Models	Short-term period			Long-term period			Strong impact	
		ΔLOOPE			ECT_{-1}ΔLOOPE		ECT_{-1} and ΔLOOPE	
Model 1	Chi-sq.	F-st.	t-st.	Chi-sq.	F-st.	t-st.	Chi-sq.	F-st.
ΔLCM	7.399380**	7.399380*	2.720180*	0.090556	0.090556	−0.300926	7.399420*	3.699710*
		ΔLCM			ECT_{-1}ΔLCM		ECT_{-1} and ΔLCM	
ΔLOOPE	4.630300*	4.630300*	2.151813*	6.355817**	6.355817*	−2.521075*	9.276259**	4.638130*
Model 2		ΔLOOPE			ECT_{-1}ΔLOOPE		ECT_{-1} and ΔLOOPE	
ΔLRT	3.870781*	3.870781	1.967430	0.075977	0.075977	0.275639	3.875000	1.937500
		ΔLRT			ECT_{-1}ΔLRT		ECT_{-1} and ΔLRT	
ΔLOOPE	2.766838	2.766838	1.663381	5.594783*	5.594783*	−2.365329*	7.347246*	3.673623*
Model 3		ΔLOOPE			ECT_{-1}ΔLOOPE		ECT_{-1} and ΔLOOPE	
ΔLPC	10.11423***	10.11423**	3.180288**	4.142564**	4.142564*	−2.035329*	13.90541***	6.952703**
		ΔLPC			ECT_{-1}ΔLPC		ECT_{-1} and ΔLPC	
ΔLOOPE	10.90965***	10.90965**	3.302975**	6.677685**	6.677685*	−2.584122*	14.33937***	7.169686**
Model 4		ΔLOOPE			ECT_{-1}ΔLOOPE		ECT_{-1} and ΔLOOPE	
ΔLPS	9.545888**	9.545888**	3.089642**	2.923143	2.923143	−1.709720	11.28637**	5.643186*
		ΔLPS			ECT_{-1}ΔLPS		ECT_{-1} and ΔLPS	
ΔLOOPE	6.937393**	6.937393**	2.633893**	6.286625**	6.286625**	2.507314**	10.72264**	5.361318***
Model 5		ΔLOOPE			ECT_{-1}ΔLOOPE		ECT_{-1} and ΔLOOPE	
ΔLRTPPP	3.854862*	3.854862	1.963380	0.069301	0.069301	−0.263250	3.856552	1.928276
		ΔLRTPPP			ECT_{-1}ΔLRTPPP		ECT_{-1} and ΔLRTPPP	
ΔLOOPE	1.962251	1.962251	1.400804	5.693614*	5.693614*	−2.386130*	6.876375*	3.438188*

Panel B: ECT_{-1} ADF Unit root test					
	Model 1	Model 2	Model 3	Model 4	Model 5
t_m	−0.923285	−0.764522	−1.514508	−1.504546	−0.795259
t_T	−2.735839	−2.561895	−2.895516	−3.202315	−2.593962
t_0	−0.969060	−0.820365	−1.544146	−1.531388	−0.849085

t_m−with intercept only, t_T−with intercept and Trend and t_0−No Intercept and No Trend. A DF denotes the Augmented Dickey-Fuller single root system respectively. The optimum lag order is selected based on the Shwarz criterion automatically; ***, ** and * indicate rejection of the null hypotheses at the 1%, 5% and 10% significance levels, respectively. The critical values are taken from *MacKinnon* (1996). Assessment period: 1997-2021

4.6. FMOLS, DOLS, CCR and Engle-Granger Analysis Results

FMOLS, DOLS, CCR cointegration methods and analysis of the results of Engle-Granger analysis and Granger Causality Tests are very useful in our study (Tables 10-12). This is because the revision of the results obtained with the ARDLBT co–integration approach with the application of these methods allows for a more reliable analysis.

Short-term and long-term cause-and-effect relationships can be more clearly analyzed using the Granger cause-and-effect relationship using the Engle-Granger cointegration method. It was confirmed that long −term interaction exists in model 3, and strong causality between variables exists in models 1, 3, and 5 (Table 12).

5. CONCLUSION AND POLICY IMPLICATIONS

1. Since the consumer market in Azerbaijan and its formation are closely related to general economic indicators, the oil factor, which acts as the main factor of economic development, can be evaluated as factors affecting the volume and turnover of the consumer market.
2. In 2015-2017, the decrease in oil revenues affected the physical volume index of the retail turnover of non -food products, not food products.
3. Since food and food products are sold on the consumer market, the share of imported food and food products in retail turnover increases attention to them. The decrease in this import in 2015 can be directly explained by the fall in oil prices by 2-3 times and, accordingly, by the devaluation (devaluation) of the national currency manat by 2 times.
4. Since one of the components of retail trade is paid services to the population, it can be said that a 2 –3 –fold increase in prices for paid services to the population in these years can be associated primarily with the conversion of many services into paid services, an increase in the quality of paid services, services and complete renewal of their fixed assets. This, of course, is reflected in the turnover of paid services to the population and retail trade.
5. Since the consumer market is a specific market, i.e., this market covers raw materials and services, it is difficult to say that its volume and turnover strongly depend on the income of the population and, of course, on the oil factor. Thus, it is difficult to predict the decrease in the circulation of the consumer market against the background of the drop in oil prices and the decrease in oil revenues. Even the decrease in the income of the population due to devaluation and the increase in the prices of imported food products did not reduce this turnover. However, it can be assumed that if this turnover is expressed in foreign currency, completely different results will be obtained.
6. Price fluctuations in the world oil market definitely have an impact on the state of the food market from both the producer and the consumer side.
7. The dynamics of the specific weight of the consumer market in the economy allows us to comment on its serious role in the economy.
8. In order to reduce the dependence of the consumer market on the oil factor, the economic policy of all oil -exporting countries in this study can be given recommendations for economic diversification.
9. During a pandemic, special attention should be paid to the decline in almost all indicators of the consumer market.

In our opinion, due to the implementation of the Strategic Road Map for the production and processing of agricultural products in the Republic of Azerbaijan during the years 2016-2022, based on the principles of sustainable development in the country, for the creation of a favorable environment in terms of achieving the formation of a competitive agricultural products production and processing sector, for the successful realization of 9 strategic goals considering the solution of the problems raised in the research work can be of great importance.

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