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RESEARCH OF THE INTERRELATION AND INTERDEPENDENCE OF CENTRAL ASIAN ECONOMIES: IMPACT OF THE ECONOMY OF KAZAKHSTAN

Abstract

This article is devoted to the study of the interconnection and interdependence of the economies of Central Asia (Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan, Turkmenistan), which plays an increasingly significant role in the global economy, based on its strategic location, natural resources and growing economic potential. Studying the influence of the Central Asian economies on each other helps to understand the complex web of economic ties in the region and has practical implications for solving economic problems and stimulating sustainable development in the region. The purpose of the study is to identify and assess the degree of interconnection and interdependence between the macroeconomic indicators of the countries of the region and their impact on the economic development of Kazakhstan. The assessment is carried out by the method of correlation and regression analysis based on data on the GDP of the countries of the region. The article was prepared within the framework of the grant funding project of the Science Committee of the Ministry of Science and Higher Education of the Republic of Kazakhstan «The role of Kazakhstan in deepening regional integration of CA countries and its sustainable development goals within modern global trends» (BR18574168).

Key words: economy, regions, interconnection, interdependence, international trade, economic problems, economic growth.

Introduction

Central Asia is a unique region rich in natural resources, cultural heritage and geopolitical significance. However, due to the peculiarities of historical development and geographical location, the economies of the countries of the region face certain challenges, such as limited sales markets, lack of infrastructure and uneven distribution of resources. Each strives to be as autonomous and independent

of external pressure as possible, while seeking maximum recognition, striving for greater international integration and more reliable guarantees of its territorial integrity, while avoiding the strengthening of regionalism. Their ideas about regional integration, foreign policy objectives and political culture are by no means conducive to the development and implementation of collective programs and even directly contradict this [1]. In light of these factors, an understanding of the interrelationships between the economies of Central Asia is indispensable for designing effective development strategies for the region.

Conducting a research on the interrelation and interdependence of Central Asian economies using correlation and regression analysis has several important reasons and advantages:

- Determining the degree of dependence between economies: correlation analysis allows us to assess the degree of relationship between various economic indicators in the countries of Central Asia, such as GDP, inflation, foreign trade turnover and others. This helps to understand how much and how the economies of the region interact with each other.
- Identification of key influencing factors: regression analysis allows to identify the main factors influencing the economic growth and development of the countries of Central Asia. This may be due to external factors, such as international trade and investment, as well as internal factors, including politics, infrastructure, human capital, etc.
- Identification of potential for cooperation: correlation and regression analysis can help identify areas where the countries of Central Asia have strong interconnections and potential for cooperation. For example, if a positive correlation is found between certain economic indicators, this may indicate the possibility of developing joint projects, creating regional supply chains, or cooperation in other areas.
- Planning and Decision Making: The study of the interconnections of economies using correlation and regression analysis can serve as a basis for developing strategies and making decisions in the field of economic development. The results obtained can help the leaders of the countries of Central Asia identify priority areas, take measures to stimulate economic growth and overcome obstacles.

Analyzing the interconnections of the economies of Central Asia using correlation and regression analysis can be useful in understanding the strength and direction of the links between various economic indicators in the region.

Conducting research on the interconnections of the economies of Central Asia is essential for understanding and improving economic integration, identifying areas of cooperation, developing economic policies, and predicting the future development of the region.

Main provisions

The study of the interconnection and interdependence of the economies of Central Asia, including the impact of the economic results of the countries of the region on the economy of Kazakhstan, is an important and relevant issue. In the context of globalization and the development of regional integration processes, understanding the interrelations of the economies of neighboring countries is important for the effective management of the national economy.

Central Asia is an important region with geopolitical prospects. The region borders Russia, China, Iran and Afghanistan, and also has enormous energy resources and transit routes. The export of these resources can create interdependence between countries in the region and their economies. As a result, the stability and economic development of the countries in this region have a direct impact on the security and economic interests of Kazakhstan.

Kazakhstan has close trade and economic ties with neighboring Central Asian countries. It is a major investor and trading partner in the region. The interdependence of economies associated with the exchange of goods and services, energy resources and investments creates a need to understand and analyze these dynamics.

Central Asian countries face common economic challenges, such as diverse and structural economies, corruption, instability and trade conflicts. However, it is also a region with potential for cooperation and development, which could benefit Kazakhstan if the relationship is managed correctly.

Analyzing the correlations between the economies of Central Asia can help to understand what factors and events influence regional economic dynamics and what measures can be taken to improve cooperation and development in this region.

