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Article

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Impact of Oil Factor on Investment: The Case of Azerbaijan

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ABSTRACT

This article investigates the long-term and short-term interactions between crude oil prices, crude oil exports, and domestic and foreign investment in Azerbaijan using annual data from 1999 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 9 hypotheses regarding the impact of oil prices and oil exports on domestic and foreign investment. 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. It is necessary to increase competition for the market between foreign and domestic investments, not only through the exchange rate, but also through other economic instruments. The study revealed the importance of the exchange rate of the Manat.

Keywords: Oil Prices, Investment, ARDLBT, DOLS, FMOLS, CCR, Granger Causation
JEL Classifications: E22, F21, Q35, Q38, Q48

1. INTRODUCTION

The macroeconomic outcomes of oil price fluctuations have been at the forefront of the debate among economists, financial analysts and policymakers over the last decades (Zmami and Ben-Salha, 2019). The strong macroeconomic performance of countries is mainly associated with the volume and price of products that play a leading role in GDP and GNI, and in many cases are of strategic importance. These products cause major financial resources and foreign exchange imports and investments to enter the country.

The importance of energy carriers acting as such products, primarily oil and gas, is growing even more against the backdrop of geopolitical and military conflicts currently taking place in the world.

The natural resources of oil and gas account for 90% of Azerbaijan's exports and about 35% of its GDP, and it is country rich in these resources and with an upper-middle income (EU Azerbaijan Business Environment Report, 2021). According to the "Agreement of the Century," signed in 1994 with the participation of President Heydar Aliyev, the activation of the large-scale development of the Azeri-Chirag-Gunashli field and new investments for the development of Azerbaijan's hydrocarbon resources in the Caspian Sea sector gave a strong impetus to its attraction. As a result, the number of international production sharing agreements has increased to 22 agreements, and the number of promising structures involved in exploration on the Azerbaijani shelf has increased. In general, investments in the amount of 60 billion US dollars were secured for the implementation of these contracts (Samadzade, 2022).

In November 1999, at the OSCE summit, four countries (Azerbaijan, Turkey, Georgia and Kazakhstan) signed a memorandum of understanding on the construction of the Baku–Tbilisi-Ceyhan export oil pipeline, and in December of the same year, "profit oil" from Azerbaijan was released to the world market and sold to the state. became a source of income and a basis for investment.

Thus, "*26 years ago, when representatives of companies representing different countries of the world met in Azerbaijan-Baku, few people thought that in a short time Azerbaijan would become one of the leading countries in ensuring energy security in Europe. In addition to strengthening geopolitical positions, this agreement also had a serious positive impact on the economy of Azerbaijan and the social well–being of the population*" (sesqazeti, 2022).

On September 14, 2017, in continuation of the "Contract of the Century," another strategic document was signed-with the direct participation of President I. Aliyev on the joint development and production share of the deep-water part of 3 fields (PGS – "Azeri," "Chirag," "Guneshli"). A new energy distribution agreement was signed and this energy strategy became the basis for increasing state revenues based on oil production in the country until 2050 and providing financing for the development of the non-oil sector. It should be noted that natural resource markets are markets subject to typical cyclical changes. This shows that years of high oil prices are shorter and smaller than years of low prices. The period of high oil prices around the world covers 1973-1985 and 2000-2014. While each period spans a little over 10 years, countries approach the process differently. Earlier studies have consistently shown that positive shifts in the flow demand for oil were responsible for most of the oil price surge between 2002-2008 (Economou,2017). Predictions of oil prices reaching $100 per barrel during the winter of 2021/22 have raised fears of persistently high inflation and rising inflation expectations for years to come (Kilian and Xiaoqing, 2022). Many countries are beginning to experience a syndrome of dependence on high oil prices, some are looking for new ways to avoid this syndrome, referring to international experience. In this regard, despite the fact that oil revenues are of particular importance for the country, studies on the management and use of oil revenues, periodic changes in the price of oil on world markets, and assessments of its impact on the national economy remain relevant, reflecting different approaches.

Under the influence of various factors, the main reason for this relevance is the fact that the price of oil on the world market can change dramatically, and the opportunities for investing in the fund expand or decrease, and the likelihood of financial and economic risks increases. In this regard, many studies are devoted to studying the experience of using this income in different oil countries.

Research shows that "*revenues from oil reserves and the oil sector do not always have a positive impact on the economy. The main question here is how to dispose of these revenues*" (Ismayilov, 2017). The management of oil revenues and the regulation of the directions of its use require the creation of proportions that will serve the effective development in the structure of the national economy, the formation of a powerful production and infrastructure potential. To implement this, the creation of the State Oil Fund of the Republic of Azerbaijan is of particular importance. As for the use of the fund's resources, they can be directed mainly to solving the most important national tasks in the interests of socio–economic progress and to building and reconstructing strategically important infrastructure facilities. At the same time, since November 30, 1999, relations related to the creation, management and activities of the Investment Fund have been regulated by law. Also, the "Strategic Roadmap for the Prospects of the National Economy of the Republic of Azerbaijan," adopted in 2016, provides for the regulation of the transfer of oil revenues to the state budget in our country and the application of the "golden rule." as a strategic goal. Studies show that high oil prices on the world market lead to a sudden influx of large financial resources into national economies.

It is a fact that in Azerbaijan "*it was during the oil boom that the oil and gas sector became the main source of the country's strongest economic growth before the fall in oil prices*" (Aimee, 2020).

However, tensions in international financial markets during the 3rd quarter of 2022, i.e. "high inflation observed in the global economy, deepening geopolitical tensions and an incomplete recovery of the China-US trade chain, are among the leading risks of financial markets, and these listed factors affect the prices of financial assets (from the author-negatively affected the investment portfolio of the State Oil Fund of the Republic of Azerbaijan. However, the tension in the international financial markets during the 3rd quarter of 2022, i.e. "high inflation observed in the global economy, deepening geopolitical tensions and incomplete recovery of the China-US trade chain are among the leading risks of financial markets, and these listed factors affect the prices of financial assets (from the author-negatively affecting the investment portfolio of the State Oil Fund of the Republic of Azerbaijan.

"*After oil prices fell in 2014 and are recovering, it would be imprudent for Azerbaijan to once again rely on stagnant oil prices to maintain strong growth, as it has been for a decade... Indeed, as oil will remain the largest contributor to Azerbaijan's gross domestic product growth for a long time to come, policy makers should assume that it is recommended in this Country Diagnostic Study (CDS) that lower oil prices will become the norm. However, it is important to recognize that significant progress has already been made in the transition process. These include strengthening the weak system of banking and financial regulation, reforms to improve the quality of vocational education and training, and reforms that limit the activities of the State Oil Company*"(Aimee, 2020). It should also be noted that as a result of taking into account such risks, the "Long-term strategy for managing oil and gas revenues" was approved by Decree No. 128 N of the President of the Republic of Azerbaijan dated September 27, 2004.

The strategy encompasses the years 2005-2025 and defines the main principles for the use of these revenues and the medium-term spending policy for this period.

Regular improvement of the national regulatory framework for managing oil revenues, forecasting both risks and world prices by various international and local institutions could not provide a comprehensive analysis of the relationship between investments in national economies. From this point of view, our goal in the article is to study the impact of rising and falling oil prices on the world market on the volume and direction of domestic and foreign investment in Azerbaijan and the following hypothesis was put forth in the research:

$H1_0$: Rising world oil prices reduce foreign investment.
$H2_0$: Rising world oil prices increase domestic investment.
$H3_0$: An increase in oil exports reduces foreign investment.
$H4_0$: Growth in oil exports stimulates domestic investment.
$H5_0$: The rise in world oil prices has a different effect on foreign investment (in dollars and manats).
$H6_0$: The rise in world oil prices has a different effect on domestic investment (in dollars and manats).
$H7_0$: The growth of oil exports has a different effect on foreign investment (in dollars and manats).
$H8_0$: The growth of oil exports has a different effect on domestic investment (in dollars and manats).
$H9_0$: The different impact of world oil prices and the growth of oil exports on domestic and foreign investment (in dollars and manats) is associated with the devaluation of the manat.

2. LITERATURE REVIEW

The role of the oil factor in the economy, including its interaction with investments, has always been in the spotlight (Ahmad, 1980; Matthiessen, 1982; Saunders, 1984; Van Wijnbergen, 1985; Al-Sahlawi, 1994; Rogoff, 2006; Morse et al.,2009; Mohamed Fatimah et al.,2009; Mohammadi and Jahan-Parvar, 2011; Mohd et al., 2013; (Musayev 2019; Mikayilov et al., 2020; Mukhtarov et al., 2020).

It should be noted that these studies were conducted solely on the basis of the indicators of our country, and for this reason they are particularly important for us. However, if we take into account the global significance of the problem that we pose in the article, it can be said that at the international level the impact of oil prices on investment is being studied in various directions. In this regard, some studies are of particular interest to us.

