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Laws of Change of Geopolitical Effects on the Economy of Central Asian Countries

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Abstract:

The article discusses the problem of risk that has become today. A review of definitions and interpretations of various risks manifested in geopolitical problems and business is carried out. Examples of a kaleidoscopic set of interpretations of the concept of risk are given.

The article deals with the problem of understanding risk in relation to supply chains. The authors studied the interpretations of risk by practical managers. As a result of the considered types of uncertainty, a classification of risk sources is proposed.

The concept of geopolitical risk is revealed and the reasons for its direct negative impact on any business are determined. A variant of the methodology is proposed with the help of which it is possible to assess the geopolitical risk for any country or region.

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In essence, a new direction of scientific research is being formed in modern geopolitics. These studies are macro-regional studies, focused not on the global system, but on stable complexes or blocks formed in different states of the globe and their parts.

In view of the fact that the motivating factors for such research are known, the importance of the

process of interstate integration, which began in Europe and is actively developing today, is significant. The global crisis and contradictions that have intensified in recent years, as well as the practice of "managing" these crises and conflicts (which is increasingly embracing the domestic policy of states), have had a significant impact on the study of regional problems in recent years. Against this background, the review is theoretically and methodologically relevant.

It is noteworthy that this situation is increasingly reflected in the modern literature. A number of authors argue that the geopolitical region should be viewed as an optimal unit that reflects the dynamic characteristics of geopolitical analysis. For example, V.A. Bulakov puts forward such an idea. From his point of view, if we consider the areas in which this area of knowledge needs to be reformed and determine the nature of future research in geopolitics, among a number of ideas he emphasizes the "transition from global geopolitical models to the level of regional geopolitical analysis." Therefore, from his point of view, "the region itself, as a complex set of political aspirations of different states connected by a specific geographical structure, should occupy a central place in geopolitical analysis" [5]. In the context of a bipolar world, especially in the context of the growing global crisis, one of such "platforms", in our view, is the Central Asian region, which today has a large number of countries with great interest in the region.

Therefore, the question arises: how can and should be studied the events and processes taking place at the level of a particular region or subregion. Moreover, in the context of increasing localization - when countries and peoples are intertwined, how can this be done at a time when global factors are directly reflected in any "platform", especially in the "platforms" where the world's major "players" have strategic interests? At a glance, the answer to these questions may be as follows: it is advisable to apply methods (or techniques) that are simply in keeping with the nature of the events or processes that interest us. And if necessary, non-traditional methods (techniques) will definitely have to be used, no matter how strange it may be for researchers who think inertially in the old-fashioned, normal mode. However, it should be noted that the category, which is a completely traditional instrument of research work for some scientific disciplines, may be an untapped reserve in new disciplines, such as geopolitics, which is still far from the real scientific position.

From our point of view, this is the situation in modeling, which is widely used in the scientific environment (especially in the natural sciences and technical sciences) [10]. N.V. Gorelova and V.N. In their research, Ryabtsev discussed one of the types of modeling with a special focus on the analytical capabilities of cognitive modeling, exploring what and how such modeling can help to study geopolitical processes at the regional and subregional levels.

The work of the "classical" geopolitical models of the world (Mexen, McKender, Chellen, Haushofer) is characterized by a high degree of generalization (H. McKender was able to describe our colorful and diverse world in the form of only three geopolitical zones), hence their schematic and global, especially at the local level, which makes it difficult (or impossible at all) to use them to predict the development of geopolitical processes. In modeling, very small units, even the smallest states, need to be considered as subjects of the world political process, not to mention large regions, which requires the development of appropriate models and methods of research and decision-making.

To date, there are not many research tools available to researchers in geopolitics [2], and they are as follows:

- mapping - working with a map, the source of information - a geographical map and a written text explaining it;
- geocartoids [13] - the use of drawings depicting this or that real or imagined area, but in a simplified way, without strictly following all the rules of classical mapping;
- the use of conceptual-graphical modeling, the simplest analogues of which are structural-logical schemes;
- analysis of quantitative data, i.e., one or more numerical parameters or numerical relationships.

The basic of these tools is a map, or more precisely, a text-supplied map (annotated map). Since working with a map is almost a major component of the arsenal of traditional (classical) geopolitics, classical geopolitics, which manipulates the representation of a typical geographic map, is "tied" to the recorded geographical area and based on this deduction of most of its concepts and postulates. This is where the theory of geographical determinism comes from.

