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SOCIAL INEQUALITY IN KAZAKHSTAN: PARAMETERS AND INDICATORS

Social inequality has always been and remains one of the key problems of any economic system, to which both society itself and the state as a whole pay attention. In the article, this problem is inextricably linked with such aspects of state economic regulation as taxation, insurance, investment, which requires a special study of all criteria and indicators for the effective provision of social security of the population.

The purpose of the study is to analyze social inequality in Kazakhstan using modern statistical methods such as cluster analysis and ARIMA modeling.

The scientific significance of the study is that it presents new insights to the analysis and modeling of social inequality in Kazakhstan. Practical significance can be observed in the analysis of parameters and dynamics of social inequality, which allows to identify vulnerable groups and focus on improving their social situation.

Cluster analysis is carried out because of data on social and economic characteristics of the population, to identify groups similar in terms of well-being. The ARIMA (Autoregressive Integrated Moving Average) method is used to model the dynamics of social inequality.

The results of the study allowed us to identify the main parameters of social inequality in Kazakhstan. It was found that income inequality remains one of the most significant factors affecting the welfare of the population. Also, significant differences are observed in the level of education, access to health care and quality of housing conditions.

The study represents an important contribution to the understanding of social inequality in Kazakhstan, its parameters, and dynamics, as it allows us to assess the scale and structure of social inequality in Kazakhstan. Identify the most vulnerable groups of the population and identify the causes of their vulnerability. To develop forecasts for the development of social inequality and assess possible risks.

Key words: social inequality, poverty, employment, unemployment.

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Қазақстандағы әлеуметтік теңсіздік: параметрлері мен индикаторлары

Әлеуметтік теңсіздік әрқашан қоғамның өзі де, жалпы мемлекет те назар аударатын кез келген экономикалық жүйелердің негізгі проблемаларының бірі болды және болып қала береді. Мақалада бұл проблема салық салу, сақтандыру, инвестициялар сияқты мемлекеттік экономикалық реттеудің аспектілерімен тығыз байланысты, бұл халықтың әлеуметтік қорғалуын тиімді қамтамасыз ету үшін барлық критерийлер мен көрсеткіштерді арнайы зерттеуді қажет етеді.

Зерттеудің мақсаты ARIMA кластерлік талдау және модельдеу сияқты заманауи статистикалық әдістерді пайдалана отырып, Қазақстандағы әлеуметтік теңсіздікті талдау болып табылады.

Зерттеудің ғылыми маңыздылығы-ол Қазақстандағы әлеуметтік теңсіздікті талдау мен модельдеуге жаңа түсініктер береді. Практикалық маңыздылығын халықтың осал топтарын анықтауға және олардың әлеуметтік жағдайын жақсартуға күш салуға мүмкіндік беретін әлеуметтік теңсіздіктің параметрлері мен динамикасын талдауда байқауға болады.

Кластерлік талдау халықтың әлеуметтік және экономикалық сипаттамалары негізінде, әл-ауқат деңгейіне ұқсас топтарды анықтау үшін жүргізілді. Әлеуметтік теңсіздік динамикасын модельдеу үшін Arima (Autoregressive Integrated Moving Average) әдісі қолданылады.

Зерттеу нәтижелері Қазақстандағы әлеуметтік теңсіздіктің негізгі параметрлерін анықтауға мүмкіндік берді. Табыс теңсіздігі халықтың әл-ауқатына әсер ететін маңызды факторлардың бірі болып қала беретіні анықталды. Сондай-ақ, білім беру деңгейінде, медициналық көмекке қол

Зерттеу Қазақстандағы әлеуметтік теңсіздікті, оның параметрлері мен динамикасын түсінуге маңызды үлес болып табылады, өйткені ол Қазақстандағы әлеуметтік теңсіздіктің ауқымы мен құрылымын бағалауға мүмкіндік береді, халықтың ең осал топтарын бөліп көрсету және олардың осалдығының себептерін анықтау, әлеуметтік теңсіздіктің даму болжамдарын әзірлеу және ықтимал тәуекелдерді бағалау.

Түйін сөздер: әлеуметтік теңсіздік, кедейлік, жұмыспен қамту, жұмыссыздық

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Социальное неравенство в Казахстане: параметры и индикаторы

Социальное неравенство всегда было и остается одной из ключевых проблем любых экономических систем, на которую обращают внимание как само общество, так и государство в целом. В статье данная проблема неразрывно связана с такими аспектами государственного экономического регулирования как налогообложение, страхование, инвестиции, что требует специального изучения всех критериев и показателей для эффективного обеспечения социальной защищенности населения.

Цель исследования заключается в анализе социального неравенства в Казахстане с использованием современных статистических методов, таких как кластерный анализ и моделирование ARIMA.

Научная значимость исследования заключается в том, что оно представляет новые инсайты к анализу и моделированию социального неравенства в Казахстане. Практическую значимость можно наблюдать в анализе параметров и динамики социального неравенства, которая позволяет выявить уязвимые группы населения и сосредоточить усилия на улучшении их социального положения.

Кластерный анализ проведен на основе данных социальных и экономических характеристиках населения, для выявления групп схожих по уровню благосостояния. Для моделирования динамики социального неравенства используется метод ARIMA (Autoregressive Integrated Moving Average).