The issues of direct and indirect interaction with investments were also touched upon in studies related to the role of the oil factor, especially oil prices, oil exports and oil revenues in economic development and economic growth (GDP). In addition, since many of the studies are related to company-level investment and the stock market(s), the literature review is divided into three parts.

2.1. Oil and Domestic and Foreign Investments

As you know, Policymakers in oil-exporting countries confront the question of how to allocate oil revenues among consumption, saving, and investment in the face of high income volatility (Cherif and Hasanov, 2013).

Moreover, Albino-War et al., (2014) came to the conclusion that strong oil revenues provide an opportunity for policymakers in oil-exporting countries to accelerate growth and promote diversification through efficient public investments that yield high social dividends. In particular, public investments could enable the buildup of a stock of physical capital into assets hat enhance economic growth and overall social welfare.

According to Marina (2021) *if we look at economic growth as a function of labour and capital then, aside from the labour force, investment is a key determinant of capital accumulation and, accordingly*, *a prerequisite for economic growth and prosperity.* She used vector autoregressive analysis (VAR) to study the dependence of investment in Croatia on oil prices in the period 1996Q1-2015Q4. The results showed that investments initially respond positively to rising oil prices, after which their reaction to rising oil prices becomes negative (and more pronounced than the initial positive reaction). The contribution of changes in oil prices to investment fluctuations is also revealed.

While the first of three essays on capital investment and crude oil in Bagh's (2015) dissertation focuses on the importance of the Baku-Tbilisi-Ceyhan oil pipeline project, the second essay examines the impact of oil abundance on domestic investment in 22 non-OECD countries, oil exporting countries between 1996 and 2010. Using static and dynamic panel estimates, the results show that oil abundance has a negative impact on gross domestic investment in these countries. The third essay observes the impact of oil prices and oil price volatility on investment inflows to the OECD group of oil-importing countries in the production function from 1970 to 2012. The results of the assessment showed that there is a long-term relationship between oil prices and other driving variables (production, trade, inflation and exchange rate) and investment. While the long-term oil price ratio is negative and significant, the short-term oil price ratio is negligible. Thus, the results of this study show that high oil prices lead to a reduction in investment, which confirms the importance of adopting a long-term energy policy that can reduce the dependence of investment on non-renewable energy sources.

Carril-Caccia et al., (2019) based on data covering 182 countries from 2003 to 2012, studied foreign direct investment in oil-rich countries and concluded that the "oil curse" is not excluded here, and that they, i.e. oil producers moving to non-oil countries are less attracted to relatively new projects.

Ali and Harvie, (2017) in his study, examined exogenous oil shocks and mutual financial policies in oil exporting countries and concluded that the trend of low oil prices that began in 2014 is a general trend for a country with a small open developing and natural resource (oil) economy-an exporter such as Libya negatively affects investment along with other economic variables such as domestic income, non-oil GDP, oil exports and the current account.

Ahmad (1980) examined the contribution of oil exports to the economic development of the major oil exporting countries in the 1990s, more precisely in 1980, and noted that the multiple increase in the price of crude oil in 1973 led to a rapid improvement in the terms of trade between OPEC countries. This led to an immediate increase in the share of oil export revenues in the balance of payments in GDP and in the financial budget of the main oil exporting countries. The short-term effect of these favorable conditions was a rapid increase in the growth rate of their economies. Of course, there is no guarantee that any of these countries will be able to achieve large-scale and sustainable economic development. Oil exports provide only potential growth, and sustainable growth is impossible unless other conditions within the system provide a positive impetus.

Van Wijnbergen (1985) in 1985 devoted an article to the optimal accumulation of capital and the distribution of investment between the commercial and non-commercial sectors in oil-producing countries.

Furthermore, a section of the Africa Centre for Energy Policy (2016) report analyzed the impact of oil revenues on education investment in Ghana.

Andreas et al., (2017) investigated the impact of oil supply and world oil price shocks on the dynamics of investment in the oil sector in OPEC countries.

Hani Abdel-Latif et al., (2018) using a non-linear distributed-lag autoregressive (NARDL) model based on quarterly data from Saudi Arabia covering the period 1990Q1-2017Q2, found that the asymmetric impact of oil price shocks on government spending is non-linear. the relationship between a negative oil price shock will have a statistically significant impact in the long run compared to a positive shock.

In an article examining the asymmetric non-linear relationship between FDI, oil prices and CO_2 emissions for the Gulf countries, Ashraf et al., (2022) concluded that FDI is positively associated with carbon dioxide emissions in the long run, and oil prices have a positive and significant effect on CO_2 emissions.

Mahmoud and Alkhatib (2018) based on annual data for the period 1970-2015. and using an autoregressive distributed lag (ARDL) co-integration methodology, examined the relationship between oil prices and FDI and domestic investment in Saudi Arabia, concluding that oil prices and financial market development are directly related to positively affect foreign investment inflows.

Gamoori et al., (2017) examining the relationship between foreign investment, economic growth and energy consumption in the member countries of the Organization of the Islamic Conference in the period 2000-2014, concluded that, along with foreign trade and financial development, investment also has a positive effect on energy consumption. in the countries studied.

Using Structural Vector Auto-regression (SVAR) and Panel Vector Auto-regression (PVAR) methodologies on annual data from 1990 to 2015, Abiona (2015). examined the impact of historical fluctuations in crude oil prices on various economies. As a result, while linear and non-linear data on shock characteristics are retained for developed countries within the SVAR specification, growth patterns for developing countries are driven only by linear shocks. In addition, he concluded that a positive increase in oil prices benefits the world community through investment, while a negative increase in oil prices is transmitted through the reduction in trade caused by interest rates.

Tabash and Khan (2018) research is based on an econometric analysis using a Vector Error Correction Model (VECM) and a Granger Causality Test based on annual United Arab Emirates time series data from 1990 to 2015. It examines the impact of fluctuations in oil prices, gross domestic product, foreign direct investment on investment in Islamic banking. The main findings of the study were that oil prices have a long-term and short-term relationship with Islamic banking investments in the UAE.

Kyari (2020) studied the impact of oil tax breaks on the flow of foreign direct investment into Nigeria and concluded that oil tax breaks are sufficient and appropriate to attract foreign direct investment into the country's oil and gas industry.

Shahnazi and Afrasiabi (2018) studied the impact of exogenous oil revenue shocks on the redistribution of public and private investment in Iran during the period 1974-2012. The study used a dynamic stochastic general equilibrium model (DSGE) based on real business cycle theory (RBC). Based on their findings, the results of the study proved that the positive oil shock had a negative impact on the private sector.

The paper by Alkhateeb et al., (2017) explores the relationship between oil revenues and employment rates in Saudi Arabia between 1991 and 2016 by adding two more variables, such as GDP and government spending. The VECM results show that oil revenues and government spending determine the level of employment in Saudi Arabia. This study notes that the fall in oil prices and its subsequent impact on oil revenues could create problems for an economy if it does not diversify its economic base and reduce its dependence on the oil sector.

Sultan and Haque (2018) applied the Johansen co-integration method and vector error correction model (VECM) to estimate the long-term relationship of economic growth with exports, imports, and government consumption spending in Saudi Arabia. The study showed that economic growth has a long-term relationship with government exports, imports, and consumer spending on oil.

Haque (2020) used the Vector Error Correction Model (VECM) based on data from 1984 to 2016 to conclude that oil rents in Saudi Arabia do not hinder foreign direct investment.

Svirava and Svirava (2022) have studied the relationship between oil prices and foreign direct investment over the past two decades. During this period, it was concluded that fluctuations in oil prices could affect the amount of direct investment by major oil-producing countries and exporters, although this does not affect the amount of foreign direct investment.

In their article, Ilyas et al., (2021) studying the different impact of oil revenues on the financing of investment and operating investments, noted that oil revenues negatively affect financial investment, but positively affect operational investment.

They came to some conclusion that the negative impact of oil revenues on investment financing can be explained through the uncertainty channel, while the positive impact of oil revenues on operating investment can be explained through the macroeconomic expectations channel.

To do this, we set ourselves the task of finding answers to the following questions and studies (Aimee, 2020) conducted to date show that the political importance of oil as a strategic resource of the country, the analysis of the regulatory framework and the share distribution of its production in the studies carried out so far have been given more space. However, the implementation of a successful oil strategy is aimed at achieving a balanced development of the economy by channeling the country's oil and gas revenues to the non-oil sector, as well as ensuring efficient management and use of revenues. The purpose of Bagirov's (2007) study is to prepare recommendations for reducing the risks associated with the inefficient management of petrodollars in Azerbaijan, to analyze the main provisions of oil contracts signed between the government of Azerbaijan and consortiums with the participation of foreign companies, and what factors affect the loss of income. We also believe that due to the sharp changes in oil prices in the world market, efficiency and risk forecasting in the management of oil revenues are mandatory and will help to mitigate these negative impacts. In this regard, the analysis of the impact of transfers from SOFAZ to the state budget on fiscal stability and the overall macroeconomic balance conducted by Aslanli (2015) is also important.