According to D.N. Zamyatin, there is another shortcoming in the work of "classical" scientists (especially in terms of modernity), namely - "the lack of conceptual (cognitive) distance between the key geographical concepts and their corresponding geopolitical devices" [7]. In this case, the geopolitical symbols of a particular country or a particular region are formed in the field of content, created on the basis of combining cartographic images and their textual interpretations [8].

Today, the arsenal of geopolitical research is being further enriched while key components such as maps and text are preserved. It is gratifying to note that in the work of scientists, the manipulation of geopolitical concepts that are not directly dependent on the "interpretation of the map" is becoming more and more a priority, "working with virtual geopolitical ensembles (emblems) that are seen as the field of action of certain political forces."

It should be noted that modern geopolitical research pays more and more attention to modern methods of studying complex systems, such as systematic approach and computer modeling [14,17,18], situation analysis [11,12], statistical analysis of data, etc.

Although the arsenal of geopolitical research is evolving, the question of what could ultimately constitute this entire geopolitical instrumentality remains open. Under what approach, style, methodology can all this work effectively and should? In our opinion, working with models of different complexity and scale, that is, geopolitical modeling is an effective way to know geopolitical events and processes at the global level, as well as geopolitical events and processes at the level of a particular region-subregion of the world. This is a requirement of today's life and the state of science, and today it can serve as a way to "infiltrate" the processes characterized by complex nonlinear systems and multifactorial combinatorics in the context of growing instability and turbulence in international relations.

What are the advantages of geopolitical modeling? It is already difficult to take into account all the components of the gamma of the foreign policy process, to form a clear picture of the subject and to predict its development, without conditional constructions that already appear in the literature as an analogue of the object of study. Today, socio-political and international systems are so complex that they have so many interconnections and feedback that it becomes increasingly difficult to predict their development on the basis of intuition and experience alone. "[19] from the series) it is very difficult to work in forecasting mode without losing geopolitical modeling. This moment is very important, because modeling is not only a reflection of the whole set of elements and connections of players

involved in this or that geopolitical game or international situation (using the method of concise data), but also estimating their capabilities, evaluating the results of alternatives when the number of alternatives is large. It also allows them to be “excluded” from considering different options for their conclusion.

Modern methods of simulation modeling can be used for geopolitical modeling [18], such modeling is not currently used in geopolitics. It can be assumed that the modern requirements of comprehensive structural simulation modeling of geopolitical processes are satisfied by multidimensional statistical analysis of non-contradictory, but complementary methods of simulation modeling, such as structural dynamics, cognitive modeling, agent modeling.

In our opinion, the use of cognitive modeling techniques with the involvement of elements of structural dynamics in the study of geopolitical issues is expedient.

The development strategies and trends of the world economy and the economic development of different countries are under the constant attention of different politicians and economists.

The development prospects of a country are directly related to the structural changes and processes taking place in national economies. In order to accurately and qualitatively assess the economic potential of countries in the world community, it is necessary to analyze the economic development of a particular community member as a process, because the processes taking place in the country cover all sectors of the economy. At the same time, the level of economic development of the whole country is determined primarily by the economic potential it has achieved.

In the conditions of modern secular economy, several types of economic potential are distinguished [9].

- production potential based on the development of financing funds (investment);
- Natural resource potential, which characterizes the ecological potential;
- regional potential;
- The potential for the involvement of new technologies in the activities of the economic system (innovation);
- labor potential, taking into account the quality and scale of labor resources.

This article (study) examines the geopolitical model of relations between the countries of Central Asia [1]. To do this, we refer to the World Bank's open database [2].

First of all, we form a list of countries to be analyzed:

- ✓ Uzbekistan;
- ✓ Kazakhstan;
- ✓ Tajikistan;
- ✓ Afghanistan;
- ✓ Kyrgyzstan.

We also include countries with a dominant status in this list: Russia and China.

The completeness, relevance and necessity of all data were taken into account in the selection of criteria for the assessment of economic potential, and the following were selected:

Mortality rate of children under -5 years. This indicator reflects the effectiveness of large-scale social reforms in the country.