Результаты исследования позволили выявить основные параметры социального неравенства в Казахстане. Обнаружено, что неравенство в доходах остается одним из наиболее значимых факторов, влияющих на благосостояние населения. Также существенные различия наблюдаются в уровне образования, доступа к медицинскому обслуживанию и качеству жилищных условий.

Исследование представляет собой важный вклад в понимание социального неравенства в Казахстане, его параметров и динамики, так как она позволяет оценить масштабы и структуру социального неравенства в Казахстане, выделить наиболее уязвимые группы населения и выявить причины их уязвимости, разработать прогнозы развития социального неравенства и оценить возможные риски.

Ключевые слова: социальное неравенство, бедность, занятость, безработица.

Introduction

Today, in the context of the post-COVID development of global economies, the issue of social inequality is acute. Differences in income are one of the fundamental issues in a number of other factors in the growth of social inequality.

However, Stephen Pirken (2018), Professor of Psychology at Harvard University, in his work “Enlightenment Today” noted that globalization has led to an increase in income in most segments of modern society and the population in general has significantly improved its lifestyle. This statement causes a lot of controversy regarding ensuring not social equality, but social justice, as a solution to

the problem of balancing social development and its impact on economic growth.

There are many areas of study of this phenomenon, ranging from taxation and a fair distribution of income to the global building of a fair society based on the balance of three pillars: people, business and the planet.

From an economic point of view, the causes of social inequality, first of all, are the unequal attitude to property, the distribution of material wealth (Afanas`ev & Yuzbashev, 2012). This approach manifested itself most clearly under Marxism, when it was the emergence of private property that led to the social stratification of society and the formation of antagonistic classes. It should be noted that the

problem of inequality of access to resources lies in the fact that it is both a cause and a consequence of modern social inequality (Veselovskij, 2017). Thus, in the economic sphere, the problems of social inequality are expressed as follows: an increase in government spending on the production of certain goods or services, a partially unfair distribution of income (not those who actually work and use their physical strength receive, but those who invest more money), respectively, hence the unequal access to resources.

Within the framework of this study, we would like to focus on such an aspect of social inequality as the problem of poverty in the regional aspect. Kazakhstan in the World Bank ratings belongs to countries with lower middle income. This means that according to this method, the poverty line in Kazakhstan, according to the World Bank, is \$5.5 per day, which is a little more than 70,000 tenge per month (Jean-François Marteau, 2020). That is, one who earns in Kazakhstan less than 70,000 per month, according to the methods of the World Bank, is already a poor person. According to the official Kazakh methodology, only those who have an income below the subsistence minimum, that is, below 34,302 tenge per month as of 2021, are considered poor (Shaukenova, 2018).

Literature review

Social inequality is based on the structure of society, in which access to common and private goods is distributed unevenly. In the reproduction of such a system, each person, to the extent that depends on his social position, as a rule, participates daily. Improving the well-being of the population based on a gradual increase in real incomes of the population, reducing their excessive differentiation between different categories of the population and proper social security are the strategic goals of social development.

As Zhussupova, A. (2016) notes in her report, the issue of the potential impact of social inequality on the political and socio-economic situation in modern Kazakhstan is becoming extremely important.

Various theoretical aspects of social inequality in Kazakhstan and other countries have been studied by many foreign and domestic scientists.

For this research work, the main definitions and concepts related to social inequality are studied in the textbook Price & Feinman (1995). "Foundations of social inequality", which details five theoretical breakthroughs concerning the changing views on the emergence and institutionalization of inequality by

anthropologists and archaeologists. It has been suggested that this key socio-economic process should no longer be seen as a mere product of agricultural origin or high population stress.

The authors of the textbook "Social Inequality: Forms, Causes, and Consequences" Hurst, C., Fitz Gibbon, H., & Nurse, A. (2016) not only consider the specificity, prevalence, and extent of social inequality in the United States in a comparative context to show how inequality arises, how it affects people and what is being done about it, but they reveal in detail the features of the impact of the process of globalization on inequality at the international level and pay increased attention to disability, transgender issues, intersectionality, the experience of Muslims, the Hispanic population and immigration.

The relevance of the topic and the surge of interest in social inequality, which notes the presence of mechanisms that prevent the accumulation of advantages and increase inequality, are also evidenced by the works of many research authors (DiMaggio & Garip, 2012; Muratova et al. 2020; Orazayeva & Kurbanova, 2021), problems past, present, and future social inequalities in advanced industrialized societies, part of social policy has been directed against economic and social inequalities (Grusky, 2019), the problems of young middle-class people being more deserving than their working-class or poor counterparts, who are aware "rules of the game" regarding how institutions work, demonstrating the larger problem of social inequality associated with institutions (Lareau, 2015; Nurmagambetova et al. 2021; Weiß, 2005; Kurbanova et al. 2021). The author of "Injustice: Why social inequality still persists", Dorling, D. (2015) reviews and presents an analysis of contemporary issues and practices underlying inequality and a brief interpretation of the main reasons for the persistence of injustice in rich countries along with possible solutions. In his study, Blackburn, R. M. (2008) considers the questions and concerns of nine important interrelated bases of inequality, and that the zero point of inequality may not be achievable, but the real problem lies in the actual degree of inequality, which can be significantly reduced, as well as identifying the analysis of serious gaps and lack of integration (Goldthorpe, 2010), reviewing empirical evidence on the impact of (a) expanding access to universal child and early childhood education, (b) interrupting schooling for the summer holidays, (c) extending the school day, and (d) increasing the number of years of compulsory schooling (Raudenbush & Eschmann, 2015).