Suleymanov et al., (2015) in their studies, when assessing the impact of Azerbaijan's oil revenues on the national economy, determined the increase in budget and export revenues and the development of foreign economic relations in Azerbaijan mainly due to these revenues. The study was of interest to us precisely from the point of view of the budgetary orientation of domestic investment in a number of cases. Although the impact of oil prices on economic activity in Azerbaijan was explored in another study, here the impact of oil on the lopsided development of the economy, the reduction and increase in poverty, and GDP was analyzed (Shahin, et al., 2021). Since domestic investment is aimed at diversifying the economy and increasing the share of the non-oil sector in GDP at the expense of oil revenues, some results were taken into account in our study. Lanouar and Karim (2020) examine the short-and long-term asymmetric effects of oil prices and oil and gas revenues on real GDP and economic diversification in an oil-dependent economy and conclude that, in the short run, both total real GDP and-oil real GDP is equal to real oil, and real oil and gas revenues exceed the impact of positive shocks, which indicates the presence of an asymmetric shock effect in the short term. They also note that the energy sector played an important role in improving the diversification of Qatar's economy and that its economy is resistant to adverse shocks associated with oil prices and oil and gas revenues. Zhu et al., (2022) used Chinese stocks from 2008 to 2021 and concluded that OPU and Tobin's q (standard price measures) can be used to predict investment opportunities). We found a negative relationship between strength. This finding is likely due to crowding out of more informed investors rather than financial constraints brought about by a higher cost of capital. Investment price sensitivity also declines more among firms with less competition, higher sales volatility, and less analyst attention. Moreover, the decline in investment price sensitivity is not concentrated in real estate or commercial activities, but rather in utilities, agriculture and livestock, and industry. These data suggest that OPU reduces the acquisition of firm information and therefore price awareness for future investment decisions.

Jaime et al., (2020) use a difference-within-a-difference strategy to determine the causal impact of the recent Colombian oil boom (2008-2016) on subnational public investment. The results showed that rising world oil prices have a predominantly positive and disproportionate impact on public investment in oil producing agencies and municipalities. Although municipalities and administrations prioritize different sectors, both have increased their investment in sectors with high social returns, indicating a lesser resource curse. Sustainable development in Azerbaijan, restoration of the freed territories and the formation of a green economy in these territories also require attention to one more issue-the relationship between green investments and oil prices. Anupam et al., (2020) in their studies focus on whether green investment is associated with rising oil prices against the backdrop of gradual economic growth and note that the impact of crude oil prices on environmental investment is mostly positive, but not statistically significant, green assets are more sensitive to oil market volatility than to changes in oil prices. One possible reason for this conclusion is that oil dependence is limited to the operation of environmentally friendly companies.

2.2. The Impact of the Oil Factor on Investments at the Company Level

In the text, Ilic and Ponomarenko (2021) explored the profitability and investment trends of oil companies in Central and Eastern Europe for 2008-2019 based on descriptive statistics, benchmarking and panel data analysis. As a result, it was determined that changes in oil prices had a different and different impact on the investment activities of oil companies in Central and Eastern Europe in different periods compared to large oil companies.

The crude oil price volatility plays an essential role for the oil companies when making a strategic investment decision (Zhu and Singh, 2016).

Henriques and Sadorsky (2011), in their paper on the impact of oil price volatility on strategic investment, obtained empirical results showing a U-shaped relationship between oil price volatility and firm investment.

According to Zhu and Singh (2016), different economic and political conditions may prompt oil companies in North America, Asia and Europe to make different strategic investment decisions. At the same time, empirical results have shown that there are regional differences, where the relationship between oil price volatility and strategic investment by oil companies in North America is an inverted U-curve. Asia has a U-shaped curve, while Europe has a linear relationship with a positive correlation.

In their study, Acharya and Sadath (2016) empirically analyzed how energy price uncertainty affects the investment decisions of manufacturing companies in India using the generalized method of moments (GMM) based on various panel data from 1992 to 1993 and 2013 to 2014. They have reported that the results are consistent with the literature on irreversible supply-side investment in manufacturing.

In 2014, Grasdal and Hölscher (2017) stated that the fall in oil prices triggered various strategic reactions among international oil and gas companies, and in their master's thesis, they explored how oil companies responded to the fall in oil prices in terms of investment and asset sales, and how their internal and external factors influenced those decisions.

2.3. Oil Prices and Stock Market

Alhakimi and Sharaf-Addin (2017) investigated the impact of changes in oil prices on financial market performance using the autoregressive distributed lag (ARDL) estimation method in Saudi Arabia over the period 1980-2018 and concluded that only inflation and investment returns have a causal effect. To the financial market. Efficiency in the short term, and, moreover, the exchange rate and the price of oil have no causal relationship with the economic efficiency of the market.

Hedi and Khuong's (2010) article examines the relationship between oil prices and the stock market in Europe during the last turbulent decade and shows that the response of stock returns to changes in oil prices varies widely across sectors.

Aloui et al., (2012) assessment of the impact of oil price fluctuations on stock returns in 25 emerging markets showed that the risk of oil price fluctuations is significantly overestimated and the impact of oil is asymmetric across market stages.

Jouini (2013) assessment of the interaction between oil prices and equity markets in Saudi Arabia between January 10, 2007 and September 28, 2011 using the VAR-GARCH process developed by Ling and Makalir (2003) concluded that the global income transfer and volatility between equity sectors and oil prices at scale.

Mahmood and Al Khateeb, (2018) paper finds that Oil Price (OP) and Financial Market Development (FMD) are positively affecting to the FDI inflows. But, increasing Domestic Investment (DI) is found responsible for decreasing FDI inflows.

Based on data from the Pakistan Stock Exchange, Hanif (2020) investigated the impact of price fluctuations in world markets, especially oil, on the performance of shares of the Pakistan Stock Exchange during the period 2009-2020. The result showed the importance of oil prices.

Wu and Wang (2021) studied the relationship between oil prices and corporate investment in response to market conditions using 27,981 annual surveys covering 2,814 listed companies from 2000 to 2018 and found that overall oil prices are negatively related to corporate investment expenses. The ratio remains unchanged even under adverse market conditions. However, in favorable market conditions, as oil prices rise, corporate investment costs rise. Thereafter, given the impact of industry competition and underlying corporate investment status, they concluded that industry competition enhances the positive impact of oil prices and market conditions on corporate investment costs. and overinvested companies are more vulnerable to the impact of oil prices and market conditions.

Zhu et al., (2022) investigated the impact of oil price uncertainty on equity price information based on investment price sensitivity. Using Chinese stocks from 2008 to 2021, they found a negative relationship between CPU and Tobin's q power (standard price measure) to predict investment opportunities.

Although the results of all these analyzes help us to come to a certain conclusion, a more detailed analysis is needed in the course of our study, and we consider it necessary to conduct an analytical and econometric analysis of the tasks we set in the article.

3. DATA AND METHODOLOGY

3.1. Data

The information was obtained from World Bank data on crude oil prices (Brent, $/barrel) (WB) and Azerbaijan State Statistics Committee data on crude oil exports, domestic and foreign investment. The data set is compiled annually and covers the period from 1999 to 2021 (Table 1 and Graph 1).

