

ORIGINAL PAPER



DOI: 10.26794/2587-5671-2022-26-1-79-90

UDC 339.9;330.34(045)

JEL F02, F10, L91, L92

Econometric Assessment of the Level of Development of Balanced Foreign Economic Relations in Conditions of Uncertainty

T.A. Yadigarov

Institute of Economics of the Azerbaijan National Academy of Sciences, Baku, Azerbaijan

ABSTRACT

The article presents an assessment of the factors influencing the balanced foreign trade ratio of foreign economic relations on the basis of the author's methodological approach on the example of the Republic of Azerbaijan. **The relevance** of the study is due to the importance of optimizing foreign trade policy through an econometric assessment of factors affecting the balance of foreign trade ratio. **The aim of the study** is to form a model of econometric assessment of factors affecting the level of development of balanced foreign economic relations in conditions of uncertainty. The author uses entropy, statistical and econometric **methods**, including coefficient and regression analyses. The paper presents a regression analysis of the relationship between the balance of foreign trade activity, the entropy of exports and imports, the real and nominal effective exchange rate of the national currency against foreign currencies, the degree of openness of the economy, and assessment using the EViews software package. The synthesis of the theoretical and methodological apparatus presented in the modeling of factors affecting the balance of foreign trade activity constitutes the **scientific novelty** of the research. The study revealed that an increase in the nominal and effective exchange rate of the national currency of each country in relation to foreign currencies, as well as the degree of openness of the economy, significantly increases the coefficient of balanced foreign trade activity. The author **concludes** that by determining the entropy, quantity and usefulness of information on the share of the main import or export partner countries of the country under study, it is possible to assess the foreign trade activities of the countries, as well as the influence of the balanced coefficient of foreign trade on the nominal and effective exchange rate of the national currency in relation to foreign currencies. **The results of the study** can be used in subsequent studies to assess the factors affecting the level of development of balanced foreign economic relations of countries, and as a methodological basis for the policy of optimizing the management of the country's economy.

Keywords: trade turnover; balanced foreign trade; uncertainty; trade balance; import; export; entropy; effective exchange rate; determination coefficient; regression level; correlation coefficient

For citation: Yadigarov T.A. Econometric assessment of the level of development of balanced foreign economic relations in conditions of uncertainty. *Finance: Theory and Practice*. 2022;26(1):79-90. DOI: 10.26794/2587-5671-2022-26-1-79-90

ОРИГИНАЛЬНАЯ СТАТЬЯ

Эконометрическая оценка уровня развития сбалансированных внешнеэкономических связей в условиях неопределенности

Т.А. Ядигаров

Институт экономики Национальной академии наук Азербайджана, Баку, Азербайджан

АННОТАЦИЯ

В статье представлена оценка факторов, влияющих на сбалансированное внешнеторговое соотношение внешнеэкономических связей на основе авторского методологического подхода на примере Азербайджанской Республики. **Актуальность** исследования обусловлена важностью оптимизации внешнеторговой политики через эконометрическую оценку факторов, влияющих на сбалансированность внешнеторгового соотношения. **Целью** исследования является формирование модели эконометрической оценки факторов, влияющих на уровень развития сбалансированных внешнеэкономических связей в условиях неопределенности. Используются такие **методы**, как энтропийный, статистический и эконометрический, в том числе коэффициентный и регрессионный анализы. Проведен регрессионный анализ зависимости между балансом внешнеторговой дея-

© Yadigarov T.A., 2022

тельности, энтропией экспорта и импорта, реальным и номинальным эффективным обменным курсом национальной валюты по отношению к иностранным валютам, степенью открытости экономики, а также проведена оценка с применением программного пакета Eviews. Синтез теоретического и методологического аппарата, представленного при моделировании факторов, влияющих на соотношение сбалансированности внешнеторговой деятельности, составляет **научную новизну** исследования. Выявлено, что повышение номинального и эффективного обменного курса национальной валюты каждой страны по отношению к иностранным валютам, а также степени открытости экономики значительно увеличивают коэффициент сбалансированной внешнеторговой деятельности. Сделан **вывод**, что путем определения энтропии, количества и полезности информации об удельном весе основных стран – партнеров по импорту или экспорту изучаемой страны можно оценить внешнеторговую деятельность стран, а также влияние сбалансированного коэффициента внешнеторговой деятельности на номинальный и эффективный обменный курс национальной валюты по отношению к иностранным валютам. **Результаты исследования** могут быть использованы в последующих исследованиях для оценки факторов, влияющих на уровень развития сбалансированных внешнеэкономических связей стран, а также в качестве методологической основы политики по оптимизации управления экономикой страны.

Ключевые слова: торговый оборот; сбалансированная внешняя торговля; неопределенность; торговый баланс; импорт; экспорт; энтропия; эффективный обменный курс; коэффициент детерминации; уровень регрессии; коэффициент корреляции

Для цитирования: Yadigarov T.A. Econometric assessment of the level of development of balanced foreign economic relations in conditions of uncertainty. *Финансы: теория и практика*. 2022;26(1):79-90. DOI: 10.26794/2587-5671-2022-26-1-79-90

INTRODUCTION

The most important task of any economic system is to ensure stable economic development. The strategic role of foreign trade in providing sustainability of the economic system is that foreign trade is based on the realization of competitive advantages by moving's the boundaries and due to additional sales markets stimulates expanded sales production in the exporting country. However, the world practice shows that intensive development of international trade, as well as the same regionalization and globalization, have an unequal impact on the economy of different countries.

The deepening of the international division of labor in the globalized world economy has significantly increased the interdependence of economies by stimulating the convergence of the world environment, creating conditions for the expansion of international economic relations between different countries. International trade, which accounts for 80% of international relations, has a significant impact on the level of development of foreign trade, responding more quickly to economic and political changes in any region of the world [1].