In order to understand in more detail the specifics of the impact of social inequality on where

people live, with whom they communicate and who they choose as friends and partners. From this point of view, the study of Bottero, W. (2007) "Social inequality and interaction" is interesting, which describes in detail the formation of social bonds in the process of social sorting, and tend to be similar to people in social class, race / ethnicity, religion and views.

In practice, studies in the social sciences (Bögenhold, 2001; Kurbanova et al. 2022) can enrich the basic material for lifestyle analysis and research related to the work of Thorstein Veblen, Georg Simmel, and Max Weber.

Methodology

Methodologically, it is imperative to rigorously define social inequality (as well as social equality) as the subject of scientific inquiry.

Social inequality extends beyond mere disparities in income, encompassing variations in various facets of individuals' lives. Conversely, numerous distinctions that individuals and families deem significant do not fall within the purview of social inequality. The delineation of parameters for measuring social inequality has been a subject of deliberation in both scholarly research and media discourse (Rakitskij, 2019).

Embracing scientific investigations that enrich our comprehension of the diverse factors contributing to social inequality is essential. This multifaceted issue impacts people's quality of life in myriad ways (Stiglitz, 2012).

Authors B. Rakitskij & G. Rakitskaja (2017) advocate for researchers to approach the study of social inequality with a robust theoretical framework, rather than solely relying on empirical observations. They propose conceptualizing social inequality as disparities in social status, which engender differences in quality of life.

According to Rakitskij (2019), social position is a form of individual' life engagement that is consistently replicable within a specific society. It is shaped by a collection of conditions and lifestyles realistically accessible to them, dictating their tangible opportunities, the trajectory of personal growth, and, ultimately, the societal archetype of personality.

Social status can be delineated by a fundamental and sufficient array of attributes, which encompass the following:

1. The position that an individual holds within the social structure, which determines whether they belong to an exploited or exploiting social group.

2. The degree of involvement in political power.
3. Level of participation in economic power or ownership.

4. Access to means of subsistence and development, including income, education, healthcare, housing, public services, and overall living conditions.

5. Exposure to environmental risks, both in natural environments and in settlements, including those related to production.

6. Protection against social risks and provision of social security.

The proposed approach diverges significantly from Western stratification methodologies by aiming to unearth the root causes of social inequalities rather than focusing on surface-level and fragmented characteristics. Rather than substituting social inequalities with non-social disparities, this comprehensive historical-materialistic approach aims to unveil profound and fundamental disparities among social groups and communities, including classes and castes.

Social inequality denotes disparities in social standing that can lead to notable variations in the quality of life and living conditions among social groups and communities. While this inequality is a typical feature of exploitative societies, in certain instances, it can be perceived as a significant injustice, prompting renewed efforts to combat it.

Irrespective of the researcher's initial standpoint, it is imperative to establish a well-defined core concept. Precise comprehension of the research subject is essential to avoid the confusion and convoluted prevalent in contemporary social science discourse.

Without examining social inequalities through an ideological lens, the methodology employed in studying them risks becoming ambiguous and inconsistent. In this context, methodology refers to applying principles derived from a particular worldview to knowledge acquisition, creative expression, and practical implementation. While this definition generally applies to all sciences, it is relevant in studying human behavior in society and the social sciences (Kopnin, 1964). Essentially, ideology shapes the methodology employed in scientific research, especially in examining society and human behavior within it.

Ideology typically encompasses a specific worldview or standpoint, including an ideal state of existence and the strategies and orientation for attaining it.

The practical nature of science ensures that the ideological consistency of social science stems from its partiality and is sustained by it (Rakitskij, 2017).

When investigating social inequality, it becomes crucial to address the following inquiries:

- Is any social inequality ever deemed acceptable or socially indispensable, universally or during specific historical epochs?

- Is it pragmatic and essential to aspire to the complete eradication of social inequality from society, or is it sufficient to merely constrain it?

Scientific inquiry doesn't aim to resolve these queries but rather to make an ideological decision. By confronting and resolving these issues, research on social inequality can circumvent ambiguity, inconsistency, and vacuous discourse, ensuring the investigation is grounded in a lucid and purposeful approach.

According to Parsons (1940), social stratification systems define class status through two key structural-functional components: the occupational division of labor and the kinship system. The occupational division of labor dictates that class status is primarily determined by professional achievements, which are assessed using universal efficiency criteria in socially functionalized domains. The kinship system manifests in socially functionalized areas, where family bonds are essential, even in environments promoting equal-opportunity ideologies. Various studies suggest that the contemporary evolution of kinship structures allows individuals to achieve professional mobility while maintaining family cohesion (Polyakova, 2014).

During the 20th century, three main methodological approaches – Marxist, Weberian, and structural-functionalism – provided different viewpoints on the essence of social inequality. These approaches shaped the theoretical and empirical structures concerning social inequality systems and social status or class development mechanisms in sociology. However, significant shifts in the theoretical examination of social inequality took place during the latter part of the 20th century, leading to the introduction of new methodological approaches.