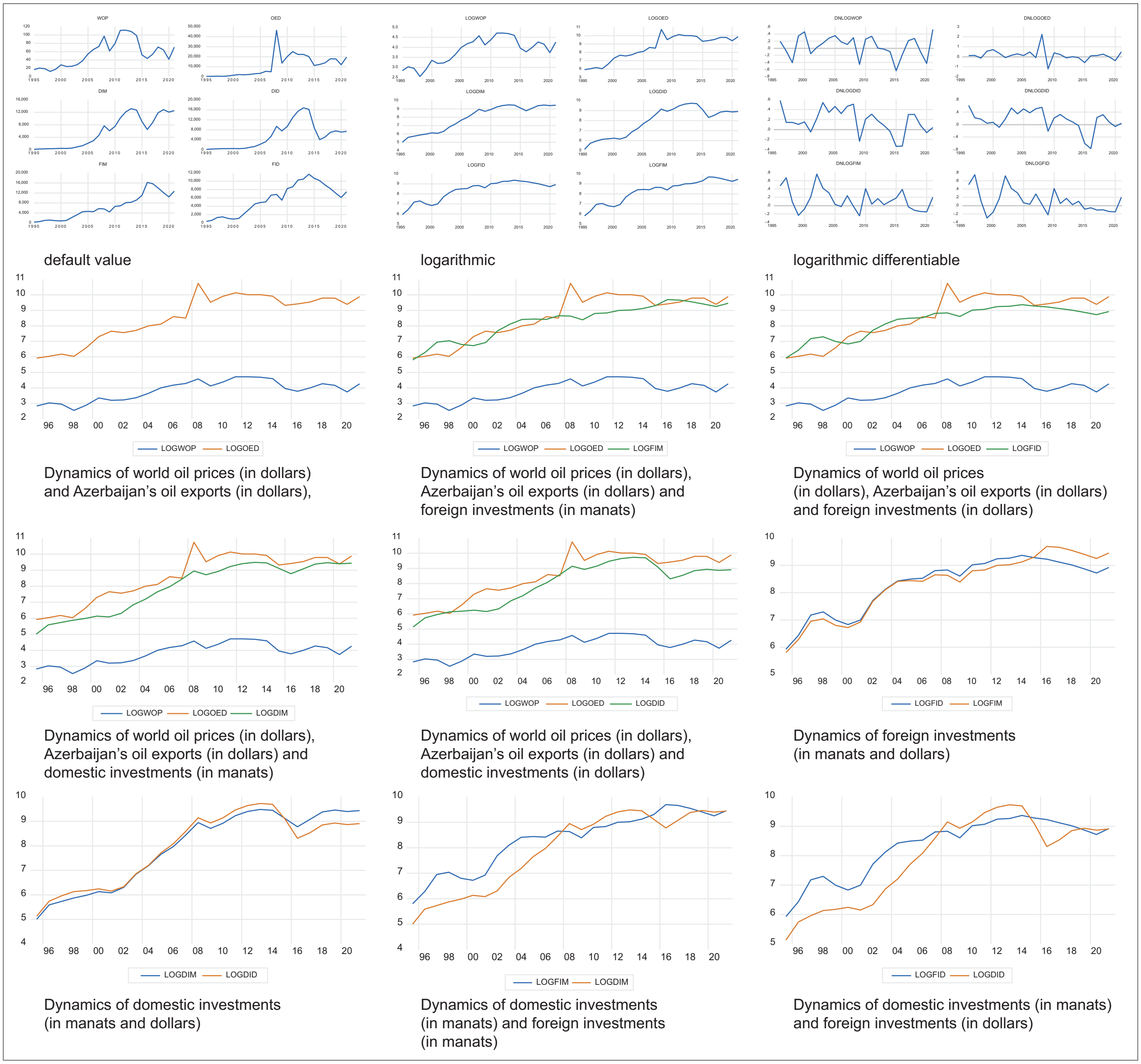
Let's take a look at the statistical data of the period under study. World oil prices and oil exports in Azerbaijan are moving synchronously. And the volume of these exports, mainly in value terms, changes in accordance with changes in world oil prices. The volume of net investments in manats has changed since 2003 in accordance with world oil prices and oil exports. The volume of foreign investments in dollar terms has also changed since 2003, corresponding to world oil prices and oil exports. However, the synchronous shift continues until 2015. During this year, the 2-time devaluation of the Azerbaijani manat kept consistent with changes in the expression of foreign investments in manat, but there was a decrease in dollar terms.

The volume of domestic investments in Azerbaijan in manats has also changed since 2003, corresponding to world oil prices

Table 1: Data and internet resource

Variables	Descriptions	Source
FIM	Foreign İnvestments (manats)	www.stat.gov.az
FID	Foreign İnvestments (dollars)	www.stat.gov.az
DIM	Domestic investments (manats)	www.stat.gov.az
DID	Domestic investments (dollars)	www.stat.gov.az
OED	Oil export (dollars)	www.stat.gov.az
WOP	World oil prices - barrel/(dollars)	www.worldbank.org

Graph 1: Dynamics of world oil prices (in dollars), Azerbaijan's oil exports (in dollars), domestic investments (in manats and dollars), foreign investments (in manats and dollars)



and oil exports. The continuation of this simultaneous change after 2015 is, of course, due to the two devaluations of the Azerbaijani manat during this year. This was proved by the fact that domestic investments decreased in volume, although they remained consistent with changes in dollar terms. The fact that domestic investments fluctuate in terms of both manat and dollar, almost identical in 2003-2006, is due to the equalization of the exchange rate of manat to the dollar. Thus, starting from this year, oil contracts began to work at full capacity and oil dollars began to enter Azerbaijan. Therefore, domestic investments in manat exceeded domestic investments in dollar terms. This case, as mentioned above, lasted until the devaluation of the manat in 2015. The same was observed in the dynamics of foreign investments in manat and dollar terms. During the period under study, foreign investments exceeded domestic investments until 2007, but during these years, domestic investments in Azerbaijan began to prevail at the expense of petrodollars. This is also due to the fact that foreign investments are directed mainly to the oil sector before the full operation of oil contracts.

Considering these circumstances and especially the importance of the influence of changes in the exchange rate of the manat on the volume of foreign and domestic investments in the manat and dollar terms, we have built a large number of models using different variables.

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.

Table 2: Descriptive statistics for the variables

Indicators	LnDID	LnDIM	LnFID	LnFIM	LnOED	LnWOP
Mean	7.909691	7.911203	8.307195	8.308707	8.576378	3.830077
Median	8.535581	8.712744	8.720199	8.635118	9.322520	3.992496
Maximum	9.729081	9.486372	9.367148	9.693760	10.74425	4.715548
Minimum	5.129899	5.005958	5.927193	5.803326	5.918578	2.543176
SD	1.450455	1.541699	1.000480	1.128413	1.489012	0.648360
Skewness	−0.435055	−0.500687	−0.918132	−0.702517	−0.526677	−0.351630
Kurtosis	1.697148	1.634476	2.556679	2.294596	1.948770	1.939438
Jarque-Bera	2.761330	3.225830	4.014453	2.780682	2.491468	1.821787
Probability	0.251411	0.199306	0.134361	0.248990	0.287730	0.402165
Sum	213.5616	213.6025	224.2943	224.3351	231.5622	103.4121
Sum Sq. Dev.	54.69934	61.79773	26.02496	33.10619	57.64611	10.92965
Observations	27	27	27	27	27	27

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-domestic investments (manats) and between world oil prices (in dollars) and oil export (dollars) between and domestic investments (dollars) between world oil prices (in dollars) and oil export (dollars) are not more than 0.3. but foreign investments (manats) and between world oil prices (in dollars) and oil export (dollars) between and foreign investments (dollars) between world oil prices (in dollars) and oil export (dollars)are not more than 0.3-0.6. Although the standard deviation is less in world oil prices (in dollars), it is more in domestic investments (manats), domestic investments (dollars), foreign investments (manats) and foreign investments (dollars). Negative asymmetry is present in all variations, depending on their fluctuations (changes).

3.2. Methodology

The following equations were used to study the impact of world oil prices and oil exports on domestic and foreign investments in dollar and manat terms.

Logarithmically

$$DIM = f(WOP) \tag{1}$$

$$DID = f(WOP) \tag{2}$$

$$FIM = f(WOP) \tag{3}$$

$$FID = f(WOP) \tag{4}$$

$$DIM = f(OED) \tag{5}$$

$$DID = f(OED) \tag{6}$$

$$FIM = f(OED) \tag{7}$$

$$FID = f(OED) \tag{8}$$

$$LnDIM = \psi_0 + \psi_1 LnWOP + \varepsilon \tag{9}$$

$$LnDID = \psi_0 + \psi_1 LnWOP + \varepsilon \tag{10}$$

$$LnFIM = \psi_0 + \psi_1 LnWOP + \varepsilon \tag{11}$$

$$LnFID = \psi_0 + \psi_1 LnWOP + \varepsilon \tag{12}$$

$$LnDIM = \psi_0 + \psi_1 LnOED + \varepsilon \tag{13}$$

$$LnDID = \psi_0 + \psi_1 LnOED + \varepsilon \tag{14}$$

$$LnFIM = \psi_0 + \psi_1 LnOED + \varepsilon \tag{15}$$

$$LnFID = \psi_0 + \psi_1 LnOED + \varepsilon \tag{16}$$

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 prices (*WOP*), crude oil exports (*OED*) and domestic (*DIM*;*DID*) and foreign investment (*FIM*;*FID*), 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 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 crude oil prices

(*WOP*), crude oil exports (*OED*) and domestic (*DIM*;*DID*) and foreign investment (*FIM*;*FID*) is as follows.