In the last period of 2020, the reduction of demand for oil in the world market, unfavorable economic situation in a number of countries, social tensions and sanctions have had a negative impact on world trade in goods. An explosion at a radioactive and toxic warehouse of Vale's company in Brazil on January 25, 2019, the severe economic damage to iron ore and other industries caused by Cyclone

Veronica in Australia in March 2019 (\$ 1.2 billion), and the negative effects of the COVID-19 pandemics negatively affected the development of international trade around the world, resulting in a 3.0% decrease in world commodity exports in 2019 compared to 2018, or \$ 579.34 million. In the first quarter of 2020, international trade in goods decreased by 3% and world exports by 7.6%, and this decline continued until the end of 2020.¹ It should be noted that all this creates conditions of uncertainty in the development of foreign economic relations between the countries of the world and requires the improvement of economic policy in the direction of the level of development of balanced foreign economic relations.

In recent years, economic policies based on increasing exports and stimulating economic growth have been expanding among the world countries with the depreciation of national currencies. In neighboring countries, including most of the CIS countries, the depreciation of the national currency and the sharp decline in world oil prices have had a serious impact on the Azerbaijani manat. Thus, on February 21, 2015, by the decision of the Central Bank of the Republic of Azerbaijan, the Azerbaijani manat was devalued, the exchange rate against the US dollar was reduced by 34% and the decision was made to switch to a floating exchange rate on December 21, 2015. It should be noted that after this decision, which was the 4th largest devaluation of the manat, 1 US dollar continued to depreciate and amounted

¹ URL: <https://customs.gov.az/az/faydali/gomruk-statistikasi/xarici-ticaretin-veziyyeti-haqqinda/> (accessed on 13.06.2021).

to 1.7 manats. The depreciation of the national currency in Azerbaijan during the year affected macroeconomic indicators and led to a decrease in trade turnover. Thus, due to the depreciation of the national currency in 2019 compared to 2014, the volume of GDP decreased by 36.0% or 32.6 billion USD. Taking into account the negative consequences of the COVID-19 pandemic, the volume of GDP in 2020 compared to 2014 decreased by 43.3% or by 32.63 billion US dollars and trade turnover by 33.9% or by 12.545 billion US dollars.² It should be noted that the rise in the real exchange rate plays a key role in the appreciation of the manat, so this indicator is important in the development of economic relations in the face of external uncertainty.

The level of development of balanced foreign economic relations is mainly determined by the balanced foreign trade ratio. This indicator is expressed as the ratio of the country's foreign trade balance (the foreign trade balance) to trade turnover. Among the factors that directly affect the level of development of balanced foreign trade relations, the degree of openness of the country's economy, expressed in the ratio of trade turnover to GDP, the entropies of exports and imports are important. From this point of view, it is possible to determine the level of development of balanced foreign economic relations in the Republic of Azerbaijan by econometrically assessing the impact of these indicators on the balanced foreign trade ratio.

LITERATURE REVIEW

Although there are studies on the econometric assessment of the development of foreign economic relations, there is no consensus on the econometric assessment of the factors affecting the level of development of balanced foreign economic relations. Researchers advocating a floating exchange rate regime claim that all crises occur in countries where the national currency is linked to one of the world's leading currencies, and that a stable financial regime is the cause of these financial crises. Despite the long development of theories developed by proponents of fixed exchange and floating exchange rates, and since then there have been many works written on the problem, there has been no agreement on exchange rates and their choice, the dominance of the exchange rate for a particular country, the impact of balanced foreign economic relations. Although

there are more modifications to the exchange rate regime, I. Varyash and other economists divide the exchange rate regimes into three main groups: the ratio of one currency to another, the transition regime, and the floating exchange rate regime [2]. The IMF distinguishes between fixed-rate mode, transition mode, and floating degree mode within these three groups.

Despite the long development of theories developed by proponents of fixed exchange and floating exchange rates, and since then there have been many works written on the problem, there has been no agreement on exchange rates and their choice, the dominance of the exchange rate for a particular country, the impact of balanced foreign economic relations.

Summarizing the various opinions of scientists allows you to conclude that the balance of foreign trade whether as an economic category is defined not only numerical export parameters and imports, and becomes important strong, innovative development of the economy, growth in the level of well-being and the solution of general economic problems [3–6].

Research by S. Edwards shows that countries with unstable economic conditions rarely choose a rate similar to one of the world's currencies [7]. The author's research notes that countries with lower growth rates and softer restrictions on capital flows prefer a more rigid exchange rate regime. Most developed countries are even more inclined to apply floating exchange rates. The author's research notes that declining net capital inflows reduce the supply of manat, which in turn leads to a rise in the real exchange rate and, as a result, the national currency gains value.

In his study, J. M. Rizzo analyzed the choice of exchange rate regimes in developing countries over a period of twenty years and concluded that countries with low inflation prefer to use a fixed exchange rate regime instead of a floating exchange rate [8].

Research by I. Domach and others shows that countries with economies in transition prefer not to use a floating exchange rate regime when there is a small budget deficit, high openness of the economy, high level of development of the private sector, and the domestic market [9].

At the same time, countries with broad access to foreign financial markets and a large share of monetary reserves are opting for a more flexible exchange rate regime.

In the economic literature on the impact of the exchange rate regime on macroeconomic indicators, most researchers note that the exchange rate regime

² URL: <https://www.stat.gov.az/source/trade/> (accessed on 13.06.2021).

has a significant effect on inflation. The authors conclude that a stable exchange rate regime with a consistent macroeconomic policy leads to lower and more stable inflation. Edwards believes that the exchange rate regime influences inflation through the application of financial discipline.

Using the VAR method for exchange rate transfer, many researchers, including Rossi and Leigh (2002), M. Carty (1999), Aliyu (2009), Shehu Usman Rano (2009), examined the impact of exchange rate changes on price indices and concluded that exchange rate and import price shocks have little effect on domestic inflation in most countries, even in developed countries [10–12].