Theoretical shifts in the examination of social inequality during the latter portion of the 20th century arose in response to significant societal changes occurring during that period. These changes encompassed modifications in the configurations of social inequality, which were mirrored and conceptualized within sociological theory. Thus, the scrutiny of concrete historical events parallels the scrutiny of their theoretical reconstructions. This article is formulated upon this premise, analyzing historical events to illustrate the transformation and waning of the Marxist theory of inequality centered on economic class, along with the progression of Webe-

rian (Weber, 2018) and Parsonsian (Parsons, 1940) methodological approaches. Researchers adopt diverse approaches and theoretical stances regarding the “labor society” and its eventual demise. However, they all pinpoint specific characteristic processes and phenomena contributing to the notion of the “end of the working society”. This concept was most extensively elaborated upon by Offe (1985).

Offe (1985) posits that the labor society, synonymous with the industrial society emphasizing the importance of the industrial sector, undergoes a significant shift with the decline of the working culture. This shift signifies a departure from the centrality of workers and their roles in production as the principal organizing principle of social structures. Conflicts over industrial production control cease to be the primary impetus for social development. The rationalization of technical and organizational relationships or economic means and ends through industrial capitalist rationality no longer holds sway as a rational approach leading to societal advancement.

Offe's (1985) propositions are not just theoretical constructs, but they are also backed by empirical evidence from sociological inquiries and real-world social phenomena. This evidence supports the idea that the concept of work is not an inherent societal structure, but rather a construct influenced by external factors. This understanding relegates industrial sociology to a specialized domain of applied research. Moreover, research shows that the realm of work no longer solely shapes public consciousness and behavior. This is evident in the diminishing role of socioeconomic status indicators in influencing electoral behavior and political engagement, even less so than religious affiliation. Similarly, social and political conflicts have shifted their focus from labor-capital dynamics to management.

In his work “Power without Property,” Berle (1959), a proponent of managerial theory, contests the conventional separation of ownership and control as illogical. He argues that control inherently entails possession; without control, ownership loses its essence. The notion of “ownership” merely reflects control over the means of production. Societies witnessed a “Power without Property” output paradigm in the mid-twentieth century. Consequently, the theoretical dissociation between ownership and control functions must yield a more profound understanding. In practice, ownership-based appropriation is waning, supplanted by robust power systems. Thus, property emerges as a specific manifestation of power.

All the above-mentioned points of view have been considered from a theoretical point of view.

But still the main purpose of applying the methods of cluster analysis and forecasting to identify the living standards of the population by regions

Cluster analysis and forecasting are powerful tools for studying the standard of living in different regions. They help to identify groups of regions with similar characteristics and to forecast future trends in living standards. The results of such studies can be used to develop effective social policies aimed at improving the living conditions of the population in different regions of the country.

The method of hierarchical clustering was used to identify clusters by regions. This method creates a hierarchical structure of clusters, gradually uniting regions with similar indicators of living standards.

Visually, the method of hierarchical clustering is represented in the form of a dendrogram.

The Box-Jenkins model (ARIMA (p, d, q)) was applied to forecast one of the main indicators of the standard of living of unemployment.

$$Y_t = c + \phi_1 Y_{t-1} + \phi_2 Y_{t-2} + \dots + \phi_p Y_{t-p} + \theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2} + \dots + \theta_q \varepsilon_{t-q} + \varepsilon_t,$$

where

- Y_t : time series value at time t
- c : constant
- ϕ_i : autoregressive coefficients ($i = 1, 2, \dots, p$)
- ε_t : white noise (random error)
- θ_i : moving average coefficients ($i = 1, 2, \dots, q$)

The initial model (ARIMA), was constructed using the given equation

Results and discussion

In Kazakhstan, poverty reduction is one of the urgent activities of state bodies, so various programs and measures to reduce poverty have been adopted, including such measures as increasing employment, reducing unemployment, increasing the efficiency of public works, improving vocational training and retraining, etc. on the basis of the main criteria for income – this is the subsistence minimum and the poverty line. At the same time, all these measures, in our opinion, require adjustment in terms of determining the main parameters and indicators.

Social inequality and poverty, despite the global nature of this problem, is less studied in Kazakhstan than in developed Western countries (Ostry et al. 2014).

The most important social factors in the regional aspect influencing social inequality and poverty are such indicators as the unemployment rate, the stan-

dard of living of the population, the level of employment of labor resources (Esping-Andersen, 1999).

Taking into account regional differences in the development of poverty reduction measures and the definition of income and employment policies, statistical research methods were applied.

For the study, analysis of variance (the “general linear model” method) was applied. It is based on correlation or regression analysis used in multivariate analysis. An ARIMA model was also built.

With the help of analysis of variance, significant regional differences in the level of unemployment were revealed. A hypothesis was put forward that, despite the fact that there is an imbalance between regions, the unemployment rate does not differ by region.

Especially globally, a regional imbalance is observed in terms of the level of employment of labor resources and the quality of life in the regions of the Republic of Kazakhstan.

As the former Vice Minister of National Economy of the Republic of Kazakhstan Madina Abylkasymova stated, “In the field of internal migration, the problem of regional imbalance of labor resources remains today. As a result of irrevocable migration from the northern regions of Kazakhstan to Russia, the demographic situation in these regions is deteriorating. Migration flows are attracted to regions with significantly higher per capita productivity growth.”

According to her, there is a personnel imbalance: in the northern regions, qualified personnel are most often required in industry, and migrants arriving in these regions, as a rule, do not have the necessary skills.

“At the same time, most of the migrants, having low qualifications, seek self-employment or employment in the sector of large cities and agglomerations, where there are more opportunities for employment. In the northern regions, these sectors are growing much more slowly” (KazTAG, 2022).