$$\Delta LnDIM_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LnDIM_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LnWOP_{t-i} + \lambda_1 DIM_{t-1} + \lambda_2 LnWOP_{t-1} + \varepsilon_1 t \quad (17)$$

$$\Delta LnDID_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LnDID_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LnWOP_{t-i} + \lambda_1 DID_{t-1} + \lambda_2 LnWOP_{t-1} + \varepsilon_2 t \quad (18)$$

$$\Delta LnFIM_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LnFIM_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LnWOP_{t-i} + \lambda_1 FIM_{t-1} + \lambda_2 LnWOP_{t-1} + \varepsilon_3 t \quad (19)$$

$$\Delta LnFID_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LnFID_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LnWOP_{t-i} + \lambda_1 FID_{t-1} + \lambda_2 LnWOP_{t-1} + \varepsilon_4 t \quad (20)$$

$$\Delta LnDIM_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LnDIM_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LnOED_{t-i} + \lambda_1 DIM_{t-1} + \lambda_2 LnOED_{t-1} + \varepsilon_5 t \quad (21)$$

$$\Delta LnDID_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LnDID_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LnOED_{t-i} + \lambda_1 DID_{t-1} + \lambda_2 LnOED_{t-1} + \varepsilon_6 t \quad (22)$$

$$\Delta LnFIM_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LnFIM_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LnOED_{t-i} + \lambda_1 FIM_{t-1} + \lambda_2 LnOED_{t-1} + \varepsilon_7 t \quad (23)$$

$$\Delta LnFID_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LnFID_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LnOED_{t-i} + \lambda_1 FID_{t-1} + \lambda_2 LnOED_{t-1} + \varepsilon_8 t \quad (24)$$

where $-\varepsilon_1 t$, (1,2,..8) is the error term that must be white noise, Δ is the first difference 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. *Ln*-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-ntegration, $H_0\ \lambda_{1i} = \lambda_{2i} = 0$; $H_1\ \lambda_{1i} \neq \lambda_{2i} \neq 0$. 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.

$$\Delta LnDIM_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LnDIM_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LnWOP_{t-i} + \mu ECT_{t-1} + \varepsilon_1 t \quad (25)$$

$$\Delta LnDID_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LnDID_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LnWOP_{t-i} + \mu ECT_{t-1} + \varepsilon_2 t \quad (26)$$

$$\Delta LnFIM_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LnFIM_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LnWOP_{t-i} + \mu ECT_{t-1} + \varepsilon_3 t \quad (27)$$

$$\Delta LnFID_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LnFID_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LnWOP_{t-i} + \mu ECT_{t-1} + \varepsilon_4 t \quad (28)$$

$$\Delta LnDIM_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LnDIM_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LnOED_{t-i} + \mu ECT_{t-1} + \varepsilon_5 t \quad (29)$$

$$\Delta LnDID_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LnDID_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LnOED_{t-i} + \mu ECT_{t-1} + \varepsilon_6 t \quad (30)$$

$$\Delta LnFIM_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LnFIM_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LnOED_{t-i} + \mu ECT_{t-1} + \varepsilon_7 t \quad (31)$$

$$\Delta LnFID_t = \psi_0 + \sum_{i=1}^{p1}\psi_{1i}\Delta LnFID_{t-i} + \sum_{i=0}^{p2}\psi_{2i}\Delta LnOED_{t-i} + \mu ECT_{t-1} + \varepsilon_8 t \quad (32)$$

Furthermore, it should be noted that although we did not investigate the reliability of the ARDL model using combined co-integration methods in our study, we report that Bayer and Hanck (2013) reported the reliability of the ARDL model with a

Table 3: Results of unified root tests

Model	Variable	ADF	PP	KPSS
With Intercept only		At level form		
	LnWOP	−1.623378	−1.550012	0.533478**
	LnOED	−1.821738	−1.678957	0.661534**
	LnDIM	−2.199608	−2.024235	0.716777**
	LnDID	−1.371060	−1.959777	0.642528*
	LnFIM	−2.569527	−2.420389	0.735130**
	LnFID	−3.078981**	−3.078981**	0.668029**
		At first differencing		
	Δ*LnWOP*	−4.570098***	−4.518805***	0.171829
	Δ*LnOED*	−7.421685***	−7.421685***	0.221692
	Δ*LnDIM*	−3.566991**	−3.610083**	0.379529*
	Δ*LnDID*	−3.143979**	−3.155025**	0.320428
	Δ*LnFIM*	−3.934862***	−3.490410**	0.366092*
	Δ*LnFID*	−3.378468**	−3.256124**	0.416573*
With intercept and trend		At level form		
	LnWOP	−1.637476	−1.578025	0.172975**
	LnOED	−0.983744	−1.675275	0.180960**
	LnDIM	−0.692463	−0.903389	0.172801**
	LnDID	−1.250078	−0.980901	0.168667**
	LnFIM	−2.023040	−2.023040	0.193183**
	LnFID	−1.551988	−1.551988	0.195828**
		At first differencing		
	Δ*LnWOP*	−4.475116***	−4.389386***	0.164709**
	Δ*LnOED*	−7.763464***	−8.311203***	0.093328
	Δ*LnDIM*	−3.663967**	−3.680926**	0.101679
	Δ*LnDID*	−3.196420**	−3.216200**	0.082072
	Δ*LnFIM*	−3.604486**	−3.509976**	0.040512
	Δ*LnFID*	−3.554026*	−3.267914*	0.039020
No intercept and no trend		At level form		
	LnWOP	0.649267	0.794026	N/A
	LnOED	1.534793	1.421744	N/A
	LnDIM	1.355407	2.258069	N/A
	LnDID	0.689374	1.349462	N/A
	LnFIM	2.310038	2.310038	N/A
	LnFID	1.775377	1.476655	N/A
		At First differencing		
	Δ*LnWOP*	−4.544280***	−4.492490***	N/A
	Δ*LnOED*	−6.828424***	−6.693779***	N/A
	Δ*LnDIM*	−3.077008***	−3.067530***	N/A
	Δ*LnDID*	−3.029062***	−3.026001***	N/A
	Δ*LnFIM*	−3.214236***	−3.159567***	N/A
	Δ*LnFID*	−3.208574***	−3.098112***	N/A
LnWOP				I (1)
LnOED				I (1)
LnDIM				I (1)
LnDID				I (1)
LnFIM				I (1)
LnFID				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: 1999-2020. Legend: N/A-Not Applicable

single co-integration equation in their study. Engle and Granger (1987) pioneered the residual-based cointegration approach, which is used to detect the presence of a long-term relationship between variables. The Angle and Granger test can be applied to limited data with a unique order of integration between variables. In addition, the main problem of the mentioned method is that it gives biased, in other words, incorrect results due to the reduction of explanatory features (Faisal, 2017). In addition, Johansen (1988) provided researchers with a preferred criterion for maximum self-esteem. Thus, it allows multiple co-integrating relationships between series (variables) to be established.

After that, Phillips and Ouliaris (1990) developed a new approach to study cointegration between series (variables), formerly known as the Phillips and Ouliaris cointegration test. An ECM model based on the F-statistic was developed by Boswijk (1994). In addition, Banerjee et al., (1998) developed an *ECM* model based on *t*- statistical tests.

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

Table 4: VAR lag order selection criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
			Endogenous variables: F_{LnDIM} (LnDIM/LnWOP)			
0	−46.99760	NA	0.172759	3.919808	4.017318	3.946854
1	8.997027	98.55055*	0.002704*	−0.239762*	0.052768*	−0.158627*
2	10.25839	2.018180	0.003395	−0.020671	0.466879	0.114555
			Endogenous variables: F_{LnDID} (*LnDID/LnWOP*)			
0	−38.95388	NA	0.090776	3.276310	3.373820	3.303355
1	5.319386	77.92094*	0.003628*	0.054449*	0.346979*	0.135585*
2	8.054926	4.376863	0.004049	0.155606	0.643156	0.290832
			Endogenous variables: F_{LnDID} (*LnDID/LnOED*)			
0	−46.28532	NA	0.163189	3.862825	3.960336	3.889871
1	−1.970679	77.99376*	0.006501	0.637654	0.930185*	0.718790
2	2.940920	7.858559	0.006096*	0.564726*	1.052277	0.699952*
			Endogenous variables: F_{LnFID} (*LnFID/LnWOP*)			
0	−36.05833	NA	0.072006	3.044666	3.142177	3.071712
1	0.642852	64.59408	0.005275	0.428572	0.721102	0.509707
2	8.055135	11.85965*	0.004049*	0.155589*	0.643140*	0.290815*
			Endogenous variables: F_{LnDIM} (*LnDIM/LnOED*)			
0	−56.74507	NA	0.376792	4.699606	4.797116	4.726651
1	−9.935367	82.38508*	0.012295	1.274829	1.567360*	1.355965*
2	−5.692806	6.788097	0.012162*	1.255424*	1.742975	1.390650
			Endogenous variables: F_{LnDID} (*LnDID/LnOED*)			
0	−56.38166	NA	0.365995	4.670532	4.768042	4.697578
1	−18.34958	66.93645	0.024102	1.947966	2.240497	2.029102
2	−11.54019	10.89503*	0.019417*	1.723215*	2.210765*	1.858441*
			Endogenous variables: F_{LnFIM} (*LnFIM/LnOED*)			
0	−59.91158	NA	0.485419	4.952927	5.050437	4.979972
1	−17.11452	75.32284	0.021834	1.849161	2.141692	1.930297
2	−7.751220	14.98128*	0.014340*	1.420098*	1.907648*	1.555323*
			Endogenous variables: F_{LnFID} (*LnFID/LnOED*)			
0	−59.91158	NA	0.485419	4.952927	5.050437	4.979972
1	−17.11452	75.32284	0.021834	1.849161	2.141692	1.930297
2	−7.751220	14.98128*	0.014340*	1.420098*	1.907648*	1.555323*

