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Оценка влияния инвестиций и цен на нефть на торговый баланс между Азербайджаном и Россией с использованием эконометрических методов

В данном исследовании изучается влияние иностранных инвестиций и цен на нефть на торговый баланс между Азербайджаном и Россией за период 1998 – 2024 годов с использованием годовых временных рядов и эконометрических методов.
Цель исследования. *Целью данного исследования является изучение влияния иностранных инвестиций и цен на нефть на торговый баланс между Азербайджаном и Россией в период с 1998 по 2024 год. Применяя различные эконометрические методы, исследование нацелено на выявление направления, силы и характера взаимосвязей между ключевыми экономическими переменными. Цель исследования - определить, как колебания цен на нефть и инвестиционных потоков влияют на показатели двусторонней торговли, выявить причинно-следственные связи и предоставить рекомендации по политике, направленной на повышение экономической диверсификации и укрепление торгового сотрудничества между двумя странами.*
Материалы и методология. *В исследовании использованы годовые данные временных рядов за период 1998–2024 годов для анализа влияния иностранных инвестиций и цен на нефть на торговый баланс между Азербайджаном и Россией. Данные были собраны из официальных статистических источников, включая Государственный комитет статистики Азербайджана, Центральный банк Азербайджана, Всемирный банк и международные энергетические базы данных.*
В исследовании применён комплекс описательных и эконометрических методов для обеспечения всестороннего анализа. Сначала были использованы описательная статистика и корреляционный анализ для обобщения данных и выявления первоначальных взаимосвязей между переменными. Затем применена модель множественной линейной регрессии для количественной оценки влияния иностранных инвестиций Азербайджана, инвестиций России и мировых цен на нефть на торговый баланс между двумя странами.
Для проверки достоверности и надёжности модели были проведены диагностические тесты, включая тесты на автокорреляцию, гетероскедастичность и нормальность остатков. Также был применён анализ причинно-следственных связей Грейнджера (Granger causality) для определения направления взаимного влияния между переменными. Все расчёты выполнены с использованием программных пакетов Microsoft Excel и EViews 12.
Результаты. *Результаты эмпирических исследований показывают, что иностранные инвестиции Азербайджана оказывают наиболее сильное и значимое положительное влияние на торговый баланс между Азербайджаном и Россией, что свидетельствует о том, что приток внутреннего капитала способствует улучшению показателей торговли. Цены на нефть также оказывают положительное влияние, подтверждая, что более высокие цены на нефть стимулируют инвестиционную активность и товарооборот.*
Заключение. *Полученные результаты подчеркивают стратегическую важность цен на нефть в определении инвестиционных и торговых моделей. Для обеспечения устойчивого экономического роста и снижения уязвимости к внешним потрясениям Азербайджану и России следует стремиться к большей диверсификации экономики, содействовать созданию взаимных инвестиционных возможностей и укреплять двустороннее сотрудничество за пределами энергетического сектора.*

Ключевые слова: *товарооборот Азербайджана и России, иностранные инвестиции, цены на нефть, эконометрический анализ, причинно-следственная связь по Грейнджеру, экономическое сотрудничество.*

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Assessing the Impact of İnvestment and Oil Prices on the Trade Balance Between Azerbaijan and Russia Using Econometric Methods

This research *investigates the impact of foreign investment and oil prices on the trade balance between Azerbaijan and Russia over the period 1998 – 2024 using annual time-series data and econometric methods.*
The purpose of the research. *The purpose of this study is to examine the impact of foreign investment and oil prices on the trade balance between Azerbaijan and Russia during the period 1998 –2024. By applying various econometric techniques, the study aims to identify the direction, strength, and nature of the relationships among these key economic variables. The research seeks to determine how fluctuations in oil prices and investment flows influence bilateral trade performance, to reveal causal interlinkages, and to provide policy insights for enhancing economic diversification and strengthening trade cooperation between two countries.*
Materials and methodology. *This study utilizes annual time-series data covering the period from 1998 to 2024 to analyze the impact of foreign investment and oil prices on the trade balance between Azerbaijan and Russia. The data were collected from official*

statistical sources, including the State Statistical Committee of the Republic of Azerbaijan, the Central Bank of Azerbaijan, the World Bank, and international energy databases.The research employs a combination of descriptive and econometric methods to ensure comprehensive analysis. Descriptive statistics and correlation analysis were first used to summarize the data and examine initial relationships among the variables. The multiple linear regression model was then applied to quantify the effects of Azerbaijan's foreign investment, Russia's foreign investment, and global oil prices on the trade balance between two countries. To verify the validity and reliability of the model, several diagnostic tests were performed, including tests for autocorrelation, heteroskedasticity, and normality of residuals. The study also applies Granger causality analysis to identify the direction of causal relationships among the variables. All the calculations are made in Microsoft Excel and Eviews 12 application software packages.