Currently, the labor market is experiencing a net outflow of skilled labor from Kazakhstan to Russia and abroad, and a net influx of unskilled labor with no vocational education.

All models were built using application software packages such as Gretl and R.

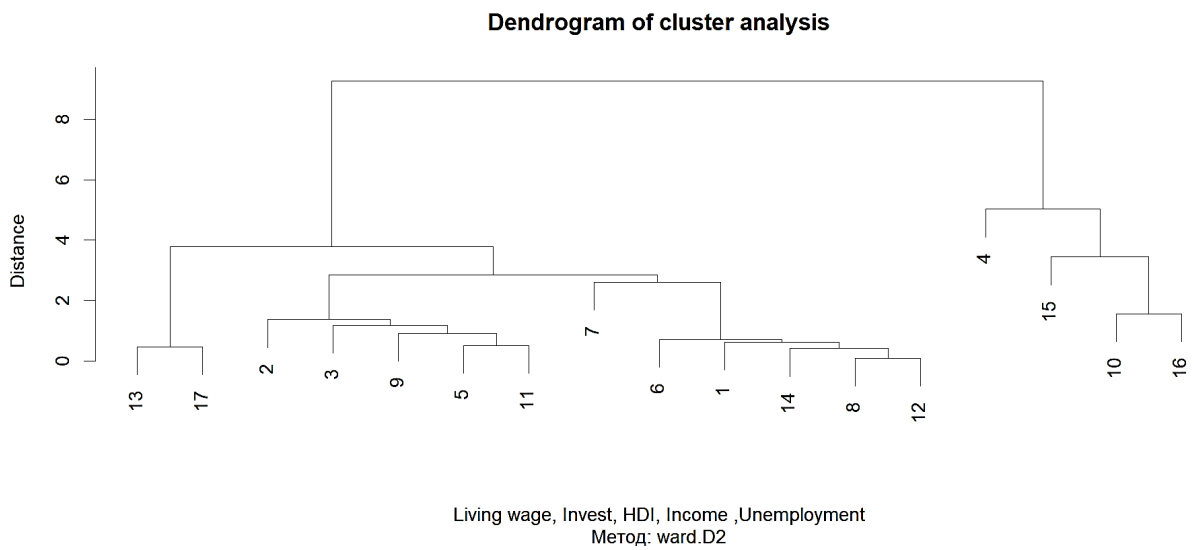
Using the ARIMA model, we built a short-term forecast for 5 years (2017-2022 years, and the representative year is 2022) ahead in terms of the unemployment rate in the Republic of Kazakhstan.

A cluster analysis of the regions was also carried out in terms of poverty indicators.

The initial data for this type of analysis were selected by determining the most important indicators characterizing the social inequality of the population. In this paper, the following variables were selected: the subsistence minimum, the human development index, the average nominal income, and the unemployment rate by regions.

To determine the number of clusters, we use a dendrogram, which is shown in Figure 1. On it we see a vertical hierarchical tree graph, with the help of which we determined that the optimal number of

clusters is 3 clusters. In this graph, the variables are combined with each other using the far neighbor method. The far neighbor method means by itself the union of the object the most distant element, which is located closer to the new object. The first combines the human development index, the average nominal income of the population and investment in fixed assets. In the second cluster, these data are combined with the subsistence minimum, and in the third, the unemployment rate by region is added to them.



We can show this dendrogram more clearly as follows.

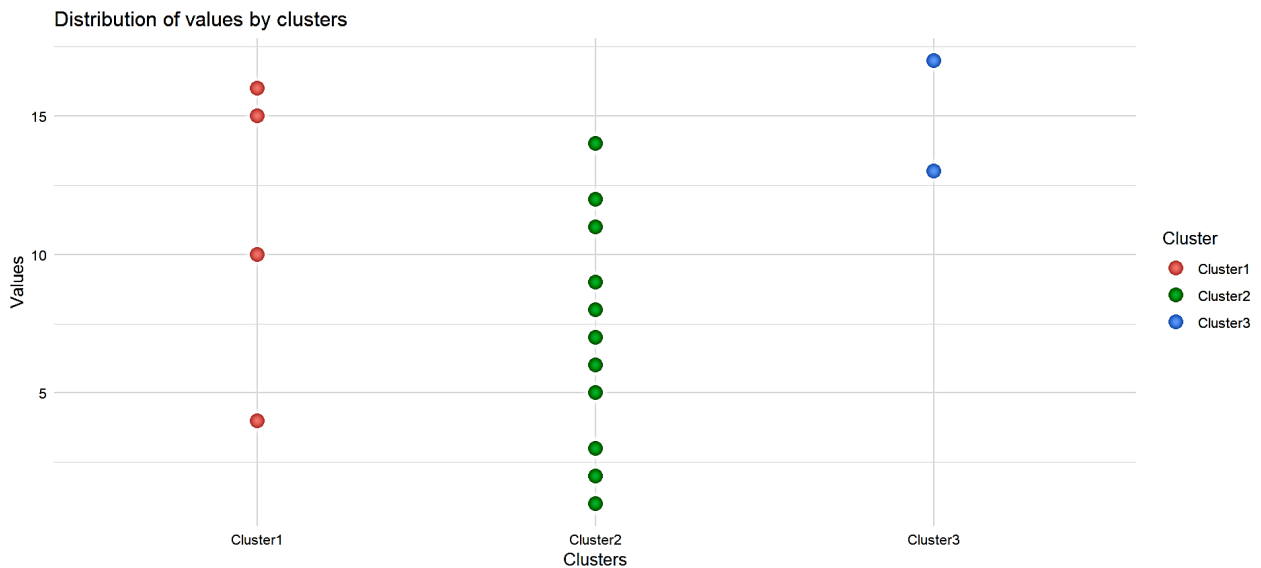


Figure 1 – Dendrogram

Note – compiled by the author on the basis of Stat.gov.kz [Electronic resource]

The predictors divided in this way are tested for the level of significance, since we reject the null hypothesis and accept the competing one, except for the investment indicator. The results are summarized in Table 1 (see Appendix – Tables (Table 1)).