Literature review

According to M. Laumulin and M. Augan, over more than three decades of the existence and development of the independent states of Central Asia, certain concepts and approaches to the study of the region have developed in world political science. Methods, views and concepts differ from each other depending on the affiliation of the respective researchers to one or another scientific school and especially on their political views. It so happened that from the very beginning, almost all foreign studies on Central Asia were politicized to one degree or another [2, 3].

The international significance of Central Asia is due to its geopolitically advantageous location between Russia, China, Iran and the Caucasus, significant energy and natural resource potential, transport and transit opportunities, as well as proximity to the hotbeds of armed conflicts (Afghanistan, Pakistan and India), which greatly affect international security. The interest of big players in our region is obvious: the existing research institutes and analytical centers are engaged in research of regional integration, political, economic and socio-cultural processes in the Central Asian region, as well as the development of analytical scenarios for the development of cooperation. The largest among them are: the Institute of Central Asian Studies (Republic of Tatarstan, Russia), the "Oy Ordo" Center for Expert Initiatives (Kyrgyzstan), the International Institute for Central Asian Studies (Uzbekistan), the Kazakhstan Institute for Strategic Studies (KISS, Kazakhstan), the Institute for Central Asian regional economic cooperation (China), National Bureau of Asian Research (USA) and others.

Currently, the following areas of research of the Central Asian region can be distinguished from both domestic and foreign experts [2, 3]:

- internal processes in the region, intra-regional relations and internal political development of individual republics;
- the international situation of the region, the geopolitical processes around Central Asia, the relations of the states of the region with world and regional players;
- country-specific nature, that is, the works are devoted to individual states of the region;

The most common form of studying the region today is complex publications, which present a variety of topics, and the problems of the region are presented by experts specializing in relevant issues (international collaborations). Issues of Russian and Chinese policy in the region have been in the focus of Western researchers since the early 1990s [2].

Kazakh and foreign authors have made a significant contribution to research on Central Asian economic interaction. Richard Pomfret [4] analyzes the Central Asian economies of Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan from the moment they experienced the commodity boom of the early 2000s to the crash in 2014. He also explores these countries' relations with outside powers and the development opportunities offered by infrastructure projects as well as rail links between China and Europe.

Stefan Barizitz [5] explores the history of the economic development of Central Asia over many centuries, with an emphasis on the significance of the trade routes of the Silk Road. The work provides an overview of the economic interaction of the region with other parts of the world and analyzes its impact on the modern economy of Central Asia.

Vinokurov E.Yu., Libman A.M., Maksimchuk N.V. [6] explore the dynamics of integration processes in Central Asia, assess the quantitative characteristics of integration in Central Asia over the past decade. They argue that Central Asia is not an independent region of integration, being a sub-region within the post-Soviet space. The integration dynamics of Central Asia is determined by the general trends in the development of the post-Soviet space. The authors also identify two additional trends – the growing influence of China in the Central Asian region and the development of Kazakhstan as the second "integration core".

These works represent only a small part of the vast body of literature on Central Asian economic interaction. The authors' research allows us to better understand the features and challenges facing the countries of the region, as well as to develop strategies and policies to achieve sustainable economic growth and cooperation in Central Asia.

Thus, a significant part of scientific works is devoted to the study of the region's interaction with other parts of the world and integration associations. In our opinion, the issues of economic interconnection within the region remain unresolved. To establish strong relationships between the republics of Central Asia, it is advisable to comprehend the dynamics of bilateral relations between the

republics themselves in new geopolitical and geo-economic conditions. The USA, EU, China, Russia and other countries of the world are trying to play an increasingly active role in the "5+ Format". Under these conditions, the role of scientific research to unlock the potential of Central Asian countries in mutual integration processes is significantly increasing. Annual summit meetings of the leaders of the Central Asian countries, who are trying to find areas of growth for their economies, have become traditional. In this regard, the study of aspects of internal interconnections and interdependencies will allow for a more complete understanding of the forces and directions of relations between various economic indicators of the region, as well as to assess the potential for cooperation and integration in Central Asia.

Materials and methods

The research on the interrelation and interdependence of Central Asian economies was carried out using a correlation-regression analysis.

The following is a general approach to conducting research:

- Definition of variables: Selected economic indicator – GDP, which will represent the economies of Central Asia.
- Data collection: Relevant data collected for the selected indicator for each country in Central Asia based on data from the World Bank, UN.
- Carrying out correlation analysis: correlation coefficients between pairs of economic indicators for each country are calculated.
- Conducting regression analysis: Regression models are built to explore deeper relationships between variables. Dependent and independent variables are identified and regression analysis methods such as multiple regression and linear regression are applied to investigate how the independent variables affect the dependent variable.
- Interpretation of the results: the obtained results are analyzed and conclusions about the relationships and the impact between the economic indicator in Central Asia are made. The statistical significance of the links, the measure of the strength of the relationship and the direction of the influence of the variables were assessed.