Results. *The empirical results indicate that Azerbaijan's foreign investment has the strongest and most significant positive effect on the trade balance between Azerbaijan and Russia, suggesting that domestic capital inflows enhance trade performance. Oil prices also exert a positive impact, confirming that higher oil prices stimulate investment activity and trade turnover.*

Conclusion. *The findings emphasize the strategic importance of oil prices in determining investment and trade patterns. To ensure sustainable economic growth and reduce vulnerability to external shocks, Azerbaijan and Russia should pursue greater economic diversification, promote mutual investment opportunities, and strengthen bilateral cooperation beyond the energy sector.*

Keywords: *trade turnover between Azerbaijan and Russia, foreign investment, oil prices, econometric analysis, Granger causality, economic cooperation.*

Introduction

Between 1998 and 2024, various periods of increase and decrease were observed among the Azerbaijan-Russia trade balance, the volume of investments from Russia and Azerbaijan, and oil prices. The Azerbaijan-Russia trade balance generally showed an increasing trend. Although trade turnover was at a low level in 1998, it began to rise from the mid-2000s onwards with the strengthening of economic relations. In 2014, international sanctions imposed on Russia and the COVID-19 pandemic in 2020 negatively affected the trade balance, causing temporary declines. However, between 2022 and 2024, trade relations entered a phase of recovery and growth. The volume of foreign investments from the Russian Federation rapidly increased between 1998 and 2008, reaching a high level before the global financial crisis in 2008. Due to the crisis in 2009, investments declined, but growth was observed again between 2010 and 2013. After 2014, sanctions against Russia and political tensions weakened investment flows, leading to decreases in 2015–2016. The COVID-19 pandemic in 2020 also negatively impacted investments. From 2022 onwards, geopolitical developments exerted pressure on investment volume, and the decline continued.Azerbaijan's foreign investment volume generally followed a positive development path. Starting from the early 2000s, interest from investors increased with the development of the oil sector, with rapid growth observed between 2005 and 2014. The global drop in oil prices and regional risks in 2015–2016 slowed investment growth. From 2017, with economic diversification and the promotion of foreign investments, the investment volume began to rise again. Although there was a temporary decline in 2020 due to the pandemic, recovery and growth continued from 2021 to 2024.Oil prices were very low in 1998 but showed significant growth from the early 2000s. In 2008, oil prices sharply dropped due to the global financial crisis but then exhibited a rising trend between 2009 and 2014. After 2015, oil prices fell again and reached their lowest level in 2020 due to the pandemic. Starting in 2021, global recovery and increased demand have led to rising oil prices.Between 1998 and 2024, the statistical variables mentioned showed complementary and interrelated fluctuations. Economic and political factors, international events, and market shocks significantly influenced the growth and decline dynamics of each variable. This reflects the complex and multifaceted nature of economic relations between Azerbaijan and Russia.

Recent Publications

Recent research has increasingly focused on the interconnections between oil prices, foreign investment, and trade balances in resource-dependent economies [1-11], with special emphasis on Azerbaijan and Russia. A comparative econometric study [1] analyzed Russia, Azerbaijan, and Indonesia, demonstrating unidirectional causality from oil prices to both exports and exchange rates, confirming the centrality of energy markets in trade competitiveness. Earlier work [2] supported these findings by showing, through VAR and impulse response analysis, that positive oil shocks lead to manat appreciation and accumulation of international reserves. The research of [5] is used quarterly data from 2004Q1–2021Q3, the study applies a VAR model to examine Russia's responses to oil price shocks. Results show that monetary channels (exchange rate, inflation, interest rates) are more sensitive than fiscal indicators, with clear pro-cyclical effects on industrial production. A further comparison of the different economies of post-Soviet countries, particularly the CIS, reveals that all went through periods of differing transitions into fiscal policies,which is a more effective tool in tightening the expansionary effect of the economy[6]. The period of political instability, a prevailing budget deficit as a result of reduced economic activities or disconnection from the global economic system,as well as a lack of proper institutions and policies, impacted the ability to achieve sustained GDP growth. These countries passed through periods of recession;