In Figure 2, we see clusters by the level of predictors. In terms of unemployment, the regions included in cluster 3 are in the lead, this is due to the average income, which is very low compared to other regions. Also in last place are the regions of the

3rd cluster in terms of investments in fixed assets. The regions of the first cluster are slightly higher than the regions of the second cluster, which indicates a relatively low unemployment rate. The first cluster leads in terms of the average nominal income of the population, in terms of investment in fixed capital, the subsistence minimum, and, accordingly, the human development index. The regions of the second cluster have the lowest unemployment rate, as well as the cost of living and the human development index.

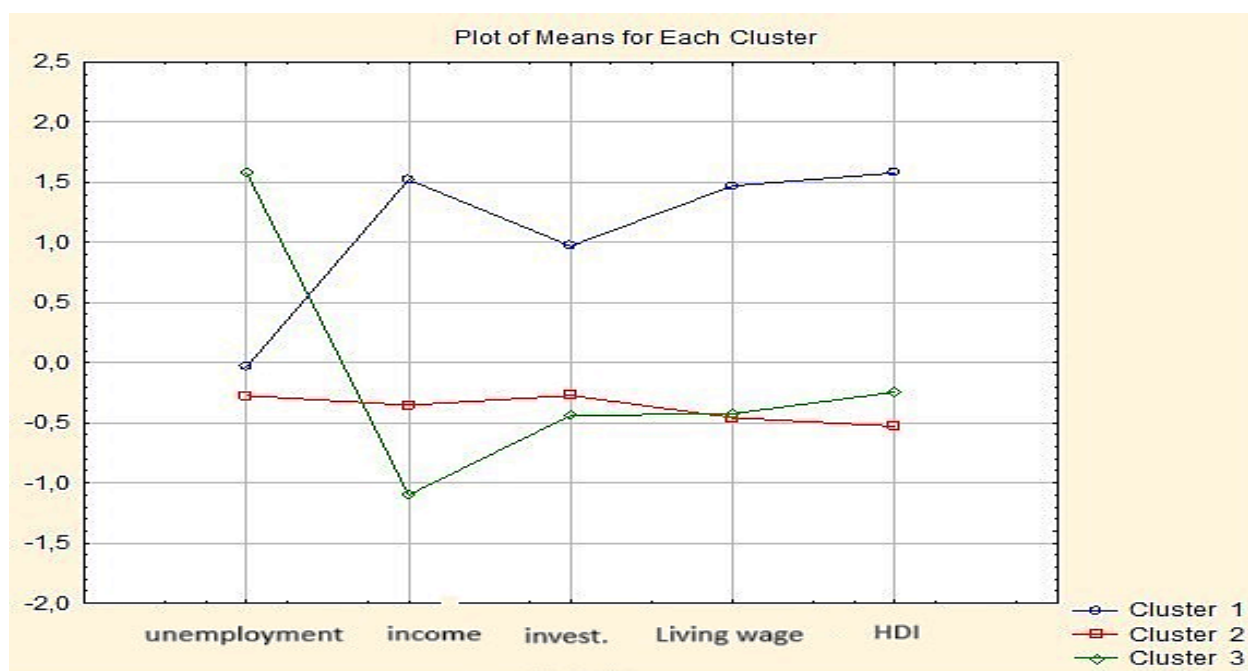


Figure 2 – Graph of clusters
Note – compiled by the author (QazStat, 2022)

The k-means method divides the regions studied in this case according to the principle of proximity of average values. Thus, the first cluster included Atyrau, Mangistau regions and the city of Astana. As we know, oil production and processing are developed in the first two regions. And precisely because of the concentration of raw materials in these parts, there are many foreign companies there. Accordingly, employees of foreign companies have higher wages than in national companies, and the city of Astana is the capital of Kazakhstan. Many residents of other regions that do not belong to this cluster come here to earn money, also to study, after which they settle in these cities and increase the number of educated labor forces in them.

Table 2 shows the distance between the average values of each region and the average value of the cluster (see Appendix – Tables (Table 2)). With an average unemployment cluster value of 4.775 in Mangistau and Atyrau regions, it is 4.8, in Astana it is 4.4, respectively. Of all the regions of the first cluster, the Mangistau region has the lowest average nominal income of 137.5 thousand tenge. And the highest is in the Atyrau region 210 thousand tenge. The highest human development index in the city of Astana is 0.82, and the average for the cluster is 0.74.

The second cluster (see Appendix – Tables (Table 3)) includes such regions as Akmola, Aktobe, Almaty, West Kazakhstan, Zhambyl, Karaganda,

Kostanai, Kyzylorda, Pavlodar, North Kazakhstan and East Kazakhstan regions.