To calculate paired correlation coefficients, the following formula was used:

$$R_{xy} = \frac{\overline{x \cdot y} - \bar{x} \cdot \bar{y}}{s(x) \cdot s(y)} \quad (1)$$

A positive value of this correlation coefficient indicates a positive (direct) relationship between the variables, a negative value indicates a negative (inverse) relationship, and a zero value indicates the absence of a relationship. Their criteria are assessed on the Chaddock scale.

If the absolute value of the correlation coefficient is less than 0.3, then there is practically no connection, if between 0.3 and 0.5 – the connection is weak, 0.5 and 0.7 – moderate, 0.7 and 1 – strong (strict).

To find the coefficient of determination – a statistical indicator that reflects the explanatory power of the regression f: X → Y, the following formula was used:

$$R^2 = (R_{xy})^2 \quad (2)$$

The correlation coefficient is equal to the square root of the coefficient of determination, so it can be used to assess the significance of regression models.

The coefficient of determination is a statistical measure of fit that can be used to determine how well a linear regression model fits the data on which it is built.

The coefficient of determination varies in the range from $-\infty$ to 1. If it is equal to 1, this corresponds to an ideal model, when all observation points lie exactly on the regression line, i.e. the sum of the squares of their deviations is 0. If the coefficient of determination is 0, this means that there is no relationship between the variables of the regression model.

Also, to find the average coefficient of elasticity, a measure of the sensitivity of one variable to a change in another, the the following formula was used:

$$E = \frac{\partial y}{\partial x} \cdot \frac{x}{y} = b\frac{\bar{x}}{\bar{y}} \quad (3)$$

The average coefficient of elasticity shows how many percent the resulting variable will change relative to its average level when the factor variable changes by 1% relative to its average value.

The information base of the study was the data of the World Bank Open Data, The Observatory of Economic Complexity on the economic development of the countries of Central Asia from 1990–2022.

When collecting data, the following principles were taken into account: openness, accessibility and transparency of statistical materials, comparability of data and results over time, which allows for correct comparisons.

The limitation of the study was the lack of official data on the GDP of Turkmenistan in 2022. At the end of 2022, the GDP growth of Turkmenistan amounted to 6.2% [7], therefore, an indicator that takes into account this growth was used.

Microsoft Excel was used to process statistical data.

To achieve the goal of the study, various general scientific methods of cognition (analysis – to determine the main directions of economic relations within the region by analyzing data on trade flows, exports and imports; synthesis – to identify general patterns in the development of economic relations in the region based on data from various sources (GDP, trade indicators, export structure); generalization – to identify general patterns in the analysis of indicators, coefficients and statistical data, as well as general trends in the development of economic relations in the region), methods of economic analysis (comparison – to identify differences in the development of the economies of Central Asia when analyzing key economic indicators (in this research – GDP), as well as to identify patterns when analyzing the results of correlation and regression analysis) and quantitative and qualitative study of the economic processes (to conduct statistical analysis using quantitative data on the volumes of GDP, exports and imports, to compare the economic activity of countries and identify general trends, as well as to identify factors that explain changes in the economic relationships of Central Asian countries) under consideration were also applied.

The initial data are presented in table 1.

Table 1 – GDP of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan from 1990–2022, US billion dollars

	Y	X1	X2	X3	X4
Years	Kazakhstan	Kyrgyzstan	Tajikistan	Turkmenistan	Uzbekistan
1990	26,93	2,68	2,63	3,19	13,36
1991	24,92	2,57	1,35	3,21	13,68
1992	24,92	2,32	2,16	3,20	12,94
1993	23,41	2,03	1,64	3,18	13,10
1994	21,25	1,68	1,52	2,56	12,90
1995	20,37	1,66	1,23	2,48	13,35
1996	21,04	1,83	1,04	2,38	13,95
1997	22,17	1,77	0,92	2,45	14,74
1998	22,14	1,65	1,32	2,61	14,99
1999	16,87	1,25	1,09	2,45	17,08
2000	18,29	1,37	0,86	2,90	13,76
2001	22,15	1,53	1,08	3,53	11,40
2002	24,64	1,61	1,22	4,46	9,69
2003	30,83	1,92	1,56	5,98	10,13