however,the resource-rich countries, which include Russia and Azerbaijan, with fiscal potential from their prominent oil reserves, were capable of enjoying periods of economic booms that coincided with increasing oil prices and therefore translated to direct economic growth. The reverse is also true for both countries, as they became oil-dependent;therefore, during periods of decreased oil prices, these countries went through recession and a decrease in economic activities, prolonging the transition period. It should be noted that both countries have experienced almost similar economic turbulence, and their positions always change with respect to each other. Study [7] were analyzed the evolution of Soviet and post-Soviet area studies in Western academia, showing how Cold War geopolitics shaped research agendas, funding priorities, and institutional structures. They conclude that while the field expanded significantly during the Soviet era, its post-Soviet transformation reflects broader shifts in global politics and the reconfiguration of knowledge production.The research of [4] is analysed revealed relationship among oil exports, GDP, oil prices, and the exchange rate, thereby confirming both the Marshall-Lerner condition and the J-curve phenomenon on Azerbaijan republic.

Methodology

This study employs a quantitative econometric approach to investigate the impact of foreign investment and oil prices on the Azerbaijan–Russia trade balance during the period 1998–2024. Annual time-series data for trade turnover, foreign investment from Russia and Azerbaijan, and global oil prices were collected from international financial databases and national statistical sources[12-14]

To ensure comparability and stabilize variance, all variables were transformed into their natural logarithmic form. The first differences of the logarithms were used as approximations of the growth rates of the corresponding variables. Descriptive statistics were first calculated to examine the central tendency, dispersion, and distributional properties of the dataset. In addition, the Jarque–Bera test was applied to check for normality, while the correlation matrix was used to assess the strength and direction of linear associations between variables.

A multiple regression model was estimated using the Ordinary Least Squares (OLS) method, with the trade turnover as the dependent variable and foreign investments from Russia and Azerbaijan, together with oil prices, as explanatory variables. The statistical significance of the model was verified through the Fisher criterion and the t-statistics of the coefficients. Diagnostic tests were conducted to evaluate the validity of the model, including the Durbin–Watson statistic for autocorrelation and the White test for heteroskedasticity.

Furthermore, the stationarity of the time series was tested using the Augmented Dickey–Fuller (ADF) test. Given the time-series nature of the data, the Granger causality test was employed to examine causal linkages among the variables at different lags. To capture the dynamic interactions and shock responses, Impulse Response Functions (IRFs) and Variance Decomposition Analysis (VDA) were applied within a Vector Autoregressive (VAR) framework.

This comprehensive methodological design ensures that the analysis not only identifies the direct relationships between investments, oil prices, and trade turnover but also captures their dynamic interdependencies and the persistence of shocks over time.

Empirical Findings

The empirical analysis provides comprehensive insights into the relationship between Azerbaijan–Russia trade turnover, foreign investment flows, and global oil prices over the period 1998–2024.In the context research, descriptive analysis serves as an essential preliminary step, providing a comprehensive overview of the statistical properties of the dataset. By examining measures of central tendency (mean, median), dispersion (standard deviation, minimum, and maximum values), and distributional characteristics (skewness and kurtosis), Table 1 assess the underlying structure of the variables under consideration.

The descriptive statistics of the logarithmic variables provide important insights into their distributional characteristics. The average value of trade turnover (LN_TRADE_TURNOVER_RUS_AZ) is 14.16, with a median of 14.47, suggesting a slightly left-skewed distribution. Azerbaijan's foreign investment (LN_FOREIGN_INVESTMENT_AZ) has a mean of 7.07 and a median of 7.34, also indicating a minor negative skewness. Similarly, Russia's foreign investment (LN_FOREIGN_INVESTMENT_R) records a mean of 8.10 and a median of 8.38, reflecting a slight left skew, while the oil price (LN_OIL_PRICE_USD_BARREL) exhibits a mean of 4.03 and a median of 4.17, consistent with the same pattern. The residuals (LN_RESIDUAL) present a mean of **–2.39** and a median of **–2.13**, suggesting that, on average, the model underestimates the dependent variable.