The main difference between the regions of the second cluster and the first is that in the second cluster the average nominal income of the population, investment in fixed assets, and the subsistence minimum are much lower.

Of the above regions that are included in the second cluster, the lowest unemployment rate is observed in the Karaganda region, which is explained by the presence of factories for the processing and extraction of coal and other minerals. This region is also attractive to investors for the same reasons and is a leader in capital investment. In terms of average nominal income, the leader is the West Kazakhstan region, which is rich in natural gas deposits. The average human development index is 0.446. The third cluster includes the Turkestan region and the city of Shymkent (see Appendix – Tables (Table 4)). The city of Shymkent is located in the Turkestan region and was its center until 2017. The average nominal income is much lower than in the previous clusters, although the subsistence level is at the level of the second cluster, which also leads in terms of unemployment.

Let's start the analysis of variance with a strip chart. Which clearly shows us that the highest level of unemployment is observed in such regions as West Kazakhstan, North Kazakhstan, Turkestan, Almaty, Shymkent. These are regions that are included in high-risk areas.

Then the Anova model was built in the R program.

During the analysis, the null hypothesis was rejected and an alternative hypothesis was put forward, which confirmed that regional differences in unemployment rates are significant. Therefore, we conclude that the quality factor still affects the performance indicator. We make such an input based on the fact that the calculated Fisher criterion is greater than the tabular one and the p-value is less than 0.05 significance level.

We will check whether the conditions for the applicability of the analysis of variance are met:

- Is there homogeneity of dispersions?
- Do the residuals have a normal distribution?

To check the equality of variances, we use the Levene test best, the Barlett test is undesirable.

The null and alternative hypotheses for both tests are:

- H0: variances are equal
- H1: at least one variance is different

During the Leven test, the null hypothesis was confirmed: The p-value is 0.3085.

Since p-value = 0.3085, it is possible to reject the H0 hypothesis only with an allowable error of 30.85%. Therefore, the hypothesis of homogeneity of variances is accepted at the 5% significance level.

Do the residuals have a normal distribution?

Shapiro.test(a\$unemployment), Cramer-von Mises and Anderson-Darling tests. These criteria are less known, but usually work much better than the Lillifors criterion. They are implemented in the cvm.test() and ad.test() functions respectively: Cramer test – cvm.test(a\$unemployment), ad.test(a\$unemployment)

All tests for the normality of the distribution confirmed the hypothesis of the normality of the distribution.

Shapiro-Wilk normality test

W = 0.91405, p-value = 0.1171;

Cramer-von Mises normality test

W = 0.13324, p-value = 0.03529;

Anderson-Darling normality test

A = 0.70231, p-value = 0.05427.

Conclusion

The forecast for 5 years ahead in terms of the unemployment rate of the Republic of Kazakhstan was built using the ARIMA model in the Gretl program.

To determine which model we will use Ar(1) or Ma, a correlogram (see Appendix A) was constructed.

The graph showed that we will use the Ar (1) model, since, as we can see the ACD autocorrelation graph decreases slowly, and the PACF partial autocorrelation graph narrows very quickly to zero.

The forecast showed us that the unemployment rate in the whole of the Republic of Kazakhstan will decrease every year (see Appendix B).

If the forecast shows that the unemployment rate in the Republic of Kazakhstan (RK) will decrease, it may indicate positive economic and socio-demographic processes. Let us consider possible reasons that may explain this decrease. In some regions of the country, the decrease in unemployment may be associated with a decrease in the working-age population for demographic reasons, such as the aging of the population and a decrease in the number of young people entering the labor market. A decrease in the active population due to migration to other countries or lower birth rates may also contribute to lower unemployment as competition for jobs is reduced. SMEs can also have an impact: the development of SMEs, which are often an important source of jobs, can also contribute to lower unemployment.

Based on this analysis, we can conclude that the projected decline in unemployment in Kazakhstan may be the result of a combination of factors, including economic growth, economic diversification, government employment programs, improved skills of the population and demographic changes. It is important to note that a sustained decline in unemployment requires constant attention from the government and business to maintain economic activity and create new jobs.

The regional disproportions in frame of social inequality can be decreased by maintaining the demographic stability and by measures of the social development policy including poverty eradication. To do this, comprehensive strategies and programs should be developed for all areas where poverty exists, which are aimed at environmentally sound and sustainable use of the environment, resource mobili-

zation, poverty alleviation and eradication, employment and sustainable income generation opportunities.

Indicators of economically sustainable development, namely focus on investment in human capital, with special policies and programs to address the problems of rural areas, urban poor, women and children.

Based on the analysis of the forecast, it can be concluded that the projected decline in unemployment in Kazakhstan may be the result of a whole set of factors, including economic growth, diversification of the economy, government employment programs, improved skills of the population and demographic changes. It is important to note that a sustained decline in unemployment requires constant attention from the government and business to maintain economic activity and create new jobs.