- migration indicator. This indicator, measured by the ratio of migrants to emigrants, reflects the conjuncture of the labor market and the attractiveness of long-term residency in this country;
- The share of the population living in rural areas. It shows the share of the population living outside the city limits, mainly engaged in agricultural production.
- Foreign investment in the country's economy (US dollars). The use of the country's private resources and the funds of banks in neighboring countries characterizes the attractiveness for foreign investors and allows us to reflect on the economic stability of the country.

Annual GDP growth rates. One of the main economic indicators. Describes the growth rates of the country's domestic economy.

Annual inflation, in percent. It shows how much the national currency of the state has depreciated.

- The ratio of the unemployed to the working population. This figure shows the share of the unemployed population in the working-age population.
- The share of the population using electricity. Shows the percentage of electrified settlements in the state.
- Articles published in scientific journals by state grants. Describes the research activities of the state and shows the scope of research in fundamental areas.
- distribution of SO₂ into the atmosphere. The level of SO₂ air pollution is a negative factor, indicating the level of development of industry and public infrastructure.
- number of aircraft. Air transport is relatively technological and expensive. Its existence reflects the level of development of the country.

The existence of railways. The construction of railways is a laborious and expensive process, and although railways depend on the territory of the country, it depends on the level of development of its infrastructure.

- The share of land involved in agriculture. Central Asian countries are mainly engaged in the export of agricultural products, so this indicator can also be considered as a criterion. At the same time, it should be noted that the land allocated for agriculture is not correlated with the number of rural population in developed countries, but shows the level of development of this sector.
- the number of people living in cities. Determines the growth rate of the urban population.
- birth rate. Mortality rate. Both social benefits and attendance attitudes toward population growth, the state's attitudes toward population growth, and population aging reflect the positive nature of this indicator.

Let us consider the laws of change of some of the given indicators:

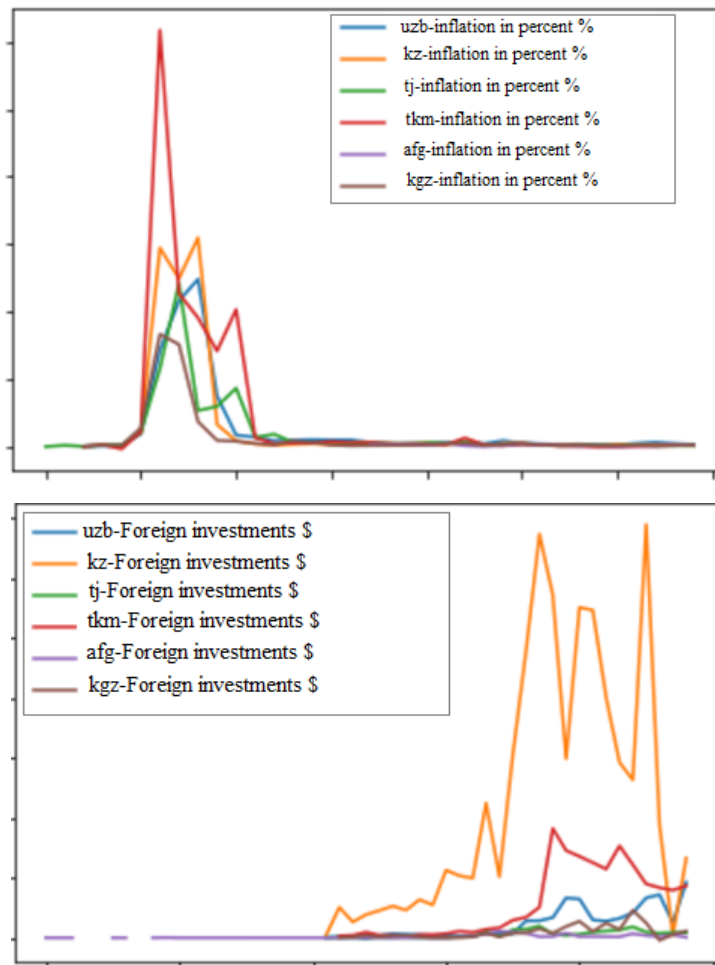


Figure 1. Illustration of economic indicators of Central Asian countries

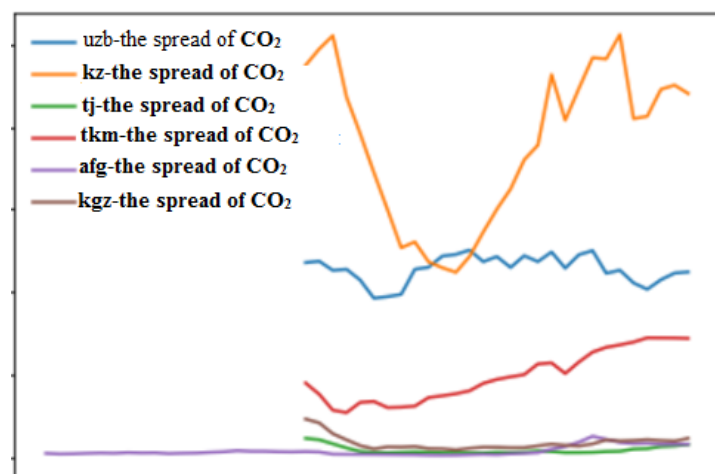


Figure 2. An illustration of the economic performance of Central Asian countries.

Above were the indicators of various economic, social, demographic and infrastructural sectors. This approach allows an assessment of the country's potential from the author's perspective.

Python programming language was used to import, compile and process indicators [3]. Data from 1971-2020 of these indicators were collected and used.

Clearly, there may be interruptions in the aggregated database due to the specifics of the region, the different development periods of the countries, and the closed conditions of the economy. In these cases, the data interruption was supplemented by medianalytic data.

To get the next round in the import of each indicator, we put a prefix to the name of the country:

➤ uzb-Migration indicator.

➤ kz-Migration indicator.

So we get a size with a matrix of 120 figures equal to 50x120.

Based on the data of this matrix, using the programming language, we construct a correlation matrix of indicators using the following formula [16].

$$r_{xy} = \frac{\sum(d_x * d_y)}{\sqrt{(\sum d_x^2 * \sum d_y^2)}} \quad (1)$$

Bunda;

r_{xy} is the correlation coefficient of x and y stock price indicators

dx is the difference of any x value from the average value of this series;

dy is the difference between the performance of any y series and the average performance of that series

Here is an example of the calculation of SO₂ distribution for Uzbekistan / Tajikistan.

To calculate the regression parameters, we create a calculation table:

Table 1.Data for calculating the correlation coefficient

$$M_x = 222936$$

$$M_y = 111594$$

X - M _x	Y - M _y	(X - M _x) ²	(Y - M _y) ²	(X - M _x)(Y - M _y)
-18716.	2766.	350288656.	7650756.	-51768456.
-18716.	2766.	350288656.	7650756.	-51768456.
-2486.	496.	6180196.	246016.	-1233056.
2624.	-214.	6885376.	45796.	-561536.
84.	-4244.	7056.	18011536.	-356496.
-16296.	-10064.	265559616.	101284096.	164002944.
-17706.	-6184.	313502436.	38241856.	109493904.
33404.	1536.	1115827216.	2359296.	51308544.
18554.	-304.	344250916.	92416.	-5640416.
19254.	13446.	370716516.	180794916.	258889284.

$$N = 10$$

$$\sum(X - M_x)(Y - M_y) = 472366260$$

$$r = \sum((X - M_x)(Y - M_y)) / \sqrt{((SS_x)(SS_y))}$$

$$r = 472366260 / \sqrt{((3123506640)(356377440))} = 0.4477$$

For this case, r is equal to 0.44, which indicates that there is some correlation between the indicators, but it is not possible to say with certainty how they may affect each other. These indicators may be related to other factors.

The correlation coefficient [6] is a standardized indicator, the amount of which can vary from + to -. If the indicators under study are not related, the correlation coefficient will be zero. If the correlation coefficient is +1 or -1, the indicators under study are completely correlated and they are proportional to each other, their interdependence is represented by a linear function [4]:

$$y = a + b_1x_1 + b_2x_2 + \dots +$$

its graph corresponds to the regression line. If the correlation factor is greater than zero, it indicates that there is a direct relationship between the indicators. If the correlation coefficient is less than zero, the relationship is inverse. If the correlation coefficient is less than 0.3 per module, the relationship between the indicators is weak. If the correlation coefficient is 0.3: 0.7 per module, the relationship is average. If the value of the correlation coefficient per module is greater than 0.7, the bond will be strong. Then we have a matrix of size 120x120, when the cells will have a number indicating the relationship of the two economic indicators.