METHODOLOGY

Since economic development is always accompanied by risks, methodological approaches are important in assessing economic events. From this point of view, the field of study and application of econometrics can be both economic theory and economic events. Compared to economic theory, econometrics reflects both the quantitative and qualitative aspects of these events. For example, economic theory suggests that an increase in price results in a decrease in demand for a product, an increase in real interest rates in the debt capital market reduces net capital inflows; a decrease in net capital inflows reduces the supply of the national currency, and so on. Although it proves such issues, it does not answer the question of under what circumstances they occurred. Areas of application and use of econometrics are the factors that shape the development of economic events and processes. In this regard, in the example of the Republic of Azerbaijan, the EViews application software package was used in the econometric assessment of the level of development of balanced foreign economic relations under conditions of uncertainty. It should be noted that the use of this software package increases the statistical significance of the model and the quality of research by conducting various tests and graphical analysis of trends to detect heteroscedasticity, autocorrelation of the regression model and eliminate them.

The study examined the entropy of exports and imports, along with the nominal and effective exchange rates of the manat to foreign currencies, the impact of the openness of the economy on the balance of balanced foreign trade activity of the Republic of Azerbaijan in the EViews application software package. The entropy of exports and imports is important in assessing the associative activity of each country with the surrounding world. Assessment of associative

activity is the science of Sociology or Associations, which studies the most general laws of the origin, activity, development, and management of associations in nature, society and thought as a new scientific direction. Although this science is based on the methodological basis of systemology, synergetic and cybernetics, it is formed as an integration of traditional science and art. Sociology should be based on the principles of uncertainty, instability, and ambiguity.

Entropy will be calculated mainly by the following formula [13].

$$H = - \sum_{i=1}^m p_i \times \log p_i, \quad (1)$$

where H — is the entropy, p_i — is the specific weight of the partner country in the country's total imports or exports, and i — is the partner country.

The amount of information is determined in accordance with the formula

$$i = n \times H, \quad (2)$$

and the usefulness of the information with

$$F = H_0 - H_1. \quad (3)$$

In these formulas, the amount of information, the number of research cycles, the usefulness of the information, and the entropy, respectively.

Using the research method, it is possible to calculate the entropy of exports and imports of the Republic of Azerbaijan on associative activities with countries around the world.

It should be noted that the level of development of balanced foreign economic relations in the conditions of uncertainty is assessed by the dynamics, structure, and composition of foreign economic relations. Based on these indicators, the share of imports and exports in total trade turnover and GDP (the degree of openness of the economy), the growth rate. Trade turnover by meat and geographical structure, the participation level of priority areas in foreign trade with different countries, etc. is determined. The most important of these indicators for assessing the associative activity of the country is the indicator of the level of development of balanced foreign trade relations [14].

$$C = \frac{\text{Foreign Trade Balance}}{\text{Trade turnover}}, \quad (4)$$

where C — is the ratio of balanced foreign trade activity. This ratio varies in the range $-1 \leq C \leq 1$.



Fig. 1. Foreign trade turnover and foreign trade balance of the Republic of Azerbaijan for 2005–2020, billion USD

Source: compiled by the author based on information. URL: <https://www.stat.gov.az/source/trade/?lang=en> (accessed on 13.06.2021).

As the national economy of each country is significantly dependent on mutual import and export operations, it has not been possible to achieve a fully balanced foreign trade in the world practice. Using this methodology, it is possible to assess foreign economic relations between countries.

DATA, ANALYSIS, AND RESULTS ANALYSIS OF FOREIGN TRADE OF THE REPUBLIC OF AZERBAIJAN

The location of the Republic of Azerbaijan in a more favorable geographical location at the intersection of two transport hubs and the creation of a transport hub, which has recently become a hub for all vehicles on the East-West, North-South routes, have a positive impact on the development of foreign economic relations. Studies show that the share of key partners in Azerbaijan's imports and exports tended to be equal regularly. This tendency is mainly because foreign economic policy in the country is aimed at balancing imports and exports. All this can be seen more clearly in the chart below (Fig. 1).

As can be seen from the graph, the trade turnover reached a peak of 54.93 billion US dollars in 2008 for the entire period under review. This increase is mainly due to the increase in the price of oil on the world market, which is the basis of exports in the Azerbaijani economy. In recent years, the fall in oil prices on the world market has resulted in a decrease in trade turnover. At the same time, this decline is closely linked to the effects of the global financial crisis and the COVID-19 pandemic. The continuation of the global financial crisis in the world has led to a decrease in the real and effective exchange rate of the Azerbaijani manat against foreign currencies since 2014, leading to a decrease in exports and trade turnover. As a result, the foreign trade balances, although having an active balance, decreased in 2015–2020 compared to 2014. As the economic policy pursued in foreign trade was

more focused on balancing imports, the foreign trade balance was positive for all periods studied.

ECONOMETRIC ASSESSMENT OF THE FACTORS INFLUENCING THE LEVEL OF DEVELOPMENT OF BALANCED FOREIGN ECONOMIC RELATIONS IN THE REPUBLIC OF AZERBAIJAN

The level of development of balanced foreign economic relations in each country is characterized by a balanced foreign trade activity ratio. In order to econometrically assess the factors affecting the balanced foreign trade ratio, let us assess the impact of the entropy of exports and imports, the real and effective exchange rate of the Azerbaijani manat against foreign currencies, as well as the degree of openness of the economy. According to the methodology presented, the entropy of exports and imports, the degree of openness of the economy, and the balanced foreign trade ratio are calculated according to the statistical data of the State Statistics Committee and the State Customs Committee of the Republic of Azerbaijan for 2005–2020 and reflected in the table below (Table 1).

To conduct a regression analysis of the entropy of exports and imports in the Republic of Azerbaijan with the coefficient of balanced foreign trade activity characterizing the level of development of balanced foreign economic relations in the Republic of Azerbaijan for 2005–2020, the relationship between the real and nominal effective exchange rate of the Azerbaijani manat; EVIEWS, Matlab, MS Excel, Mathcad, etc. from ready mathematical software packages can be used. For this purpose, using the EVIEWS software package, which is more widely used in economic research, we obtain the following result based on the data in the table above (Table 2).