In terms of variability, trade turnover ranges between 12.35 and 15.40 with a standard deviation of 0.90, demonstrating moderate dispersion. Azerbaijan's foreign investment varies between 5.01 and 8.04, with a standard deviation of 0.83, indicating relatively high variability. Russia's foreign investment fluctuates between 6.21 and 8.85, with a standard deviation of 0.69, showing moderate volatility. Oil prices range from 2.54 to 4.72, with a standard deviation of 0.58,

Таблица 1 / Table 1

Описательная статистика логарифмических переменных
Descriptive statistics of the logarithmic variables

	LN_TRADE TURRUS_AZ	LN_FOREIGNINVEST_AZ	LN__FOREIGN_ INVEST_RU	LN_OIL_PRICE_	LN_RESIDUAL
Mean	14.16128	7.069324	8.096587	4.030667	-2.395297
Median	14.47090	7.345490	8.377336	4.169349	-2.126193
Maximum	15.39919	8.039157	8.853665	4.715548	-0.486426
Minimum	12.34810	5.010635	6.214608	2.540814	-6.214608
Std. Dev.	0.895559	0.834608	0.692245	0.579444	1.396225
Skewness	-0.760868	-1.059653	-1.344228	-0.933227	-1.076549
Kurtosis	2.317481	3.131670	3.917859	3.167742	3.800228
Jarque-Bera	3.013303	4.884527	8.742783	3.804440	5.715883
Probability	0.221651	0.086964	0.012634	0.149237	0.057387
Sum	368.1934	183.8024	210.5113	104.7973	-62.27773
Sum Sq. Dev.	20.05066	17.41428	11.98009	8.393872	48.73612
Observations	26	26	26	26	26

also suggesting moderate volatility. Residuals range widely from **−6.21 to −0.48**, with a standard deviation of **1.40**, indicating some degree of model error dispersion.

All variables display negative skewness, implying that the distributions are slightly skewed to the left. The kurtosis values are generally close to the benchmark value of 3, which corresponds to a normal distribution. Specifically, LN_FOREIGN_INVESTMENT_RU (3.92) exhibits leptokurtic properties, indicating heavier tails, while trade turnover (2.32) is platykurtic, reflecting a flatter distribution. Residuals (3.80) display heavier tails (leptokurtic).

The results of the Jarque–Bera test further clarify the normality of the variables. For trade turnover ($p = 0.22$), Azerbaijan's foreign investment ($p = 0.087$), and oil prices ($p = 0.15$), the null hypothesis of normal distribution cannot be rejected at the 5% significance level. However, for Russia's foreign investment ($p = 0.0126$), the null hypothesis is rejected, confirming that this series deviates significantly from normality.

The correlation matrix plays a crucial role in econometric research, as it provides a comprehensive overview of the linear relationships between the variables under study. Table 2 is showed correlation matrix between the lograhitmic variables.

LN_TRADE_TURNOVER_ RUS_AZ and LN_FOREIGN_ INVESTMENT_AZ (0.956) This very strong positive correlation indicates that increases in Azerbaijan's foreign investment are strongly associated with increases in trade turnover between Russia and Azerbaijan.

LN_TRADE_TURNOVER_ RUS_AZ and LN_FOREIGN_ INVESTMENT_R (0.889) There is also a strong positive correlation between Russia's foreign investment and the trade turnover, suggesting that higher Russian investment tends to coincide with higher bilateral trade.

Таблица 2 / Table 2

Корреляционная матрица
Correlation matrix

	LNTRADETURNRU-AZ	LNFOREIGNINVESTAZ	LNFOREIGNINVESTMRU	LN_OIL_PRICE
LN_TRADE_TURNOVER_RUS_AZ	1.000000	0.955799	0.889460	0.831284
LN_FOREIGN_INVESTMENT_AZ	0.955799	1.000000	0.936001	0.815279
LN__FOREIGN_INVESTMENT_RU	0.889460	0.936001	1.000000	0.892796
LN_OIL_PRICE_USD_BARREL	0.831284	0.815279	0.892796	1.000000

LN_TRADE_TURNOVER_RUS_AZ and LN_OIL_PRICE_USD_BARREL (0.831) A strong positive correlation shows that oil price growth is associated with higher trade turnover, likely due to oil's central role in both economies.