If we visualize this set of data (unoriented) in the form of a graph, the relationships between the nodes will depend on the correlation coefficient, and we get the following view.

As can be seen from the graph, the indicators with the largest correlation are in the form of a group in the middle of the graph, the indicators with weak relationships are located at the edge of the graph.

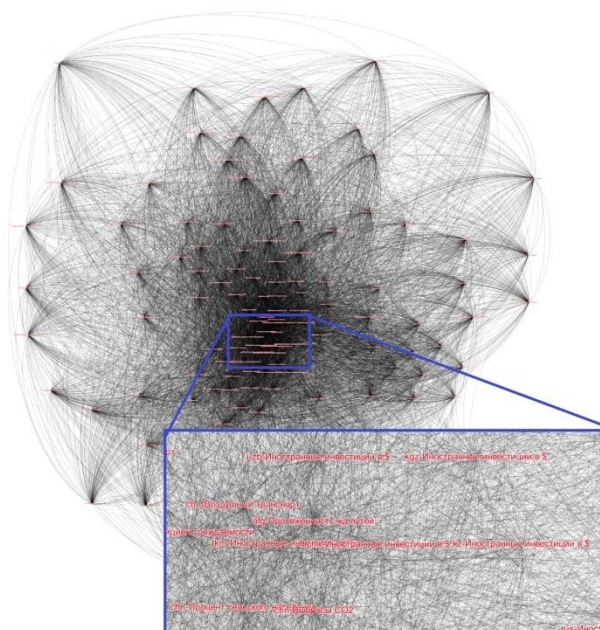


Figure 3. Growth indicators of countries

If we look at the data again, we see that in the middle of the graph are the following indicators:

- Growth rate of children under 5 years of age;
- Birth rate;
- Percentage of rural population;
- Air transport;
- Distribution of SO₂;
- Inflation

These figures vary with equal intensity in the countries under consideration. In other words, we can see that with the development of the countries in the region, a decrease in child growth is observed.

The number of air transport, which is an indicator of transport infrastructure, will increase. To this can be added the release of SO₂ into the atmosphere. All of these criteria are interrelated with economic and geopolitical processes in Central Asia. Based on this, trying to find a "point of abrupt change", which allows you to determine the coefficients and then determine the maximum correlation coefficient relative to other countries.

Table-2. Countries that are more dependent on the situation in the region

Kyrgyzstan	350
Russia	377
Afghanistan	396
China	404
Tajikistan	417
Uzbekistan	435
Kazakhstan	447
Turkmenistan	447

Table-3. The most influential countries in the region

Uzbekistan	363
Kazakhstan	372
Afghanistan	389
Tajikistan	404
Kyrgyzstan	414
Uzbekistan	421
Russia	434
Turkmenistan	477

According to the above tables, it can be concluded that the performance of Kyrgyzstan and Russia is less dependent on the performance of other neighboring countries. The fact is that these countries do not have a leading position in the region, and the processes taking place in these countries also depend to a lesser extent on other countries.

The data in Table 3 show that China has a strong influence on other countries with its internal processes. It is also possible to see that some indicators of Uzbekistan are correlated with the indicators of other countries.