Based on the results obtained from the EVIEWS application software package, the regression equation will be as follows:

Table 1

Balance of foreign trade activity ratio in the Republic of Azerbaijan for 2005–2020 and dynamics of factors influencing it

Years	Entropy of imports (X1)	Entropy of exports (X2)	Nominal effective exchange rate of manat against foreign currencies (X3)	Real effective exchange rate of manat against foreign currencies (X4)	Degree of openness of the economy (X5)	Balanced foreign trade activity ratio (Y)
2005	0.734	0.665	0.921	0.858	0.646468	0.015891
2006	0.7525	0.678	0.9	0.89	0.554682	0.094983
2007	0.7877	0.761	0.854	0.951	0.356175	0.029282
2008	0.79	0.721	1.001	1.218	1.124323	0.738921
2009	0.821	0.634	0.983	1.155	0.470111	0.411933
2010	0.741	0.716	1.042	1.277	0.528467	0.527868
2011	0.709	0.757	1.081	1.342	0.550812	0.462877
2012	0.896	0.85	1.083	1.303	0.481618	0.424749
2013	0.941	0.496	1.081	1.315	0.466907	0.381279
2014	0.983	0.876	1.245	1.466	0.492012	0.503588
2015	0.999	0.882	0.897	1.1	0.389569	0.106709
2016	0.933	0.83	0.663	0.913	0.466828	0.034545
2017	0.961	0.823	0.659	0.943	0.552845	0.222612
2018	0.967	0.778	0.726	0.996	0.656372	0.258495
2019	0.957	0.727	0.734	0.99	0.691299	0.179216
2020	0.9513	0.831	0.756	1.003	0.574344	0.122994

Source: compiled by the author based on the author's calculations and materials. URL: <https://customs.gov.az/en/faydali/gomruk-statistikasi/xarici-ticaretin-veziyyeti-haqqinda/> (accessed on 13.06.2021).

Estimation Command:

=====

LS Y X5 X4 X3 X2 X1 C

Estimation Equation:

=====

$$Y = C(1)*X5 + C(2)*X4 + C(3)*X3 + C(4)*X2 + C(5)*X1 + C(6)$$

Substituted Coefficients:

=====

$$Y = 0.518015528607*X5 + 1.28038888125*X4 - 0.446045654134*X3 - 0.117429885594*X2 - 0.396726454072*X1 - 0.586023553649 \quad (5)$$

As can be seen from the table, there is a very high correlation between the variables Y and X1, X2, X3, X4 and X5 according to the Chedok scale. $R = 0.927$.

With the help of the F-Fisher criterion, the statistical significance of the set of regression equations can be

checked. For this purpose, the F-Fisher criterion should be compared with the value of $F_{tab.}(\alpha; m; n - m - 1)$. According to Table 2, this reflects the results of the EViews software package,

$$F - statistic (Fisher's criterion) = 25.4.$$

If we determine the value of Table F in EXCEL using the formula

$$F_{tab.}(\alpha; m; n - m - 1) = F_{tab.}(0.05; 5; 10) = 3.33.$$

The F-Fisher criterion, compared with the value of $F_{tab.}(\alpha; m; n - m - 1)$, appears to be the $F - Fisher criterion > F_{tab.}(25.4 > 3.33)$. This means that the regression equation is statistically significant. This means the adequacy of the established model (5). The statistical significance of the individual coefficients included in the model can also be determined with the help of t-statistics.

Table 2

The Result of the EViews Software Package

Dependent Variable: Y				
Method: Least Squares				
Date: 06/13/21 Time: 20:50				
Sample: 2005 2020				
Included observations: 16				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
X5	0.518016	0.110660	4.681147	0.0009
X4	1.280389	0.228885	5.594016	0.0002
X3	-0.446046	0.267653	-1.666506	0.1266
X2	-0.117430	0.202360	-0.580302	0.5746
X1	-0.396726	0.239802	-1.654392	0.1291
C	-0.586024	0.286242	-2.047299	0.0678
R-squared	0.927115	Mean dependent var		0.282246
Adjusted R-squared	0.890673	S.D. dependent var		0.215979
S.E. of regression	0.071413	Akaike info criterion		-2.160687
Sum squared resid	0.050998	Schwarz criterion		-1.870966
Log likelihood	23.28549	Hannan–Quinn criter.		-2.145851
F-statistic	25.44064	Durbin–Watson stat		1.893785
Prob(F-statistic)	0.000022			

Source: EViews application was developed by the author based on the software package.

$$Y = -0.3967 * x_1 - 0.1174 * x_2 - 0.4460 * x_3 + 1.2804 * x_4 + 0.5180 * x_5 - 0.5860, R^2 = 0.927$$

$$t \quad (-1.65) \quad (-0.58) \quad (1.67) \quad (5.59) \quad (4.68) \quad (-2.05), \quad DW = 1.894.$$

As can be seen from the regression equation obtained from the EViews application software package, the increase in factor X1, which represents the entropy of exports, X2, which represents the entropy of imports, as well as X3, which represents the nominal effective exchange rate of the Azerbaijani manat to foreign currencies, characterizes the level of balanced foreign economic relations. Decreases factor Y, which reflects the ratio of balanced foreign trade activity, increases factor X4, which represents the nominal effective exchange rate of the Azerbaijani manat against foreign currencies, and factor X5, which indicates the degree of openness of the economy that increases the Y factor. However, to ensure the adequacy of this result, it is

necessary to check the statistical significance of the given coefficients. For this purpose, the following hypothesis should be tested:

$$H_0 : \beta_1 = 0$$

$$H_0 : \beta_1 \neq 0$$

The crisis points of the student's distribution will be $\alpha = 0.05$, based on the 5 sign variables included in the model at the level of significance and the amount of choice will be $t_{0.025;10} = 2.228$. The coefficients of the variables X1, X2, and X3 are not statistically significant according to the crisis point of the student's distribution. on the contrary, the coefficients of the variables X4 and X5 are statistically

significant. Although the coefficient of free boundary is smaller than the point of crisis of the student's distribution, it is entirely desirable that the free boundary is in the model. The coefficient of determination is statistically significant ($R^2 = 0.927$) as it is high enough based on the results obtained from the EViews software package.