*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

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 33-40)

$$LnDIM_t = \psi_0 + \lambda_1 LnWOP_t + \varepsilon_t \tag{33}$$

$$LnDID_t = \psi_0 + \lambda_1 LnWOP_t + \varepsilon_t \tag{34}$$

$$LnFIM_t = \psi_0 + \lambda_1 LnWOP_t + \varepsilon_t \tag{35}$$

$$LnFID_t = \psi_0 + \lambda_1 LnWOP_t + \varepsilon_t \tag{36}$$

$$LnDIM_t = \psi_0 + \lambda_1 LnOED_t + \varepsilon_t \tag{37}$$

$$LnDID_t = \psi_0 + \lambda_1 LnOED_t + \varepsilon_t \tag{38}$$

$$LnFIM_t = \psi_0 + \lambda_1 LnOED_t + \varepsilon_t \tag{39}$$

$$LnFID_t = \psi_0 + \lambda_1 LnOEDP_t + \varepsilon_t \tag{40}$$

Here ψ_0, λ_1 - are regression coefficients, *LnDIM LnDID LnFIM* and *LnFID* dependent variables as mentioned above, while *LnWOP* and *LnOED* are independent variables, explanatory variables. ε - is error (is white noise), t - is time. After estimating the regression equation, the reliability of ε-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 (33-40) 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 5: Results from bound tests

Estimated model	Model 1	Model 2	Model 3	Model 3.A	Model 4	Model 5	Model 5A	Model 6	Model 7	Model 8
F−Statistic (Bound Test)	10.42037***	26.29763***	3.669380*	5.104002**	7.287852***	2.579427	11.06621***	5.429225**	6.707257***	8.842172***
R^2	0.989222	0.984407	0.956275	0.949296	0.958146	0.985727	0.982034	0.972674	0.967207	0.962528
$Adj-R^2$	0.987753	0.983051	0.944769	0.944887	0.947131	0.981971	0.980472	0.968770	0.958578	0.952667
Durbin−Watson stat	1.548069	1.609204	1.509535	1.471503	1.373699	1.954962	1.237235	1.944770	1.577154	1.664087
Critical Values	Co−integration	Co−integration	Co−integration	Co−integration	Co−integration	No co−integration	Co−integration	Co−integration	Co−integration	Co−integration
	10%	5%	2.5%	1%						
Lower Bounds I (0)										
n=1000	3.02	3.62	4.18	4.94						
n=35	3.223	3.957		5.763						
n=30	3.303	4.09		6.027						
Upper Bounds I (1)										
n=1000	3.51	4.16	4.79	5.58						
n=35	3.757	4.53		6.48						
n=30	3.797	4.663		6.76						

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

Table 6: Models

Model 1	F_{LnDIM} (LnDIM/LnWOP)	ARDL (1,1) C (AIC) (AS) C2
Model 2	F_{LnDID} (LnDID/LnWOP)	ARDL (1,0) C (AIC) (AS) C2
Model 3	F_{LnFIM} (LnFIM/LnWOP)	ARDL (2,2) C (AIC) (AS) C2
Model 3A		ARDL (1,0) C (SIC) (AS) C2
Model 4	F_{LnFID} (LnFID/LnWOP)	ARDL (2,2) C (AIC) (AS) C2
Model 5	F_{LnDIM} (LnDIM/LnOED)	ARDL (2,2) C (AIC) (AS) C2
Model 5A		ARDL (1,0) C (SIC) (AS) C2
Model 6	F_{LnDID} (LnDID/LnOED)	ARDL (2,2) C (AIC) (AS) C2
Model 7	F_{LnFIM} (LnFIM/LnOED)	ARDL (2,2) C (AIC) (AS) C2
Model 8	F_{LnFID} (LnFID/LnOED)	ARDL (2,2) C (AIC) (AS) C2
Model 9		ARDL (1,0) C (AIC)

AS: Automatic selection, C2: Case 2: Restricted constant and no 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. Angle-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, Grange-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 Angle 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:

$$\Delta LnFIM_t = \sigma_0 + \sum_{i=1}^{p}\sigma_{1i}\Delta LnFIM_{t-i} + \sum_{i=0}^{q}\sigma_{2i}\Delta LnWOP_{t-i} + \tau_1 ECT_{t-1} + \theta_1 t \quad (41)$$

$$\Delta LnFID_t = \sigma_0 + \sum_{i=1}^{p}\sigma_{1i}\Delta LnFID_{t-i} + \sum_{i=0}^{q}\sigma_{2i}\Delta LnWOP_{t-i} + \tau_2 ECT_{t-1} + \theta_2 t \quad (42)$$

$$\Delta LnDIM_t = \sigma_0 + \sum_{i=1}^{p}\sigma_{1i}\Delta LnDIM_{t-i} + \sum_{i=0}^{q}\sigma_{2i}\Delta LnWOP_{t-i} + \tau_3 ECT_{t-1} + \theta_3 t \quad (43)$$

$$\Delta LnDID_t = \sigma_0 + \sum_{i=1}^{p}\sigma_{1i}\Delta LnDID_{t-i} + \sum_{i=0}^{q}\sigma_{2i}\Delta LnWOP_{t-i} + \tau_4 ECT_{t-1} + \theta_4 t \quad (44)$$

$$\Delta LnFIM_t = \sigma_0 + \sum_{i=1}^{p} \sigma_{1i} \Delta LnFIM_{t-i} + \sum_{i=0}^{q} \sigma_{2i} \Delta LnOED_{t-i} + \tau_5 ECT_{t-1} + \theta_5 t \quad (45)$$

$$\Delta LnFIM_t = \sigma_0 + \sum_{i=1}^{p} \sigma_{1i} \Delta LnFIM_{t-i} + \sum_{i=0}^{q} \sigma_{2i} \Delta LnOED_{t-i} + \tau_6 ECT_{t-1} + \theta_6 t \quad (46)$$

$$\Delta LnFIM_t = \sigma_0 + \sum_{i=1}^{p} \sigma_{1i} \Delta LnFIM_{t-i} + \sum_{i=0}^{q} \sigma_{2i} \Delta LnOED_{t-i} + \tau_7 ECT_{t-1} + \theta_7 t \quad (47)$$

$$\Delta LnFIM_t = \sigma_0 + \sum_{i=1}^{p} \sigma_{1i} \Delta LnFIM_{t-i} + \sum_{i=0}^{q} \sigma_{2i} \Delta LnOED_{t-i} + \tau_8 ECT_{t-1} + \theta_8 t \quad (48)$$

Here, σ_0, σ_{1i}, σ_{2i} and τ_1, τ_2, τ_3, τ_4, τ_5, τ_6, τ_7, τ_8, φ_9 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, 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.

1. Asafu-Adjaye (2000) suggested that short-term or weak causality can be detected using Granger statistics or the sum of lag coefficients equal to zero,
2. Another long-term causation was identified by Masih and Masih (1996), who showed that *ECT* can be determined using *t*-statistical significance. The *ECT* coefficient must be between 0 and 1, negative and statistically significant.
3. Asafu-Adjaye (2000), (Lee and Chang, 2008) demonstrated joint testing for both short-term and long-term causation or strong causality when variables in the system were swapped in the short and long term. relations after this short-term shock indicate that they have recovered (Muhammad et al., 2017 Menegaki, 2019).

Using Equations 41-48, the following cause-and-effect relationships can be tested:

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 $\Delta LnOED_{t\text{-}i}$ and $\Delta LnWOP_{t\text{-}1}$) together for each free variable (null hypothesis: H_0: $\sigma_{2i} = 0$, i = 1…*p*). The rejection of the null hypothesis suggests that *LnOED* and *LnWOP* have short-term effects on *LnFIM*, *LnFID*, *LnDIM*, and *LnDID*.