Continuation of Table 1

2004	43,15	2,21	2,08	6,84	12,03
2005	57,12	2,46	2,31	8,10	14,31
2006	81,00	2,83	2,83	10,28	17,33
2007	104,85	3,80	3,72	12,66	22,31
2008	133,44	5,14	5,16	19,27	29,55
2009	115,31	4,69	4,98	20,21	33,69
2010	148,05	4,79	5,64	22,58	49,77
2011	192,63	6,20	6,52	29,23	60,18
2012	208,00	6,61	7,63	35,16	67,52
2013	236,63	7,34	8,45	39,20	73,18
2014	221,42	7,47	9,11	43,52	80,85
2015	184,39	6,68	8,27	35,80	86,20
2016	137,28	6,81	6,99	36,17	86,14
2017	166,81	7,70	7,54	37,93	62,08
2018	179,34	8,27	7,77	40,77	52,63
2019	181,67	8,87	8,30	45,23	59,91
2020	171,08	7,78	8,13	46,10	59,89
2021	197,11	8,54	8,75	54,00*	69,24
2022	220,62	10,93	10,49	57,35**	80,39

* indicator from the source [8].
** indicator taking into account the source [7].
Note: Compiled on the basis of [8; 9].

The GDP of Kazakhstan was taken as a dependent variable, the GDP of Uzbekistan, Kyrgyzstan, Turkmenistan and Tajikistan were considered as independent variables. Further, during the analysis of paired regression, the dependent and independent variables changed.

Results and discussion

The dynamics of the GDP of the countries of Central Asia varies depending on each individual country and economic conditions. However, in general, the Central Asian region, consisting of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan, has shown significant economic growth in recent decades.

The dynamics of GDP (Figure 1) of the Central Asian countries over the past years has been mostly positive, but with some fluctuations.

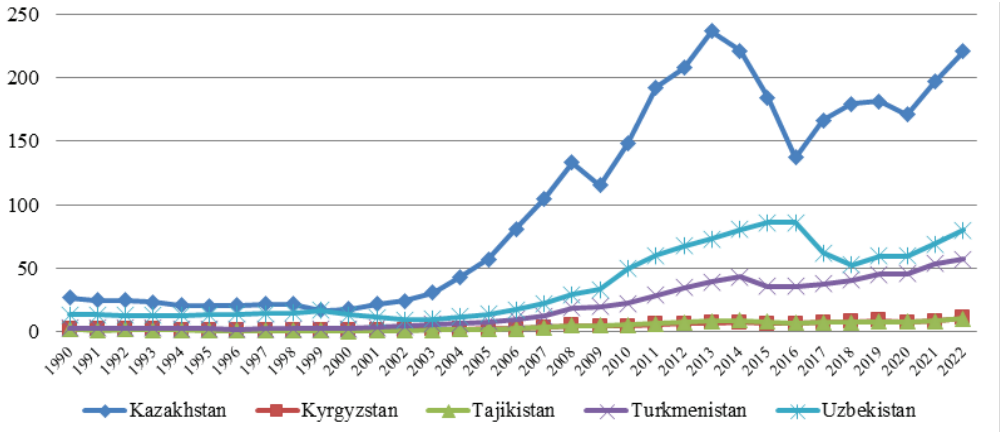

Figure 1 – Dynamics of GDP in Central Asian countries, 1990–2022, US billion dollars

Note: Compiled by the sources [7; 8; 9].

Kazakhstan has the largest economy among the countries of Central Asia. The country's GDP has grown in recent years, but with a slower trend.

Uzbekistan also experienced GDP growth. Since the reforms introduced in the country in 2016, Uzbekistan's economy has become more open to foreign investment.

Kyrgyzstan also has a growing economy. The country has faced political instability, which may affect the economic situation.

Turkmenistan's GDP represents a significant share of the gas industry. However, due to a lack of transparency and limited access to data, a complete picture of a country's economy can be difficult.

The GDP of these countries is growing mainly due to several factors, such as the growth in the extraction of natural resources (mainly oil, gas and minerals), the development of the industrial sector, the growth of agriculture, infrastructure projects and investments, and the development of tourism and services.

Kazakhstan is the largest economy in the region and has the largest GDP. It achieves its growth largely through the extraction of oil, gas and other resources, as well as investment in infrastructure and industry.

Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan have also shown growth in their economies in recent years. However, they have their own characteristics and challenges. For example, Tajikistan and Kyrgyzstan are more dependent on agriculture and labor migration, while Turkmenistan is more dependent on natural gas exports.

Some Central Asian countries are also undertaking structural reforms and economic diversification to reduce dependence on natural resources and create a more sustainable and diversified economic sector.

Paired correlation coefficients, which are calculated by formula 1, are presented in Table 2.