According to the EViews application software package, the hypothesis of autocorrelation can be tested from Table 2 to Durbin-Watson statistics. In this case, $\alpha = 0,05$, with 5 explanatory variables to the significance level for $m = 5$ and $n = 16$ observations, the Durbin-Watson crisis points will be as follows [15, p. 337].

$$d_l = 0.615; d_u = 2.157.$$

Since $d_l = 0.615 < DW = 1.894 < d_u = 2.157$, no conclusion on the existence of autocorrelation has been determined [15, p. 311]. This means that the regression equation is statistically significant, and the constructed model

$$Y = -0.3967 * x_1 - 0.1174 * x_2 - 0.4460 * x_3 + \\ + 1.2804 * x_4 + 0.5180 * x_5 - 0.5860$$

is adequate. Since the coefficients for the X4 and X5 variables included in the model are statistically significant, we can conclude that a single increase in the X4 factor, the nominal effective exchange rate of the Azerbaijani manat against foreign currencies, increases the coefficient reflecting the balance of foreign trade by 1.2804 units. Also, an increase of 1 point in the X5 coefficient, which reflects the degree of openness of the economy, leads to an increase by 0.586 points in the coefficient, which reflects a balanced foreign trade activity.

The fact that the coefficient of determination $R^2 = 0.927$ means that the corresponding regression equation is explained by 92.7% of the variance results and 7.3% by the influence of other factors. The high coefficient of determination indicates that the regression equation is better able to express the initial data and that the majority of the resulting factor (92.7%) is explained by the factors included in the model.

As a result of the study, it is possible to determine the percentage change in the outcome factor by calculating the elasticity coefficient, which represents the percentage change in the dependent variable as a result of a 1% increase in the free variables included in the linear regression equation. This ratio is calculated according to the following formula [15, p. 313].

$$E = \frac{\alpha_i \times \bar{x}_i}{\bar{y}}, \quad (6)$$

here α_i — are the coefficients of the relationship equation. \bar{x}_i — calculated average value of causal factors for the studied periods \bar{y} — a calculated average of the resulting factor for the studied periods.

Since the coefficients of the variables X4 and X5 are statistically significant for the crisis point of the student's distribution, if we calculate the effect of these variables on the outcome factor by the coefficient of elasticity, we obtain the following result.

$$E_{\text{Real effective exchange rate of Azerbaijani manat in relation to foreign currency}} = \\ = \frac{\alpha_4 \times \bar{x}_4}{\bar{y}} = \frac{1.284 \times 1.1075}{0.282246} = 5.024,$$

$$E_{\text{Degree of openness of the economy}} = \\ = \frac{\alpha_5 \times \bar{x}_5}{\bar{y}} = \frac{0.562677 \times 0.51803}{0.282246} = 1.032668.$$

Calculations show that the increase in the nominal effective exchange rate of the Azerbaijani manat against foreign currencies by 1% led to an increase in the coefficient of balanced foreign trade activity by 5.024%. An increase in the openness of the economy by 1% leads to an increase in the balance ratio of foreign trade activity by 1.03%.

All this characterizes the level of development of balanced foreign economic relations in the Republic of Azerbaijan.

The dynamics of the Fitted and Actual values of the EViews application software package with the regression equation of the built-in model (5), as well as the residuals between them are given in the graph below (Fig. 2).

Balance of foreign trade activity characterizing the level of development of balanced foreign economic relations in the Republic of Azerbaijan for 2005–2020, entropy of exports and imports, real and nominal effective exchange rate of Azerbaijani manat against foreign currencies, degree of economic openness shown in the graph (Fig. 3). Based on changes in the entropy of imports (X1) and exports (X2) reflected in this graph, it can be considered that the state intervention in the import policy in the economy of the Republic of Azerbaijan is aimed at balancing imports.

Graphical description of the entropy of exports and imports in the Republic of Azerbaijan with the coefficient of balanced foreign trade activity in the Republic of Azerbaijan for 2005–2020, the real and nominal effective exchange rate of the Azerbaijani manat against foreign currencies, the openness of the economy was as follows (Fig. 4).

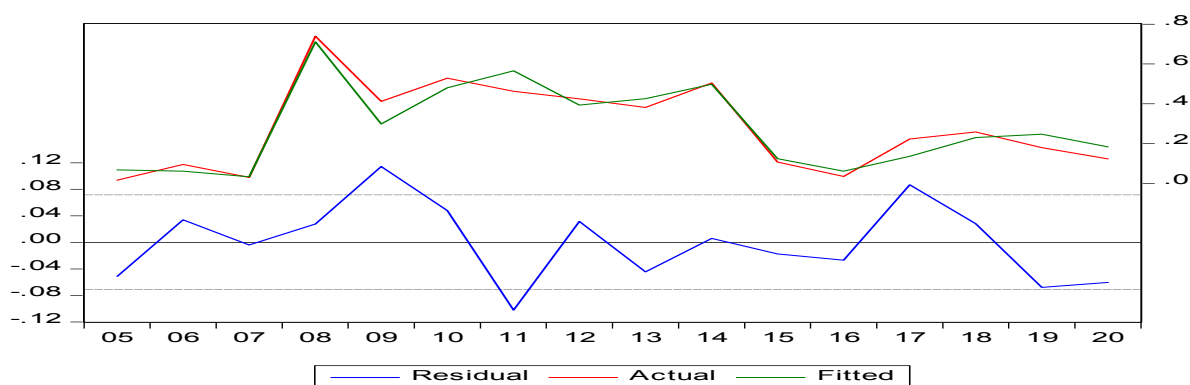


Fig. 2. Balanced foreign trade activity ratio in the Republic of Azerbaijan for 2005–2020 and actual prices obtained on the basis of the software package of factors influencing it and the dynamics of balances between them

Source: EViews application was developed by the author based on the software package.