The natural logarithm of Russia's trade turnover with Azerbaijan (**LNRUSAZTRADETURNOVER**) is modeled as a function of the natural logarithm of Russia's foreign investment (**LNFOREININVESTMENTRUS**) the natural logarithm of Azerbaijan's foreign investment (**LNFOREININVESTMENTAZ**) , oil price **(LNOILPRICE)**. and residuals **(LNRESIDUAL).** The multivariate linear regression model can be expressed as:

LN_TRADE_TURNOVER_RU_AZ = 1.1176227451*LN_FOREIGN_INVESTMENT_AZ - 0.44340133951*LN__FOREIGN_INVESTMENT_RU + 0.443571322752*LN_OIL_PRICE_USD_BARREL - 0.00141256343953*LN_RESIDUAL + 8.05921145036 (1)

A multiple regression model was developed using the EViews software package. The parameter estimates of the model were obtained through the application of the Ordinary Least Squares (OLS) method, ensuring unbiased and efficient estimation under the classical assumptions. The empirical results generated by EViews are presented in Table 3.

The results presented in Table 3 reveal that the overall formal model exhibits a high degree of explanatory power, as reflected by a coefficient of determination of 93%, which indicates that the model explains the majority of the variation in the dependent variable.To assess the significance of the constructed model (1), the observed and critical values of the Fisher criterion were calculated. These values are 70.08464 and 3.07, respectively, at a 5% significance level with degrees of freedom k1=3 and k2=23. Since 70.08464>3.07, the model is considered significant. The significance of the regression coefficients is also confirmed using the t-statistic.

Таблица 3 / Table 3

Оценка модели множественной регрессии на основе логарифмов переменных

The estimated multiple regression model based on the logarithms of the variables

Dependent Variable: LN_TRADE_TURNOVER_RU_AZ				
Method: Least Squares				
Date: 08/16/25 Time: 22:59				
Sample: 1 26				
Included observations: 26				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LN_FOREIGN_INVESTMENT_AZ	1.117623	0.178316	6.267654	0.0000
LN__FOREIGN_INVESTMENT_RU	-0.443401	0.274745	1.613867	0.0215
LN_OIL_PRICE_USD_BARREL	0.443571	0.203718	2.177378	0.0410
LN_RESIDUAL	-0.001413	0.043358	0.082579	0.0243
C	8.059211	0.844377	9.544568	0.0000
R-squared	0.930311	Mean dependent var		14.16128
Adjusted R-squared	0.917037	S.D. dependent var		0.895559
S.E. of regression	0.257951	Akaike info criterion		0.298946
Sum squared resid	1.397312	Schwarz criterion		0.540888
Log likelihood	1.113698	Hannan-Quinn criter.		0.368617
F-statistic	70.08464	Durbin-Watson stat		0.836471
Prob(F-statistic)	0.000000			

The presence of autocorrelation in the regression model was assessed using the Durbin–Watson (DW) statistic. For 26 observations, three explanatory variables, and a 5% significance level, the critical bounds are dL=0.86 and dU=1.4, which partition the interval [0,4] into five distinct regions for decision-making. The computed DW statistic is dobs=0.83, which is slightly below the lower bound . This suggests potential positive autocorrelation in the residuals, indicating that successive error terms may be correlated.

Heteroskedasticity refers to a situation in which the variance of the error terms is not constant across observations, violating one of the key assumptions of the classical linear regression model. While it does not bias the OLS estimates, it leads to inefficient estimators and unreliable standard errors, which can distort hypothesis testing. Detecting heteroskedasticity is typically done using the White tests.

Heteroskedasticity of the residuals was tested using the White test, and the results are presented in Table 4. The test statistic, where $nR^2 = Obs * R - squared$, where number of observation 26, R-squared is the coefficient of determination from the auxiliary regression of the squared residuals on all regressors, their squares, cross-products, and a constant, is equal to 11.48518. This value is less than the critical value $\chi^2_{0,16}(9) = 13.05799$. The corresponding p-value exceeds 0.05, which implies that the null hypothesis of homoskedasticity of the error term cannot be rejected.

The stationarity of the time series of the model variables was tested using the Augmented Dickey–Fuller (ADF) test. The testing results indicated that the original series and their first differences are non-stationary, whereas the second-order differenced series are stationary. The results of the test are presented in Table 4.