Using the *t* test to check the Granger cause-and-effect relationship for the long run, the statistical significance of the coefficient $ECT_{t\text{-}1}$ is

Table 7: Estimated primary ARDL model

Variable	Coefficient									
	Model 1	Model 2	Model 3	Model 3.A	Model 4	Model 5	Model 5A	Model 6	Model 7	Model 8
$LnDIM_{(-1)}$	0.830427***					1.145656***	0.723832***			
$LnDIM_{(-2)}$						−0.409259*				
$LnDID_{(-1)}$		0.613508***						1.073564***		
$LnDID_{(-2)}$								−0.411407**		
$LnFIM_{(-1)}$			1.060306***	0.868207**					1.010629***	
$LnFIM_{(-2)}$			−0.280355						−0.312829	
$LnFID_{(-1)}$					0.899923***					0.974428***
$LnFID_{(-2)}$					−0.370729*					−0.480965**
$LnWOP$	0.602946***	0.793160***	0.114334	0.053467	0.346083*					
$LnWOP_{(-1)}$	−0.274903*		−0.282744		−0.204365					
$LnWOP_{(-2)}$			0.418532*		0.451155*					
$LnOED$						0.214065**	0.242646**	0.313836**	−0.060311	0.032950
$LnOED_{(-1)}$						−0.124686			−0.057313	0.001262
$LnOED_{(-2)}$						0.163492			0.276534*	0.244806**
C	0.217969	0.119260	0.974411*	1.022785**	1.717615***	−0.010620	0.233252	0.004640	1.287432*	1.910518***

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

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

Variable	Coefficient									
	Model 1	Model 2	Model 3	Model 3.A	Model 4	Model 5	Model 5A	Model 6	Model 7	Model 8
Panel A. Long-run estimation										
$LnDIM_{(-1)}$	−0.169573**					−0.263603*	−0.276168***			
$\Delta LnDIM_{(-1)}$						0.409259*				
$LnDID_{(-1)}$		−0.386492***						−0.337843**		
$\Delta LnDID_{(-1)}$								0.411407		
$LnFIM_{(-1)}$			−0.220049*	−0.131793					−0.302200**	
$\Delta LnFIM_{(-1)}$			0.280355						0.312829	
$LnFID_{(-1)}$					−0.470806***					−0.506537***
$\Delta LnFID_{(-1)}$					0.370729**					0.480965**
$LnWOP$		0.793160***		0.053467						
$LnWOP_{(-1)}$	0.328042*		0.250122		0.592873***					
$\Delta LnWOP$	0.602946***		0.114334		0.346083**					
$\Delta LnWOP_{(-1)}$			−0.418532*		−0.451155*					
$LnOED$							0.242646**	0.313836**	0.158910*	0.279018***
$LnOED_{(-1)}$						0.252872*				
$\Delta LnOED$						0.214065*			−0.060311	0.032950
$\Delta LnWOP_{(-1)}$						−0.163492			−0.276534***	−0.244806**
C	0.217969	0.119260	0.974411*	1.022785**	1.717615***	−0.010620	0.233252	0.004640	1.287432**	1.910518***
Panel B: Short-run estimation										
$\Delta LnFIM_{(-1)}$			0.280355						0.312829*	
$\Delta LnFID_{(-1)}$					0.370729***					0.480965***
$\Delta LnWOP$	0.602946***		0.114334		0.346083**					
$\Delta LnWOP_{(-1)}$			−0.418532*		−0.451155**					
$\Delta LnDIM_{(-1)}$						0.409259*				
$\Delta LnOED$						0.214065**			−0.060311	0.032950
$\Delta LnOED_{(-1)}$						−0.163492				−0.244806**
$\Delta LnDID_{(-1)}$								0.411407**	−0.276534***	
CointEq(−1)*	−0.169573***	−0.386492**	−0.220049**	−0.131793***	−0.470806***	−0.263603**	−0.276168***	−0.337843***	−0.302200***	−0.506537***
R^2	0.636485	0.727956	0.407997	0.222168	0.604152	0.520240	0.394052	0.539244	0.556008	0.645602
$Adj-R^2$	0.621338	0.727956	0.323425	0.222168	0.547603	0.451702	0.394052	0.519211	0.492580	0.594973
Durbin-Watson stat	1.548069	1.609204	1.509535	1.471503	1.373699	1.954962	1.237235	1.944770	1.577154	1.664087
Panel C: Diagnostics										
Breusch-Godfrey Serial Correlation LM Test:										
χ^2 *SERIAL*	1.077648	2.231203	3.691583	4.046676	5.215789	0.369785	4.392000	3.174503	1.406736	1.645968
Probability	0.5834	0.3277	0.1579	0.1322	0.0730	0.8312	0.1112	0.2045	0.4949	0.4392
F−statistic	0.432402	0.985647	1.472585	1.935474	2.240888	0.127614	2.134210	1.381768	0.506808	0.599071
Probability	0.6549	0.3898	0.2572	0.1693	0.1368	0.8810	0.1433	0.2753	0.6112	0.5605
Heteroskedasticity Test: Breusch−Pagan−Godfrey										
χ^2	5.525189	8.684844	10.50775	5.753699	6.983583	4.525486	0.855811	3.808402	6.902533	5.521894
Probability	0.1371	0.0130	0.0629	0.0563	0.2219	0.4765	0.6519	0.2829	0.2280	0.3556
F−statistic	1.978922	5.768109	2.755226	3.268130	1.472968	0.839915	0.391416	1.257990	1.449353	1.077271
Probability	0.1466	0.0093	0.0492	0.0563	0.2449	0.5379	0.6805	0.3143	0.2524	0.4040
Heteroskedasticity Test: ARCH										
χ^2 *ARCH*	0.223159	0.006241	0.131376	0.083318	0.006622	0.013305	0.123068	0.006757	0.143661	0.099361

(Contd...)

Table 8: *(Continued)*

Variable	Coefficient									
	Model 1	Model 2	Model 3	Model 3.A	Model 4	Model 5	Model 5A	Model 6	Model 7	Model 8
Probability	0.6366	0.9370	0.7170	0.7728	0.9351	0.9082	0.7257	0.9345	0.7047	0.7526
F−statistic	0.207155	0.005743	0.121092	0.076909	0.006072	0.012203	0.113783	0.006195	0.132482	0.092470
Probability	0.6533	0.9402	0.7312	0.7840	0.9386	0.9130	0.7389	0.9380	0.7199	0.7652
					Ramsey RESET Test					
χ^2 *RESET* t−statistic	0.167788	0.304727	0.810428	0.349037	1.455155	1.928804	0.349344	0.814113	0.109520	1.525729
Probability	0.8684	0.7634	0.4283	0.7309	0.1628	0.0697	0.7302	0.4252	0.9140	0.1445
F−statistic	0.028153	0.092858	0.656794	0.121827	2.117476	3.720287	0.122041	0.662780	0.011995	2.327848
Probability	0.8684	0.7634	0.4283	0.7309	0.1628	0.0697	0.7302	0.4252	0.9140	0.1445
					Jarque−Bera					
χ^2 *NORMAL*	1.333073	0.699244	1.860407	0.083029	2.299421	1.392340	0.749588	0.394160	0.009170	0.529635
Probability	0.513484	0.704955	0.394474	0.959335	0.316728	0.514443	0.687431	0.821125	0.995425	0.767346
CUSUM	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable	Stable
CUSUMSQ	Stable	Stable	Stable	No−Stable	Stable	Stable	Stable	Stable	Stable	No−Stable

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

Table 9: Granger causality tests

Pairwise granger causality tests			
Null hypothesis	**Obs**	**F−Statistic**	**Prob.**
LnWOP does not Granger Cause *LnDIM*	25	0.08813	0.9160
LnDIM does not Granger Cause *LnWOP*		1.16835	0.3312
LnWOP does not Granger Cause *LnDID*	25	0.31610	0.7326
LnDID does not Granger Cause *LnWOP*		1.67860	0.2119
LnWOP does not Granger Cause *LnFIM*	25	2.98863	0.0732
LnFIM does not Granger Cause *LnWOP*		1.53419	0.2400
LnWOP does not Granger Cause *LnFID*	25	3.84976	0.0385
LnFID does not Granger Cause *LnWOP*		2.23858	0.1326
LnOED does not Granger Cause *LnDIM*	25	2.54010	0.1040
LnDIM does not Granger Cause *LnOED*		1.86163	0.1814
LnOED does not Granger Cause *LnDID*	25	2.71560	0.0905
LnDID does not Granger Cause *LnOED*		1.04754	0.3693
LnOED does not Granger Cause *LnFIM*	25	7.25193	0.0043
LnFIM does not Granger Cause *LnOED*		0.79183	0.4667
LnOED does not Granger Cause *LnFID*	25	9.85857	0.0010
LnFID does not Granger Cause *LnOED*		1.10062	0.3520

checked. The null hypothesis for this (H_0: $\tau_1 = 0, \tau_2 = 0, \tau_3 = 0, \tau_4 = 0, \tau_5 = 0, \tau_6 = 0, \tau_7 = 0$ and $\tau_8 = 0$) 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: $\sigma_{2i} = \tau_4 = 0$; H_0: $\sigma_{2i} = \tau_5 = 0$; H_0: $\sigma_{2i} = \tau_6 = 0$; H_0: $\sigma_{2i} = \tau_7 = 0$; H_0: $\sigma_{2i} = \tau_8 = 0, i = 1\ldots p$,) 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) (statistical) check the stability of the ARDL model. The J-B Normality test (Jarque et al., 1980, 1981, 1987) will be used to check the normal distribution of white noise error. The CUSUM and CUSUMSQ tests (Brown et al. 1975) ar. 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-*LnWOP*, *LnOED*, *LnDIM*, *LnDID*, *LnFIM*-variables I(1), *LnFID*-variable I(0), with intercept and Trend and No Intercept and No Trend-all variables I(1) (Table 3).