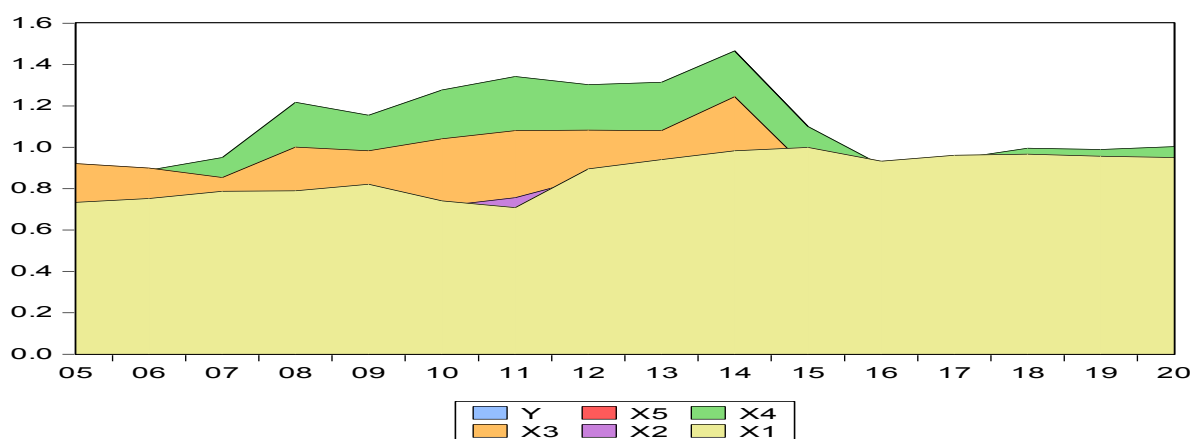


Fig. 3. Area band on the relationship between the balance of foreign trade activity in the Republic of Azerbaijan and the entropy of exports and imports, the real and nominal effective exchange rate of the Azerbaijani manat to foreign currencies, the degree of openness of the economy (2005–2020)

Source: EViews application was developed by the author based on the software package.

A number of characteristics of the balanced foreign trade activity ratio found by the regression equation obtained based on the EViews application software package are shown in the graph below (Fig. 5).

It should be noted that using the graph, it is possible to determine the forecast prices of the balance of foreign trade activity in the Republic of Azerbaijan (Fig. 6).

As can be seen from the graph, the forecast prices of the balanced foreign trade activity ratio in the Republic of Azerbaijan will be reduced by 2025. This means that the level of development of balanced foreign trade relations in the country is expected to decrease. This decrease is primarily due to the fact that the volume of exports in the Azerbaijani economy is substantially dependent on the oil factor. Increasing the share of the non-oil sector in exports will result in an increase in the foreign trade balance, which will have a positive impact on the development of balanced foreign trade relations in the future.

CONCLUSIONS

Research shows that the frequent changes in socio-economic processes in the globalized world economy in recent years, resulting in uncertainty, have a significant impact on the level of development of balanced foreign economic relations. To assess the level of development of balanced foreign economic relations in the conditions of uncertainty in the study, the balanced foreign trade ratio was calculated, the factors directly affecting this indicator were analyzed on the example of the Republic of Azerbaijan and evaluated in EViews software package. The explanatory variables involved in the model are grouped as the entropy of exports and imports in the Republic of Azerbaijan, the real and nominal effective exchange rate of the Azerbaijani manat against foreign currencies, and the degree of openness of the economy. Using the research methodology, it is easy to assess the level of development of balanced foreign economic