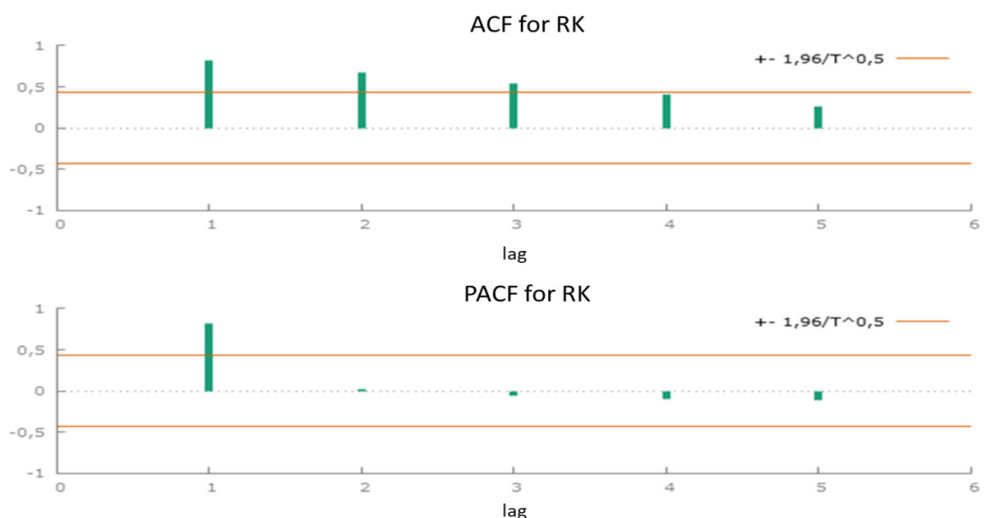
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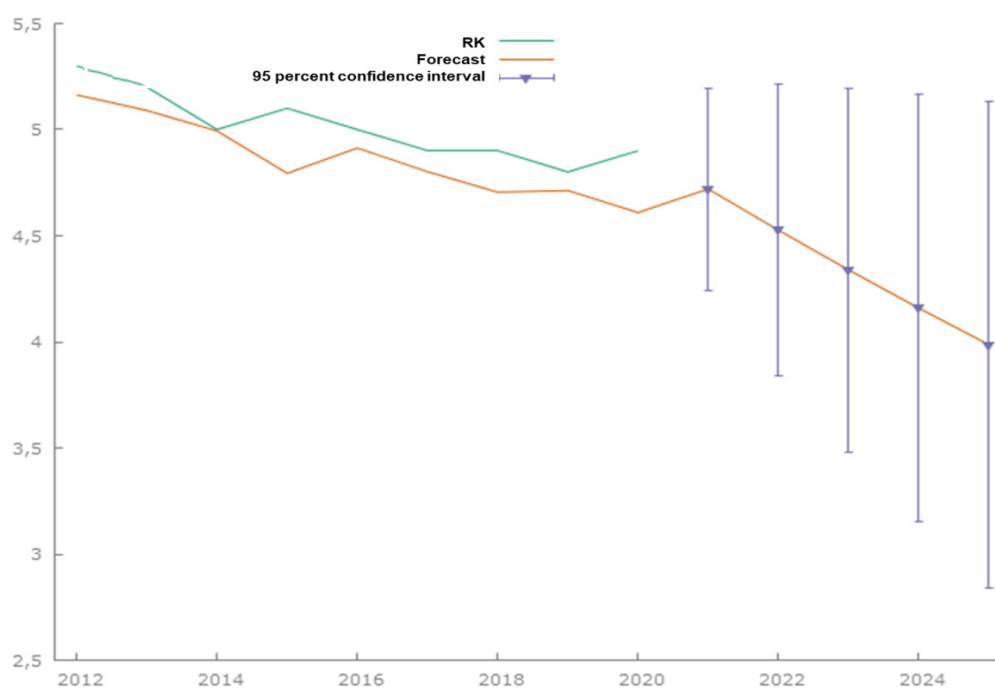
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Appendix A

Correlogram of the unemployment rate using the ARIMA model in the Gretl program



Appendix B
Forecast indicators of the unemployment rate in the Republic of Kazakhstan



Appendix – Tables

Table 1 – Predictor values

Variable	Analysis of Variance (Regions (2))					
	Between SS	Df	Within SS	df	F	signif. p
Unemployment	5,84174	2	10,15826	14	4,02551	0,041581
Income	13,04668	2	2,95332	14	30,92340	0,000007
Invest	4,96491	2	11,03509	14	3,14944	0,074232
Living wage	11,30759	2	4,69241	14	16,86833	0,000187
ICR	13,15230	2	2,84770	14	32,33000	0,000006

Note – compiled by the author (QazStat, 2022) [27]

Table 2 – Regions of the first cluster

Regions	Members of Cluster Number 1 (Регионы (2)) and Distances from Respective Cluster Center Cluster contains 4 cases	
	Distance	
Atyrau	1,485714	
Mangistau	0,820369	
Astana city	0,947885	
Almaty city	0,844723	

Note – compiled by the author (QazStat, 2022) [27]

Table 3 – Regions of the second cluster

Regions	Members of Cluster Number 2 (Регионы (2)) and Distances from Respective Cluster Center Cluster contains 11 cases
	Distance
Akmola	0,297552
Aktobe	0,389522
Almaty	0,470583
West Kazakhstan	0,378620
Zhambyl	0,327441
Karaganda	0,773545
Kostanai	0,196102
Kyzylorda	0,281453
Pavlodar	0,325257
North Kazakhstan	0,349306
East Kazakhstan	0,396948

Note – compiled by the author (QazStat, 2022) [27]

Table 4 – Regions of the third cluster

Regions	Members of Cluster Number 3 (Регионы (2)) and Distances from Respective Cluster Center Cluster contains 2 cases
	Distance
Turkestan	0,125019
Shymkent	0,125019

Note – compiled by the author (QazStat, 2022) [27]

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