Table 2 – Interpretation of the paired correlation coefficient

R_{xy}	Interpretation of the paired correlation coefficient
$R_{yx_1} = 0.9453$	very strong direct linear connection between x_1 and y.
$R_{yx_2} = 0.9766$	very strong direct linear connection between x_2 and y.
$R_{yx_3} = 0.9476$	very strong direct linear connection between x_3 and y.
$R_{yx_4} = 0.931$	very strong direct linear connection between x_4 and y.
$R_{x_1x_2} = 0.9831$	very strong direct linear connection between x_2 and x_1.
$R_{x_1x_3} = 0.9861$	very strong direct linear connection between x_3 and x_1.
$R_{x_1x_4} = 0.9173$	very strong direct linear connection between x_4 and x_1.
$R_{x_2x_3} = 0.9824$	very strong direct linear connection between x_3 and x_2.
$R_{x_2x_4} = 0.9524$	very strong direct linear connection between x_4 and x_2.
$R_{x_3x_4} = 0.9347$	very strong direct linear connection between x_4 and x_3.
Note: Compiled on the basis of calculations.	

For greater clarity, a matrix of paired correlation coefficients was constructed (Table 3, p. 114).

There is multicollinearity in this multiple regression model. This can lead to problems in further analysis and interpretation of the results. Multicollinearity means that some of the independent variables in the model are highly correlated with each other, making it difficult to separate their effect on the dependent variable as their effects confound.

Table 3 – Matrix of paired correlation coefficients R

-	y	x_1	x_2	x_3	x_4
y	1	0.9453	0.9766	0.9476	0.931
x_1	0.9453	1	0.9831	0.9861	0.9173
x_2	0.9766	0.9831	1	0.9824	0.9524
x_3	0.9476	0.9861	0.9824	1	0.9347
x_4	0.931	0.9173	0.9524	0.9347	1
Note: Compiled on the basis of calculations.					

Accordingly, their linear combinations were used. The coefficients of determination and average elasticity were calculated using formulas 2 and 3.

As a result, the following results were obtained:

1) Analysis and evaluation of the relationship between the economies of Kazakhstan and Kyrgyzstan:

◆ The calculated coefficient of elasticity E = 0.773 indicates that if Kazakhstan's GDP changes by 1%, Kyrgyzstan's GDP will change by less than 1%, that is, the impact of Kazakhstan's GDP on Kyrgyzstan's GDP is not significant.

Countries that imported more from Kazakhstan than Kyrgyzstan in 2021 were China ($10.6 billion), Russia ($5.99 billion) and Greece ($4.62 billion). Countries that imported more from Kyrgyzstan than Kazakhstan in 2021 were Switzerland ($185 million), Thailand ($37.3 million) and Hong Kong ($23 million) [10].

◆ The calculated coefficient of elasticity E = 1.156 indicates that if Kyrgyzstan's GDP changes by 1%, Kazakhstan's GDP will change by more than 1%, that is, Kyrgyzstan's GDP has a significant impact on Kazakhstan's GDP due to trade relations, investments, the energy sector and regional integration projects. These factors create conditions for mutual economic interdependence between the two countries, where the prosperity of one economy can contribute to the growth and development of the other.

In 2021, Kazakhstan exported $619 million to Kyrgyzstan. The main products exported by Kazakhstan to Kyrgyzstan are pile fabrics ($37.3 million), rolled tobacco ($32.2 million) and flavored water ($25 million). Over the past 26 years, Kazakhstan's exports to Kyrgyzstan have increased by 7.19% from $102 million in 1995 to $619 million in 2021. Kazakhstan did not export any services to Kyrgyzstan in 2021 [10].

Kyrgyzstan exported $430 million to Kazakhstan in 2021. Kyrgyzstan's main exports to Kazakhstan were float glass ($150 million), precious metal ($87.6 million) and plastic lids ($25.1 million). Over the past 26 years, Kyrgyzstan's exports to Kazakhstan have increased by 7.42% from $66.8 million in 1995 to $430 million in 2021 [10].

In 2021, Kazakhstan had a large net trade with Kyrgyzstan in the exports of food products ($113 million), mineral products ($89.1 million) and chemical products ($70.1 million).

In 2021 Kyrgyzstan had a large net trade with Kazakhstan in the exports of stone and glass ($179 million), mineral products ($90.5 million) and food products ($32.8 million) [9].

Thus, the coefficient of determination $R^2=0.9453^2=0.8936$ i.e. in 89.36% of cases, changes in the independent variable lead to a change in the dependent one. The remaining 10.64% of the changes in the independent variable are explained by other factors.