According to PP test, with intercept only-*LnWOP*, *LnOED, LnDIM*, *LnDID*, *LnFIM*-variables I(1), *LnFID*-variable I(0), with intercept and Trend and No Intercept and No Trend-all variables

I(1) (Table 3). According to KPSS test, with intercept only and with intercept and Trend all variable I(0).

The ADF, PP, and KPSS u.it 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 (Table 4).

4.3. Cointegration Testing Results

The results of the ARDL boundary test are given in Table 5. In all ARDL equations (models) (Table 6) *F* test result indicates the 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

Table 7 presents the results of the long-term and short-term approach of ARDL.

4.5. Diagnostic Test Results

The Table 8 (Panel C:) presents the results of diagnostic tests ARDL models. The evaluation results of the Breusha-Godfrey (BG)

Table 10: FMOLS, DOLS, CCR results

Variable	Model 1	Model 2	Model 3	Model 4
		Fully Modified Least Squares (FMOLS)		
LnWOP	2.265631***	2.193591***	1.471171***	1.399120***
C	−0.653914	−0.392400	2.769366*	3.030928***
R^2	0.789711	−0.392400	0.576700	0.726906
Adj. R^2	0.780949	0.865411	0.559063	0.715527
		Dynamic Least Squares (DOLS)		
LnWOP	2.181013***	2.145013***	1.319788***	1.283764***
C	−0.336915	−0.197834	3.383237***	3.522420***
R^2	0.904215	0.969677	0.735520	0.891859
Adj. R^2	0.884050	0.963293	0.679839	0.869093
		Canonical Cointegrating Regression (CCR)		
LnWOP	2.262284***	2.187512***	1.472956***	1.400425***
C	−0.637695	−0.367691	2.765527***	3.027437***
R^2	0.789666	0.871090	0.576083	0.726506
Adj. R^2	0.780903	0.865719	0.558420	0.715111
		Cointegration test		
E-G				
tau–st.	−2.231571	−3.293038	−3.146967	−4.869380**
z–st.	−8.361252	−14.70002	−19.68689*	−39.53376***
Ph–O				
tau–st.	−2.258755	−3.343125	−2.434123	−3.351722
z–st.	−8.197411	−3.343125	−8.908287	−13.43637
	Model 5	**Model 6**	**Model 7**	**Model 8**
		Fully Modified Least Squares (FMOLS)		
LnOED	1.013357***	0.943958***	0.674770***	0.605366***
C	−0.701646	−0.127332	2.610033**	3.184402***
R^2	0.908140	0.900301	0.758546	0.808274
Adj. R^2	0.904313	0.896146	0.748486	0.800285
		Dynamic Least Squares (DOLS)		
LnOED	1.017960***	0.964512***	0.612209***	0.558747***
C	−0.750098	−0.302682	3.222559**	3.670105***
R^2	0.953828	0.952198	0.844019	0.889235
Adj. R^2	0.944108	0.927923	0.811181	0.865917
		Canonical Cointegrating Regression (CCR)		
LnOED	1.015578***	0.946459***	0.679127***	0.609143***
C	−0.718872	−0.147310	2.572653**	3.151332***
R^2	0.907853	0.900044	0.757817	0.807612
Adj. R^2	0.904014	0.895879	0.747726	0.799596
		Cointegration test		
E–G				
tau–st.	−3.564986*	−3.607624*	−2.812567	−3.546853*
z–st.	−17.47712*	−17.68001*	−11.59371	−15.65545
Ph–O				
tau–st.	−3.703909*	−3.752720*	−2.978334	−3.671605*
z–st.	−18.78966*	−19.14052*	−13.10485	−16.96959*

***, ** 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: 1999–2021.

Table 11: Granger cause-and-effect analysis evaluation results. Wald test

Models	Short-term period			Long-term period		Strong impact		
	$\Delta LnWOP$			ECT_{-1}		ECT_{-1} and $\Delta LnWOP$		
	Chi–sq.	F–st.	t–st.	Chi–sq.	F–st.	t–st.	Chi–sq.	F–st.
Model 1	27.92173***	27.92173***	5.284102***	3.754499*	3.754499	−1.937653	27.99546***	13.99773***
Model 2	35.80977***	35.80977***	5.984126***	10.77722**	10.77722**	−3.282867***	38.29779***	19.14889***
Model 3,3A	0.26881	0.26881	0.518547	2.690092	2.690092	−1.640150	2.690151	1.345076
Model 4	3.276779	3.276779	1.810187	8.954927**	8.954927**	−2.992478	9.652008**	4.826004*
	$\Delta LnOE$			ECT_{-1}		ECT_{-1} and $\Delta LnOED$		
Model 5,5A	12.24517***	12.24517**	3.499310**	3.052283	3.052283	−1.747078	12.24732**	6.123658**
Model 6	13.27426***	13.27426***	3.643386***	7.200037**	7.200037**	−2.683289**	14.94832***	7.474162**
Model 7	0.465671	0.465671	0.682401	3.987431*	3.987431*	−1.996855*	3.992059	1.996029
Model 8	0.326850	0.326850	0.571708	0.548569	0.548569	−0.740654	1.969337	0.984668
	ECT_{-1} ADF Unit Root test							
	Model 1	Model 2	Model 3;3A	Model 4	Model 5;5A	Model 6	Model 7	Model 8
t_m	−2.178419	−2.231571**	−3.072896**	−4.829047***	−3.490828**	−3.537148**	−3.490819**	−2.756496*
t_T	−2.795853	−3.569807*	−3.596187*	−5.213311***	−3.748695**	−3.434759*	−3.305843*	−2.762402*
t_0	−2.231571	−3.293038***	−3.293038***	−4.869380***	−3.564986***	−3.607624**	−3.546853***	−2.812567***

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: 1999–2021.

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 models 3A and 8.

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

FMOLS, DOLS, CCR cointegration methods and analysis of the results of Engle-Granger analysis are very useful in our study (Tables 9-11). 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.

Another feature that indicates a cointegration relationship between the variables is that the white noise errors obtaine from the estimates are stationary. Table 10 shows the results of the stationary test by applying single root tests ADF, PP and KPSS on the white noise error of each long-run equation evaluated by FMOLS, DOLS and CCR. Based on these results, although in many models the white noise errors are stationary and thus again confirm the existence of a co-integrating interaction, in some models this situation is not fully confirmed. This result does support the results of the Engle-Granger and Phillips-Ouliaris cointegration tests given above.

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 models 1, 2, 5, 5A and 6, and strong causality between variables exists in models 1, 2, 4, 5A and 6 (Table 11).

5. CONCLUSION AND POLICY IMPLICATIONS

The results of a study on the impact of world oil prices and Azerbaijan's oil exports (in value terms), in other words, oil revenues (in petrodollars) on the volume of domestic and foreign investment in Azerbaijan (in manats and dollars) are presented) can be presented in the form of abstracts as follows:

- The fact that foreign investment exceeded domestic investment until 2008, i.e. before the full operation of the oil contracts, is due to the fact that most of this foreign investment was directed to the oil and gas industry (exploitation of oil and gas fields). construction of the Baku-Tbilisi-Ceyhan oil pipeline.
- Since 2008, domestic investment has exceeded foreign investment due to the influx of oil revenues (petrodollars) into Azerbaijan.
- In 2009, the decline in both domestic and foreign investment can be explained by the decline in oil prices and Azerbaijan's oil exports (in value terms), in other words, the flow of oil revenues (petrodollars).
- In 2014-2017, domestic and foreign investment decreased in dollar terms, but remained stable in manat terms, and then increased due to the devaluation of the Azerbaijani currency.
- The relevance of the exchange rate to the devaluation of the Azerbaijani manat, in other words, the compatibility of foreign and domestic investments in terms of manat and dollar until 2015.
- All these results are based on the fact that some of the proposed hypotheses are generally justified.
- Models that reflect the impact of world oil prices and Azerbaijan's oil exports (in value terms), in other words, oil revenues (in petrodollars) on the volume of domestic and foreign investment in Azerbaijan (in manats and dollars), are distinguished by their sufficiency.
- 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.

- It is necessary to increase competition for the market between foreign and domestic investments, not only through the exchange rate, but also through other economic instruments.

Thus, given the presence of certain methodological and informational (data) difficulties in the research process, as well as the fact that Azerbaijan is an oil power, it is recommended to support this type of research in the future.

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