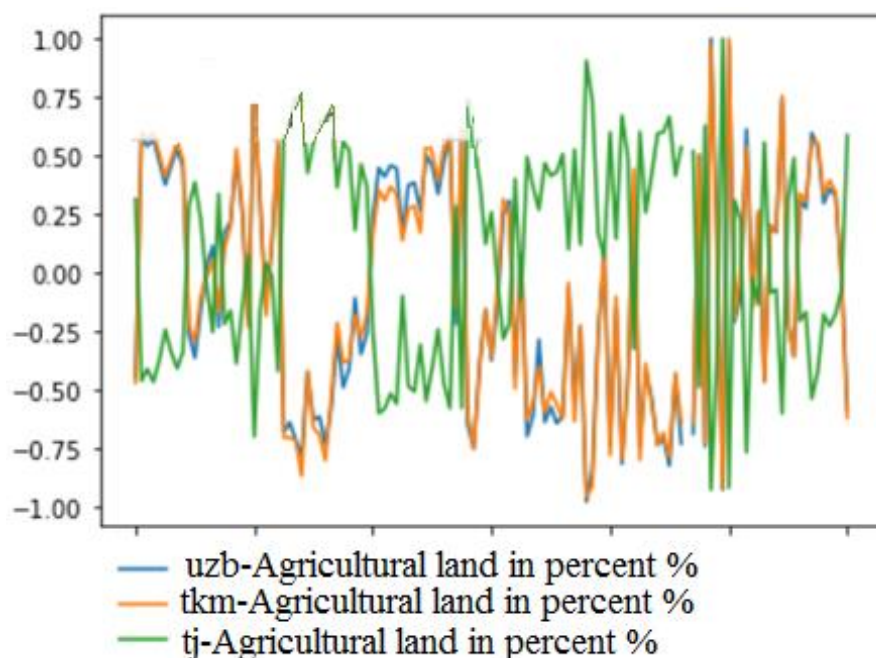


Figure 4. An example of correlation similarity in agricultural work

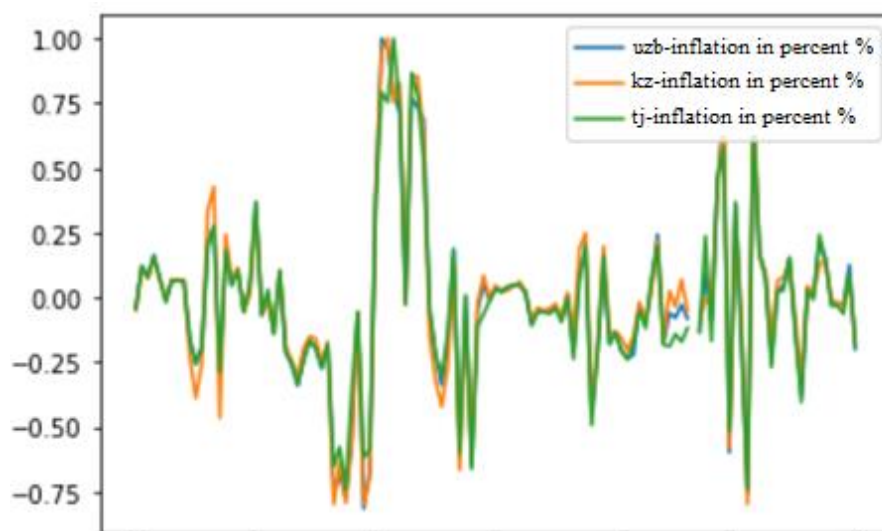


Figure 5. Example of correlation similarity in inflation criteria.

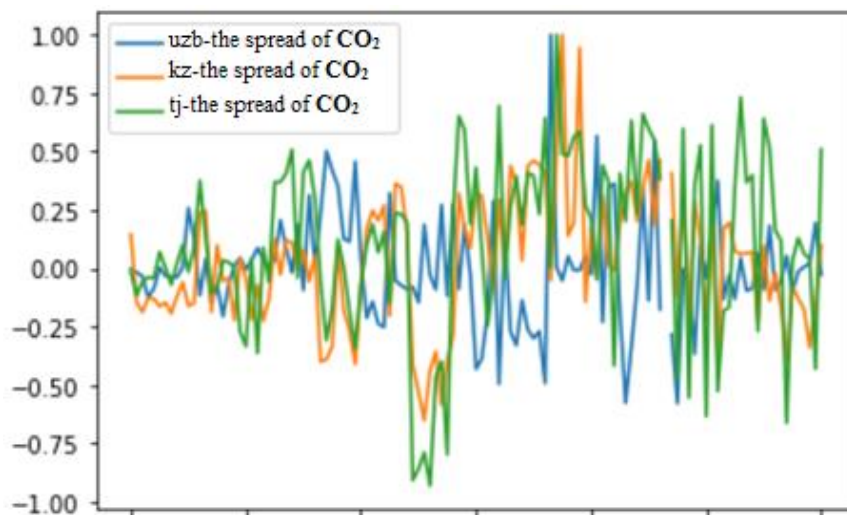


Figure 6. In the example of correlation similarity in the CO₂ criterion

Conculasion

Based on the indicators analyzed without taking into account Russia and China, almost all countries in the region have a parallel development trend and there are no dominant countries. Deviations from the average do not indicate the self-sufficiency (samodostatochniy) of any indicator or country, but rather its closure to the outside world.