2) Analysis and evaluation of the relationship between the economies of Kazakhstan and Tajikistan:

◆ The calculated coefficient of elasticity E = 0.898 indicates that if Kazakhstan's GDP changes by 1%, Tajikistan's GDP will change by less than 1%. The impact of Kazakhstan's GDP on Tajikistan's GDP is not significant.

The countries that imported more from Kazakhstan than from Tajikistan in 2021 were China ($10.6 billion), Russia ($5.99 billion) and Greece ($4.62 billion). Countries that imported more from Tajikistan than from Kazakhstan in 2021: Switzerland ($538 million), Hong Kong ($127 million) and Afghanistan ($82.6 million) [11].

◆ The calculated coefficient of elasticity E = 1.062 indicates that if Tajikistan's GDP changes by 1%, Kazakhstan's GDP will change by more than 1%. Tajikistan's GDP has a significant impact on Kazakhstan's GDP due to trade and economic ties, migration flows and remittances, the energy sector and regional projects.

In 2021, Tajikistan exported $360 million to Kazakhstan. The main products that Tajikistan exported to Kazakhstan were zinc ore ($141 million), lead ore ($136 million), and copper ore ($50.4 million). It is likely that imported raw materials are used in various industries, such as the production of automobiles, electronics, textiles and other goods. Over the past 23 years, exports from Tajikistan to Kazakhstan have increased by 22.2%, from $3.6 million in 1998 to $360 million in 2021. In 2021, Kazakhstan exported $722 million to Tajikistan. The main products exported by Kazakhstan to Tajikistan are: wheat ($219 million), petroleum gas ($162 million) and raw iron bars ($53.8 million). During the last 23 years the exports of Kazakhstan to Tajikistan have increased at an annualized rate of 13.1%, from $42.2 million in 1998 to $722 million in 2021. During 2021, Kazakhstan had a large net trade with Tajikistan in the exports of vegetable products ($262 million), mineral products ($205 million), and metals ($76 million). During 2021, Tajikistan had a large net trade with Kazakhstan in the exports of mineral products ($328 million), vegetable products ($18.2 million), and metals ($8.11 million) [11].

Thereby, the coefficient of determination $R^2 = 0.9766^2 = 0.9537$, i.e. in 95.37% of cases, changes in the independent variable lead to a change in the dependent one. The remaining 4.63% of the changes in the independent variable are explained by other factors.

3) Analysis and evaluation of the relationship between the economies of Kazakhstan and Turkmenistan:

The calculated coefficient of elasticity E = 1.123 indicates that if Kazakhstan's GDP changes by 1%, Turkmenistan's GDP will change by more than 1%. Kazakhstan's GDP has a significant impact on Turkmenistan's GDP through trade, the energy sector, investment and transport projects. For example, the joint Comprehensive program for cooperation between the governments of the two countries for 2022-2024 provides for the implementation of 30 events in the trade, economic, cultural and humanitarian spheres, industrial cooperation, energy, agriculture, transport and logistics, and healthcare. The main emphasis is placed on establishing direct contacts between representatives of the business circles of the two countries. These are the activation of the Business Council, the holding of business forums, the study of the creation of trading houses, the supply of locomotives and components for Turkmen railways, vehicles and agricultural machinery of Kazakh production, as well as the services of Kazakh service companies using financial and insurance instruments of JSC «KazakhExport». An agreement was also reached to work out the creation of joint agro-industrial complexes on the territory of the Republic of Kazakhstan with the involvement of private capital of the two countries [12].

◆ The calculated coefficient of elasticity E = 0.799 indicates that if Turkmenistan's GDP changes by 1%, Kazakhstan's GDP will change by less than 1%. Turkmenistan's GDP does not have a significant impact on Kazakhstan's GDP. The limited size of Turkmenistan's economy, the focus on exporting energy resources and limited investments are factors that limit its impact on the economy of Kazakhstan.

The countries that imported more from Kazakhstan than Turkmenistan in 2021 were Russia ($5.99 billion), China ($10.6 billion) and Greece ($4.62 billion). The countries that imported more from Turkmenistan than from Kazakhstan in 2021 were Georgia ($205 million), Cyprus ($85 million) and Bulgaria ($31.5 million).