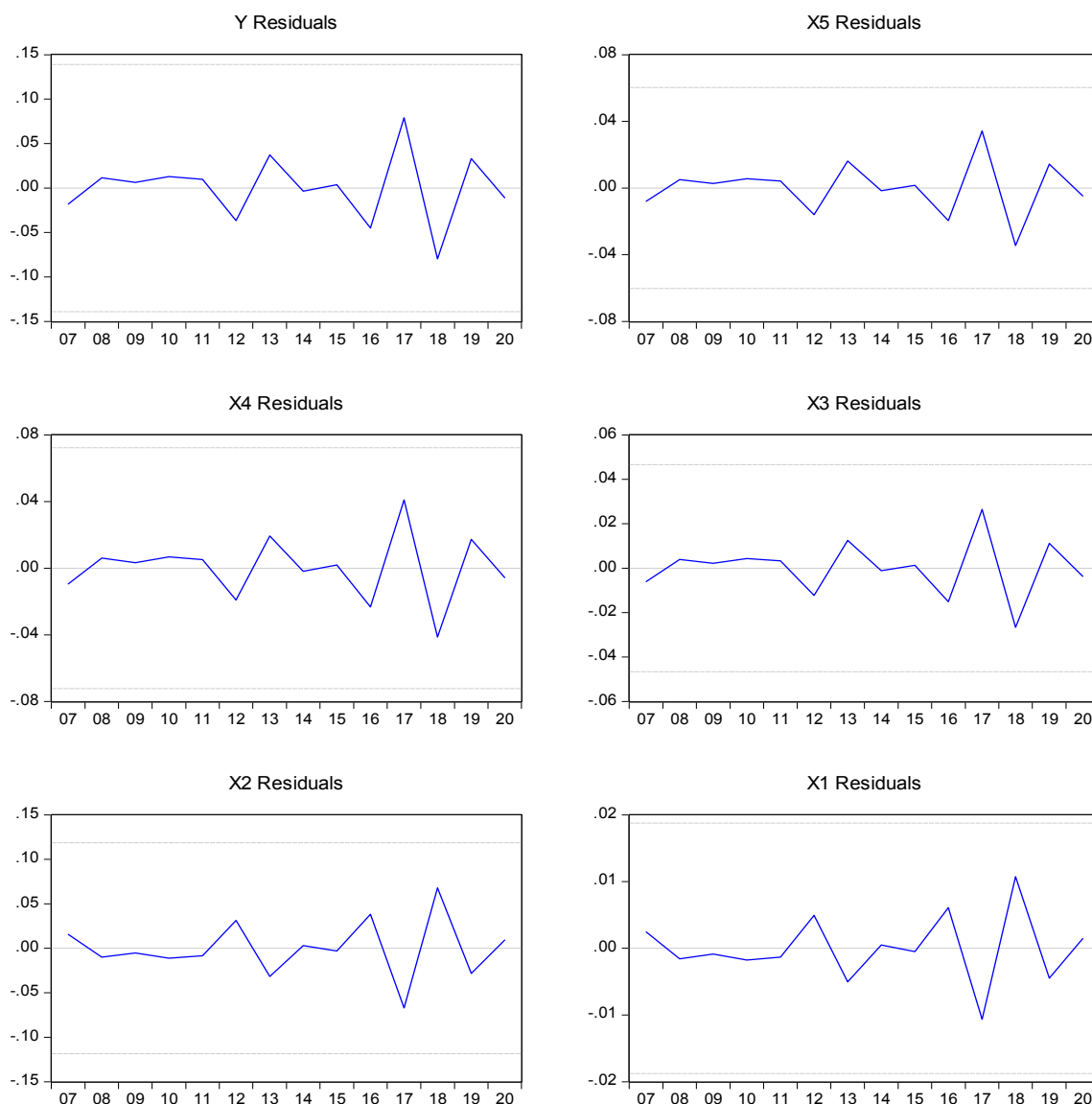


Fig. 4. Balance of foreign trade activity in the Republic of Azerbaijan for 2005–2020 and balance dynamics of the factors influencing it

Source: EViews application was developed by the author based on the software package.

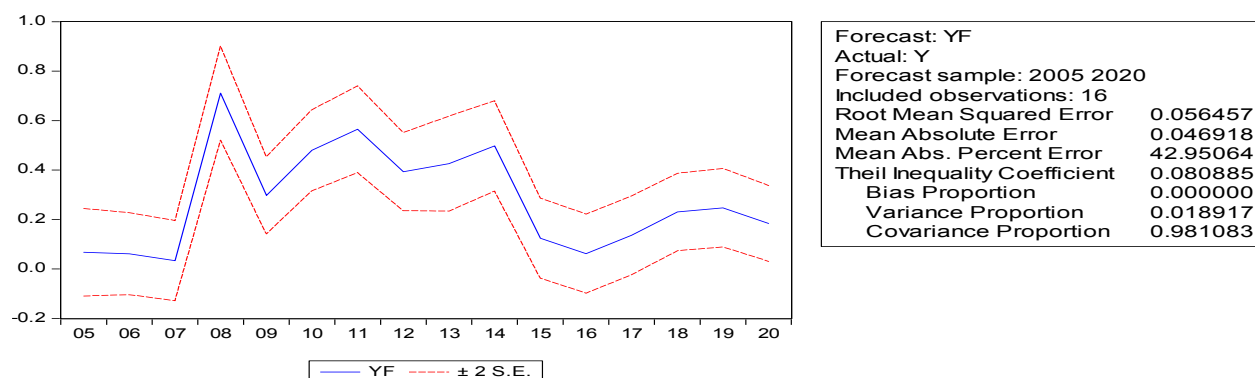


Fig. 5. Prices of balanced foreign trade activity ratio in the Republic of Azerbaijan by years, standard errors, characteristics for the forecast

Source: EViews application was developed by the author based on the software package.

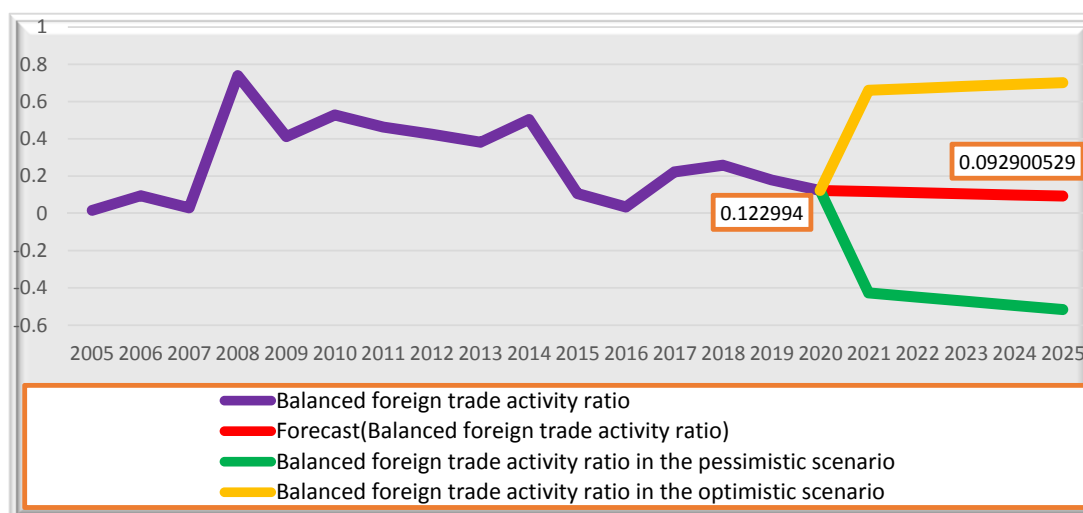


Fig. 6. Forecast prices of balanced foreign trade activity ratio in the Republic of Azerbaijan

Source: compiled by the author based on the data in Table 1.

relations in the face of uncertainty, easily identifying the positive and negative trends in foreign trade of any country.

As a result of the study, it was determined that in the example of the Republic of Azerbaijan, the entropy of exports and imports with a balanced foreign trade ratio, real and effective exchange rate of the Azerbaijani manat against foreign currencies, as well as the degree of openness of the economy

$$Y = -0.3967 * x_1 - 0.1174 * x_2 - 0.4460 * x_3 + 1.2804 * x_4 + 0.5180 * x_5 - 0.5860$$

has a very high correlation expressed by the regression equation ($R^2 = 0.927$).

The study found that the increase in the explanatory variable X1 expressing the entropy of exports, the explanatory variable X2 expressing the entropy of imports, as well as the explanatory variable X3 expressing the nominal effective exchange rate of the Azerbaijani manat against foreign currencies Although the Y factor, which represents the trading activity ratio, reduces the outcome factor, the ratios of the variables X1, X2, and X3 are not statistically significant according to the crisis point of the Student's distribution. The coefficients of the explanatory variable X4, which represents the nominal effective exchange rate of the Azerbaijani manat against foreign currencies, included in the model, and the explanatory variable X5, which expresses the degree of openness of the economy, are statistically significant.