Based on the analytical comparison, it can be concluded that among the Central Asian countries, Uzbekistan is maximally integrated into the international economy. But it can't make a serious impact right now.

It also has a strong influence on the development of Chinese territory against stereotypes. Its economic and domestic social policy is so powerful that it has a strong influence on the point of change of the graph, and Central Asian countries even contribute to the "decline" in the development of Russia. This can be seen in the volume of foreign investment in both countries.

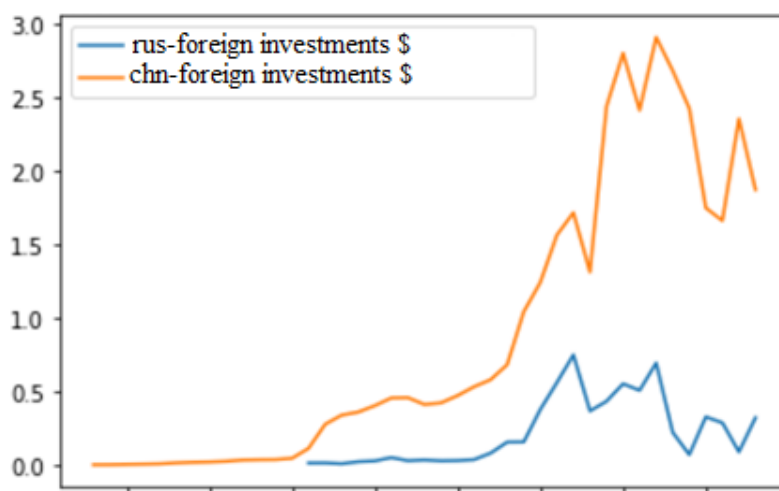


Figure 7. Dynamics of inflow of foreign investments to Russia and China

The spread of CO₂ is also a strong marker of the country's development.

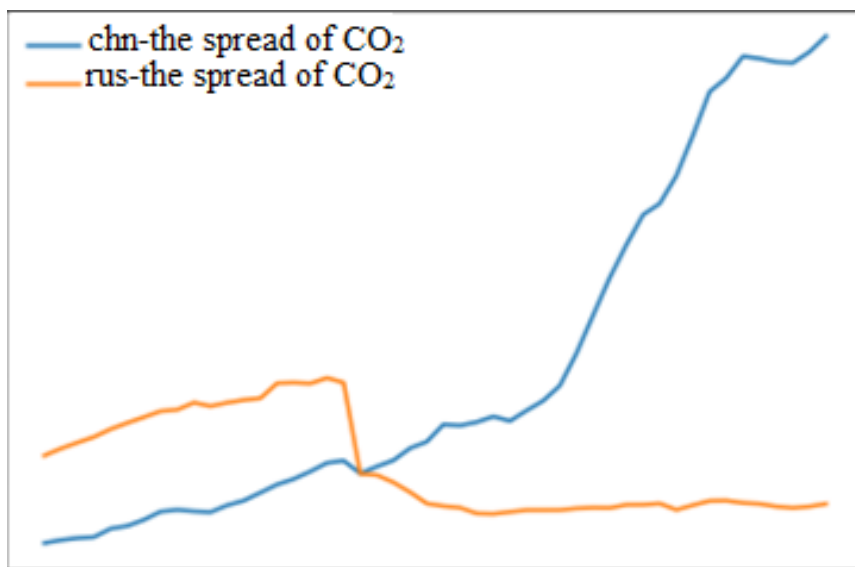


Figure 8. Dynamics of CO₂ distribution in Russia and China

In this case, the indicators of SO₂ dispersion values are not so important, the dynamics of the indicators are important for us.

Based on the above, it can be concluded that the most positive change in the economy of Uzbekistan is influenced by the markers of the Chinese economy. This means that our country needs to develop cooperation with China, both at the macroeconomic and small business levels. Over time, the point of change of the graph ("Tochka vozmusheniya") will tend to shift towards China's economic indicators.

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