In 2020, Kazakhstan exported $76.6 million to Turkmenistan. The main goods exported by Kazakhstan to Turkmenistan are wheat ($12 million), wheat flours ($10.7 million) and barium sulfate ($7 million). Over the past 22 years, Kazakhstan's exports to Turkmenistan have increased by 8.67%, from $12.3 million in 1998 to $76.6 million in 2020. In 2020, Turkmenistan exported $48

million to Kazakhstan. The main goods exported by Turkmenistan to Kazakhstan are: house linens ($15.2 million), petroleum gas ($12.9 million) and tomatoes ($9.39 million). Over the past 22 years, Turkmenistan's exports to Kazakhstan have increased by 6.4%, from $12.3 million in 1998 to $48 million in 2020 [13].

Thus, the coefficient of determination $R^2 = 0.9476^2 = 0.8979$ i.e. in 89.79% of cases, changes in the independent variable lead to a change in the dependent one.

4) Analysis and evaluation of the relationship between the economies of Kazakhstan and Uzbekistan:

- The calculated coefficient of elasticity E = 0.888 indicates that if Kazakhstan's GDP changes by 1%, Uzbekistan's GDP will change by less than 1%. The impact of Kazakhstan's GDP on Uzbekistan's GDP is not significant.

The countries that imported more from Kazakhstan than Uzbekistan in 2021 were China ($10.6 billion), Greece ($4.62 billion) and Russia ($5.99 billion). The countries that imported more from Uzbekistan than from Kazakhstan in 2021 were Switzerland ($2.4 billion), Afghanistan ($511 million) and Turkey ($1.68 billion) [14].

- The calculated coefficient of elasticity E = 0.976 indicates that if Uzbekistan's GDP changes by 1%, Kazakhstan's GDP will change by less than 1%. Uzbekistan's GDP does not have a significant impact on Kazakhstan's GDP.

In general, although there are various types of ties and interactions between Kazakhstan and Uzbekistan, the impact of Kazakhstan's GDP on Uzbekistan's GDP may be limited due to geographical, trade, economic and political factors.

In 2021, Kazakhstan exported $2.47 billion to Uzbekistan. The main goods exported from Kazakhstan to Uzbekistan were wheat ($532 million), copper ore ($183 million) and semi-finished iron ($182 million). Over the past 23 years, Kazakhstan's exports to Uzbekistan have increased by 14.1%, from $119 million in 1998 to $2.47 billion in 2021. In 2021, Uzbekistan exported $1.03 billion to Kazakhstan. The main products exported from Uzbekistan to Kazakhstan were cars ($261 million), lead ore ($40 million) and ethylene polymers ($38.7 million). Over the past 23 years, Uzbekistan's exports to Kazakhstan have increased by 11.4%, from $85 million in 1998 to $1.03 billion in 2021[14].

Thus, the coefficient of determination $R^2 = 0.931^2 = 0.8668$ i.e. in 86.68% of cases, changes in the independent variable lead to a change in the dependent one.

Conclusion

Thus, the analysis showed a direct and very strong relationship between the GDP indicators of the Central Asian countries, these indicators are highly interconnected and changes in the GDP of one country are accompanied by significant changes in the GDP of another country in the region in the same direction. The study of the interconnections of the economies of Central Asia using correlation and regression analysis is an important step in understanding the dynamics of the region's development and identifying factors contributing to its economic growth.

In this multiple regression model, multicollinearity was found, which led to problems in further analysis and interpretation of the results. Multicollinearity has made it difficult to separate their effects on the dependent variable, since their effects are mixed. Accordingly, their linear combinations were used.

The coefficients of determination and average elasticity were calculated to determine the interdependence of variables.

Analysis and evaluation of the relationship between the economies of Kazakhstan and Kyrgyzstan showed that the impact of the economy of Kazakhstan on the economy of Kyrgyzstan is not significant. Conversely, Kyrgyzstan's GDP has a significant impact on Kazakhstan's GDP. In 89.36% of cases, changes in the independent variable lead to a change in the dependent one.

Analysis and evaluation of the relationship between the economies of Kazakhstan and Tajikistan showed that the impact of Kazakhstan's GDP on Tajikistan's GDP is not significant. Conversely, Tajikistan's GDP has a significant impact on Kazakhstan's GDP. In 95.37% of cases, changes in the independent variable lead to a change in the dependent one.

Analysis and evaluation of the relationship between the economies of Kazakhstan and Turkmenistan showed that Kazakhstan's GDP has a significant impact on Turkmenistan's GDP. Conversely, Turkmenistan's GDP does not have a significant impact on Kazakhstan's GDP. In 89.79% of cases, changes in the independent variable lead to a change in the dependent one.

Analysis and evaluation of the relationship between the economies of Kazakhstan and Uzbekistan showed in both cases that the impact of the GDP of both countries on each other is not significant. In 86.68% of cases, changes in the independent variable lead to a change in the dependent one.