In research, the Granger causality test is a statistical hypothesis test used to determine whether one time series can be

Таблица 4 / Table 4

Result Dickey – Fuller test
Результаты теста Дики-Фуллера

Variables	Statistical Criteria	Critical value 1%	Critical value 5%	Critical value 10%	Prob.
Difference second difference, trend and intercept					
LN_TRADE_TURU_AZ	-9.579661	-4.416345	-3.622033	-3.248592	0.0000
LN_FOREİGN İNVEST_RU	-6.512203	-4.416345	-3.622033	-3.248592	0.0001
LN_FOREİGN İNVEST_AZ	-4.294715	-4.571559	-3.690814	-3.286909	0.0167
LN_OIL_PRICE	-6.342388	-4.440739	-3.632896	-3.254671	0.0002
LN_RESIDUAL	-7.520468	-4.440739	-3.632896	-3.254671	0.0002

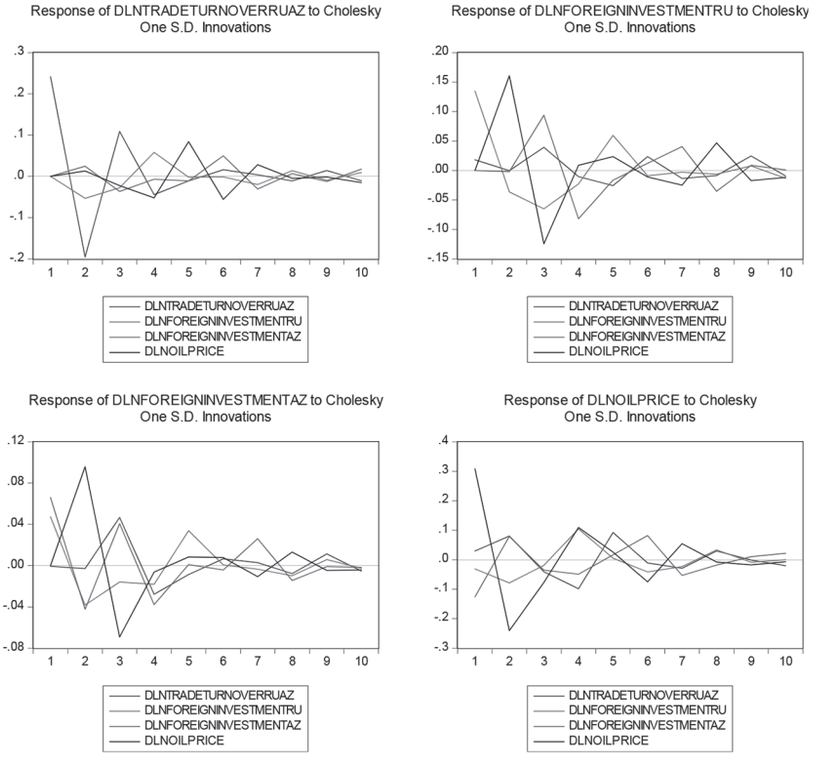

Рис. 1. Импульсная функция отклика
Fig. 1. Impulse response function

used to forecast another. It does not establish true causality in the philosophical sense but rather examines whether past values of one variable contain useful information for predicting the future values of another variable, beyond the information already contained in its own past values.

The examination of causal relationships between the factors for lag values m=1,2,3,4was carried out using the Granger causality test. With the exception of two directions, the Granger causality test confirmed the presence of a bidirectional causal relationship, which indicates the existence of a third variable that serves as the true cause of changes in the two variables under consideration. Only for lag m=1, between ΔLNTradeturnoverRU_AZ and ΔLN_Foreign_investment_RU and for lag m=4, between ΔLN_Foreign_investment_RU and ΔLN_TradeturnoverRU_AZ, are opposite causal relationships detected, where Δ denotes the differencing operator of the respective variable.

The Impulse Response Function traces the time path of dependent variables in response to a one-unit (standard deviation) shock in an explanatory variable, while holding all other shocks constant. It helps reveal both the **magnitude** and **duration** of the impact.Result of impulse response function is showed Figure 1.

Response of ΔLNTRADETURNOVER_RU_AZ

• A shock in trade turnover initially produces **volatile reactions** in itself (blue line), but stabilizes after around 5–6 periods.

• Oil price shocks (green) have some negative influence initially, turning positive later, but remain weak and short-lived.

• Foreign investment shocks (red, black) produce small oscillating effects, but they also die out quickly.

Trade turnover reacts strongly in the short run, but the effect of shocks is temporary and dissipates over time.

Response of ΔLNFOREIGNINVESTMENT_RU

• The strongest effect comes from its **own shocks** (black line), showing significant fluctuations in the first 3–4 periods before stabilizing.