The study found that the increase in the entropy of exports and imports on the explanatory variables included in the model reduces the ratio of balanced foreign trade activity, which characterizes the level of development of balanced foreign economic relations. Although an increase in entropy means a decline and a decrease means

progress, since each economic event has its own nature, an increase in entropy may indicate progress in one case and a decrease in another. For example, the increase in entropy in foreign trade is a positive thing for Azerbaijan and a negative thing for foreign partners. In relation to management and research processes, the increase in entropy indicates the complication of the problem.

According to the statistics of the State Statistics Committee and the State Customs Committee of the Republic of Azerbaijan for 2005–2020, according to the elasticity coefficient calculated in accordance with the recession equation obtained in the EViews software package, it was determined that 1% increase in the nominal effective exchange rate A balanced foreign trade activity ratio, which characterizes the level of development of economic relations, increases by 5.024%, and a 1% increase in the openness of the economy results in a 1.03% increase in the balance of foreign trade activities, which characterizes the level of development of balanced foreign economic relations.

According to the EViews application software package, the balance of foreign trade activity coefficient in the Republic of Azerbaijan for 2005–2020 and the dynamics of the balances of the factors influencing it, as well as the balanced foreign trade activity coefficient by years, standard errors, were determined. A number of characteristics of its use are given. According to forecasts, the balance of balanced foreign trade activity in the Republic of Azerbaijan will decrease by 2025.

Thus, using the research methodology, it is possible to optimize foreign trade policy by econometrically assessing the factors affecting the balanced foreign trade ratio, which characterizes the level of development of balanced foreign economic relations in the context of uncertainty for each country.

REFERENCES

1. Yadigarov T.A. Assessment of the associative activity of maritime transport and port infrastructure in Azerbaijan. *Ekonomisti: International Reviewed Scientific-Analytical Journal*. 2021;(3):38–49. URL: <http://ekonomisti.tsu.ge/doc/ekon.pdf>
2. Varjash I. Yu., Shvandar K. V., Burova T.F. Actualization of macroeconomic forecasts for aim of fiscal process. *Nauchno-issledovatel'skii finansovyi institut. Finansovyi zhurnal = Research Financial Institute. Financial Journal*. 2014;(4):118–128. (In Russ.).
3. Shvandar K., Plotnikov S., Borodin A. Modelling scope for forecasting the situation on the world oil markets. *Den'gi i kredit = Russian Journal of Money and Finance*. 2010;(4):63–69. (In Russ.).
4. Baigot M.S. Mechanisms for regulating the foreign economic activity of Belarus in the agricultural sector: Issues of theory, methodology, practice. Minsk: Belaruskaya Navuka; 2010. 367 p. (In Russ.).
5. Daineko A.E., Daineko E.A. Economy of Belarus in the integration processes of the Commonwealth of Independent States. Gorki: Belarusian State Agricultural Academy; 2010. 418 p. (In Russ.).
6. Stock J.H., Watson M.W. Introduction to econometrics. 3rd ed. Boston: Addison-Wesley; 2010. 840 p.
7. Edwards S. The determinants of the choice between fixed and flexible exchange-rate regimes. NBER Working Paper. 1996;(5756). URL: https://www.nber.org/system/files/working_papers/w5756/w5756.pdf
8. Rizzo J.-M. The economic determinants of the choice of an exchange rate regime: A probit analysis. *Economics Letters*. 1998;59(3):283–287. DOI: 10.1016/S 0165–1765(98)00056–1
9. Domaç I., Peters K., Yuzefovich Y. Does the exchange rate regime affect macroeconomic performance? Evidence from transition economies. World Bank Policy Research Working Paper. 2001;(2642). URL: <https://openknowledge.worldbank.org/bitstream/handle/10986/19572/multi0page.pdf?sequence=1&isAllowed=y>
10. Leigh D., Rossi M. Exchange rate pass-through in Turkey. IMF Working Paper. 2002;(204). URL: <https://www.imf.org/external/pubs/ft/wp/2002/wp02204.pdf>
11. McCarthy J. Pass-through of exchange rates and import prices to domestic inflation in some industrialized economies. BIS Working Paper. 1999;(79). URL: <https://www.bis.org/publ/work79.pdf>
12. Aliyu S.U.R. Impact of oil price shock and exchange rate volatility on economic growth in Nigeria: An empirical investigation. Munich Personal RePEc Archive. MPRA Paper. 2009;(16319). URL: https://mpa.ub.uni-muenchen.de/16319/1/MPRA_paper_16319.pdf
13. Yadigarov T.A. Econometric assessment of the associative activity of the Republic of Azerbaijan with the countries of the world. In: Economic and Social Development. Proc. 68th Int. sci. conf. (Aveiro, 24–25 May, 2021). Varazdin: Croatia Varazdin Development and Entrepreneurship Agency; 2021:187–197.
14. Yadigarov T.A. Customs statistics and modern information technologies. Baku: Europe Publishing House; 2020. 520 p.
15. Yadigarov T.A. Operations research and solution of econometric problems in MS Excel and EViews software packages: Theory and practice. Baku: Europe Publishing House; 2019. 352 p.

ABOUT THE AUTHOR / ИНФОРМАЦИЯ ОБ АВТОРЕ



Tabriz Abdulla oğlu Yadigarov — Doctor of Philosophy, Leading researcher at the Institute of Economics of the Azerbaijan National Academy of Sciences, Department of globalization and international economic relations, Baku, Azerbaijan

Табриз Абдулла оглу Ядигаров — доктор философии по экономике, ведущий научный сотрудник Института экономики Национальная академия наук Азербайджана, Баку, Азербайджан
<https://orcid.org/0000-0001-9119-9331>
tabrizyadigarov65@gmail.com

Conflicts of Interest Statement: The author has no conflicts of interest to declare.

Конфликт интересов: автор заявляет об отсутствии конфликта интересов.

The article was submitted on 31.07.2021; revised on 13.08.2021 and accepted for publication on 17.12.2021.

The author read and approved the final version of the manuscript.

Статья поступила в редакцию 31.07.2021; после рецензирования 13.08.2021; принята к публикации 17.12.2021.

Автор прочитал и одобрил окончательный вариант рукописи.