A direct and very strong relationship between the indicators may have different reasons and may indicate different relationships depending on the context of the study. For example, a high positive correlation between the GDP of two countries may indicate a strong trade relationship, interdependence in the export and import of goods and services, as well as the presence of similar economic structures. A high correlation may also be the result of chance or coincidence, or there may be hidden factors that affect both indicators independently of each other.Therefore, although a direct and very strong relationship between indicators may indicate important relationships, further research and analysis are necessary to identify specific factors and mechanisms that explain this relationship and confirm its significance.

The role and importance of the states of the region are changing against the background of serious geo-economic and geopolitical shifts taking place at the beginning of the third decade of the XXI century on two continents – in Europe and in Asia. The impact of these shifts on the region is potentially huge, but their final result is not yet predetermined [15, p.13]. The study and development of the Central Asian region should be comprehensive and interconnected, and one of the main tools here will be the expansion of economic cooperation and interaction between all five countries.

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ОРТАЛЫҚ АЗИЯ ЭКОНОМИКАЛАРЫНЫҢ ӨЗАРА БАЙЛАНЫСЫ МЕН ӨЗАРА ТӘУЕЛДІЛІГІН ЗЕРТТЕУ: ҚАЗАҚСТАН ЭКОНОМИКАСЫНА ӘСЕРІ

Аңдатпа

Бұл мақала өзінің стратегиялық орналасуына, табиғи ресурстарына және өсіп келе жатқан экономикалық әлеуетіне қарай жаһандық экономикада барған сайын маңызды рөл атқаратын Орталық Азия (Қазақстан, Қырғызстан, Өзбекстан, Тәжікстан, Түрікменстан) экономикаларының өзара байланысы мен өзара тәуелділігін зерттеуге арналған. Орталық Азия елдерінің экономикаларының бір-біріне әсерін зерттеу аймақтағы экономикалық байланыстардың күрделі желісін түсінуге көмектеседі және экономикалық мәселелерді шешуге және аймақтың тұрақты дамуын ынталандыруға практикалық әсер етеді. Зерттеудің мақсаты – аймақ елдерінің макроэкономикалық көрсеткіштерінің өзара байланысы мен өзара тәуелділік дәрежесін және олардың Қазақстанның экономикалық дамуына әсерін анықтау және бағалау. Бағалау аймақ елдерінің ЖІӨ деректері негізінде корреляциялық және регрессиялық талдау әдісімен жүзеге асырылады. Мақала Қазақстан Республикасы Ғылым және жоғары білім министрлігі Ғылым комитетінің (BR18574168) «Орталық Азия елдерінің интеграциясынын терендетудегі Қазақстаның рөлі және қазіргі таңдағы үрдістер шеңберіндегі елдің тұрақты дамуының мақсаттары» бағдарламалық-нысаналы қаржыландыру жобасы шеңберінде дайындалған.

Тірек сөздер: экономика, аймақтар, өзара байланыс, өзара тәуелділік, халықаралық сауда, экономикалық мәселелер, экономикалық өсу.

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ИССЛЕДОВАНИЕ ВЗАИМОСВЯЗИ И ВЗАИМОЗАВИСИМОСТИ ЭКОНОМИК ЦЕНТРАЛЬНОЙ АЗИИ: ВЛИЯНИЕ НА ЭКОНОМИКУ КАЗАХСТАНА

Аннотация

Данная статья посвящена исследованию взаимосвязи и взаимозависимости экономик Центральной Азии (Казахстана, Кыргызстана, Узбекистана, Таджикистана, Туркменистана), которая играет все более значительную роль в глобальной экономике исходя из своего стратегического расположения, природных ресурсов и растущего экономического потенциала. Изучение влияния экономик стран Центральной Азии друг на друга будет способствовать, по мнению авторов, пониманию сложной сети экономических связей в регионах, что имеет практическое значение для решения экономических проблем и стимулирования устойчивого развития в странах. Целью исследования является выявление и оценка степени взаимосвязи и взаимозависимости между макроэкономическими показателями стран региона и их влияние на экономическое развитие Казахстана. Оценка проводится методом корреляционно-регрессионного анализа на основе данных о ВВП стран региона. Статья подготовлена в рамках проекта программно-целевого финансирования Комитета по науке Министерства науки и высшего образования Республики Казахстан «Роль Казахстана в углублении региональной интеграции стран Центральной Азии и цели устойчивого развития страны в рамках глобальных трендов современности» (BR18574168).

Ключевые слова: экономика, регионы, взаимосвязь, взаимозависимость, международная торговля, экономические проблемы, экономический рост.