• Trade turnover (blue) and oil price shocks (green) produce smaller and short-lived effects.

• Foreign investment in Azerbaijan (red) has little impact. Russian foreign investment is largely self-driven, with external factors exerting minimal long-term influence.

Response of ΔLNFOREIGNINVESTMENT_AZ

• Strong positive short-run reaction to its **own shocks** (red).

• Noticeable effects from trade turnover (blue) and Russian investment (black) in the first few periods, but they converge quickly.

• Oil prices (green) have a small but persistent influence. Azerbaijani foreign investment is sensitive to both domestic and Russian shocks initially, but stabilizes over time. Oil prices maintain a mild long-term effect.

Response of ΔLNOILPRICE

• Oil prices (green) react strongly to their **own shocks**, with sharp initial volatility, then stabilizing after 5–6 periods.

• Trade turnover (blue) and investments (red, black) produce small and unstable reactions, but none are persistent. Oil prices are exogenous in this system — their dynamics are mostly self-determined, with minimal long-term feedback from trade or investment variables.

Variance decomposition shows how much of the forecast error variance of each variable is explained by its own innovations versus shocks from other variables. Figure 2 is showed variance decomposition of time series.

Variance Decomposition of ΔLN-TRADETURNOVER_RU_AZ

• Trade turnover variance is **over 90% explained by its own shocks**, even up to the 10th period.

• Contributions from oil prices, Russian and Azerbaijani foreign investment remain minimal (below 10%).

Trade turnover is strongly **self-driven** and relatively independent of shocks from oil prices or investments.

Variance Decomposition of ΔLN-FOREIGNINVESTMENT_RU (top-right)

• **Azerbaijani foreign investment (green)** explains around 20–25%.

• **Oil price shocks (black)** contribute ~10–15%.

• Trade turnover has a negligible effect. Russian foreign investment is influenced significantly by Azerbaijani investment and oil prices in the medium-to-long run.

Variance Decomposition of ΔLNFOREIGNINVESTMENT_AZ

• Early periods dominated by own shocks (~60–70%), but influence decreases over time.

• **Oil prices (black)** become the second most important factor, contributing ~30%.

• Russian investment (red) has a moderate impact (~10%), while trade turnover remains negligible. Azerbaijani foreign investment is **strongly affected by oil price dynamics**, highlighting the economy's dependency on energy markets.

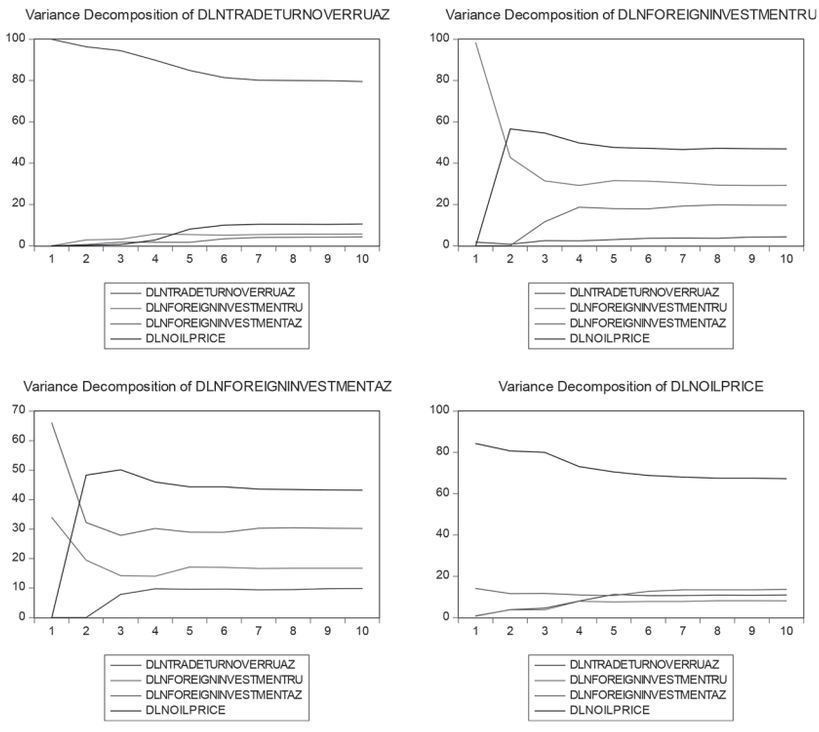

Рис. 2. Разложение дисперсии

Fig. 2.Variance decomposition

Variance Decomposition of ΔLN-OILPRICE (bottom-right)

• Oil price variance is largely explained by its own shocks (~90%), with small contributions from other variables (all below 10%).

• Trade, Russian investment, and Azerbaijani investment barely affect oil price variance.

Oil prices behave as an **exogenous factor**, driven mainly by global market forces rather than domestic trade or bilateral investment flows.

Conclusion: This study investigated the impact of foreign investment from Russia and Azerbaijan, along with global oil prices, on the Azerbaijan–Russia trade balance using econometric methods over the period 1998–2024. The analysis incorporated descriptive statistics, correlation analysis, multiple regression, diagnostic tests, Granger causality, impulse response functions, and variance decomposition to provide a comprehensive assessment of the dynamic relationships among the variables.

The regression results demonstrated that the overall model is highly significant, with a coefficient of determination of 93%, indicating that foreign investments and oil prices jointly explain the majority of the variation in the bilateral trade turnover. Azerbaijan's foreign investment was found to exert the strongest positive influence, while Russian foreign investment showed a negative effect, and oil prices contributed positively to trade dynamics. Diagnostic tests confirmed the robustness of the model, with no strong evidence of heteroskedasticity or autocorrelation.

The Granger causality test revealed bidirectional causal relationships among most variables, suggesting the existence of underlying third factors driving these linkages. Impulse response analysis highlighted that shocks to trade turnover and investment variables tend to generate strong but short-lived reactions, while oil prices behave as an exogenous force with limited feedback from trade or investment. Variance decomposition further confirmed that trade turnover is largely self-driven, Russian investment is influenced by Azerbaijani investment and oil prices, and Azerbai-

jani investment is strongly shaped by oil price dynamics. Oil prices themselves remain predominantly determined by external global market forces.

Taken together, the findings emphasize the critical role of oil prices as a driving external factor in shaping investment flows and trade dynamics, particularly for Azerbaijan. The results also highlight the asymmetric nature of investment linkages, where Azerbaijani investment significantly influences Russian flows, while the reverse effect is weaker. Moreover, the stability of trade turnover suggests that bilateral trade relations are less vulnerable to short-term shocks and more dependent on structural and policy-driven factors.

Overall, the study provides new empirical evidence on the determinants of the Azerbaijan–Russia trade balance, underscoring the importance of oil price volatility and investment flows in explaining bilateral trade dynamics. These insights may inform policymakers in both countries in designing strategies to strengthen economic cooperation, diversify trade relations, and mitigate external vulnerabilities arising from global oil market fluctuations.

Suggestions

Based on the empirical findings of this study, several recommendations can be made to strengthen and stabilize the Azerbaijan–Russia trade relationship:

1. Diversification of Trade Structure

Since trade turnover is largely self-driven and less responsive to investment and oil price shocks, both countries should focus on diversifying the composition of trade beyond oil and energy resources. Expanding cooperation in agriculture, manufacturing, and services could reduce vulnerability to oil price volatility.

2. Enhancing Bilateral Investment Policies

The results indicate that Azerbaijan's foreign investment has a stronger impact on bilateral trade than Russian investment. Policymakers in Russia may consider introducing targeted incentives to attract Azerbaijani investment, while Azerbaijan should continue policies that encourage outward investment in Russian industries with high growth potential.

3. Mitigating Oil Price Dependency

Oil prices were shown to be the dominant external driver influencing investment flows, especially in Azerbaijan. To reduce economic sensitivity to global oil shocks, both countries should adopt long-term policies aimed at promoting renewable energy, industrial modernization, and non-oil sectors.

4. Improving Economic Cooperation Frameworks

Establishing joint investment funds, free trade agreements, or bilateral infrastructure projects could help stabilize trade and reduce exposure to geopolitical and external shocks. Such cooperation would also strengthen resilience in the face of global crises similar to the 2008 financial crisis or the COVID-19 pandemic.

5. Policy Coordination and Risk Management

Since cross-country investment linkages are asymmetric (Azerbaijan's investment has more influence on Russia than vice versa), enhanced coordination of monetary, fiscal, and trade policies is needed. Moreover, implementing risk-hedging mechanisms, such as oil revenue stabilization funds or bilateral financial safety nets, would improve economic stability.

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