Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Statistics

Bachelor Thesis

Statistical Analysis of Unemployment in Kazakhstan

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CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

BACHELOR THESIS ASSIGNMENT

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Business Administration

Thesis title

Statistical Analysis of Unemployment in Kazakhstan

Objectives of thesis

The aim of the work is to describe the changes in the unemployment rate in Kazakhstan and subsequent comparison among different ages and genders. Furthemore, the thesis will identify factors that affect the unemployment rate.

Methodology

Theoretical part of the bachelor thesis will be based on selected literature and other scientific sources. In the practical part, an analysis will be made using the IBM SPSS statistics software and database of the unemployment rate in Kazakhstan. The analysis will include basic descriptive statistics, methods of regression and correlation analysis and methods of time series analysis.

The proposed extent of the thesis

30-40 pages

Keywords

Kazakhstan, unemployment rate, structural unempoyment, cyclical unemployment, seasonal unemployment, frictional unemployment, regression analysis, correlation.

Recommended information sources

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Prague on 30. 11. 2023

Declaration

I declare that I have worked on my bachelor thesis titled " Statistical Analysis of Unemployment in Kazakhstan" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the bachelor thesis, I declare that the thesis does not break any copyrights.

In Prague on 30.11.2023 _____

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Statistical Analysis of Unemployment in Kazakhstan

Abstract

The sphere of labour is an important area of the economic and social life of society. This study will analyse an unemployment rate in Kazakhstan from 2001 - 2022. In the theoretical part the author will describe an unemployment, its main types and the differences between them, as well as the causes why different types of unemployment exist. Also, the author will give a short overview of each region in Kazakhstan.

Practical part will contain a comparison of an unemployment rate among different regions, gender and age. The author identifies the region with the highest average growth rate. For the basic descriptive statistics, the chain base index and the 1st differences will be found. For the more complicated analysis the author will use the quadratic trend function and based on this will made a forecasting of unemployment rate for the next years. In the Results and Discussion chapter the author will compare the real unemployment rate with the predicted results.

Keywords: Kazakhstan, unemployment rate, structural unemployment, cyclical unemployment, frictional unemployment.

Statistická Analýza Nezaměstnanosti v Kazachstánu

Abstrakt

Sféra práce je důležitou oblastí hospodářského a sociálního života společnosti. Tato studie bude analyzovat míru nezaměstnanosti v Kazachstánu v letech 2001 - 2022. V teoretické části autor popíše nezaměstnanost, její hlavní typy a rozdíly mezi nimi a také příčiny, proč různé typy nezaměstnanosti existují. Autor také podá krátký přehled každého regionu v Kazachstánu.

Praktická část bude obsahovat srovnání míry nezaměstnanosti mezi různými regiony, pohlavím a věkem. Autor identifikuje region s nejvyšším průměrným tempem růstu. Pro základní popisnou statistiku bude zjištěn index řetězové báze a 1. rozdíly. Pro složitější analýzu autor použije funkci kvadratického trendu a na základě toho provede prognózu míry nezaměstnanosti na další roky. V kapitole Výsledky a diskuse autor porovná skutečnou míru nezaměstnanosti s predikovanými výsledky

Klíčová slova: Kazachstán, míra nezaměstnanosti, strukturální nezaměstnanost, cyklická nezaměstnanost, frikční nezaměstnanost.

Table of content

Table of figures and tables

List of abbreviations

KZ - Kazakhstan

BNS - Bureau of National Statistics

ICLS - International Conference of Labor Statisticians

ILO - International Labor Organization

1 Introduction

The sphere of labor is an important and multifaceted area of the economic and social life of society. Unemployment as an economic phenomenon reflects the complexity of the process of matching the supply of labor with its demand. It is one of the most important factors in assessing the economy of the entire country. During the economic crisis in the country there is a high level of unemployment. The social consequences of unemployment are also severe. Unemployment is more than an economic disaster; it is also a social catastrophe. Depression leads to inactivity, and inactivity to loss of skills, loss of self-respect, moral decline, and social unrest.

Employment gives us confidence in the future. With a stable job and a regular salary, a human being feels more confident in all aspects of his or her life. This is one of the most important factors that affects our financial situation, as well as our emotional state. Recent events such as the COVID19 pandemic and the military conflict between some states affect the economic situation of many countries, as well as the people living there. Due to the scarcity of working places, there is involuntary unemployment. In this case, the state tries to provide financial support to companies and entrepreneurs. Unfortunately, the compensation does not match the amount that each of the above-mentioned needs, so unemployment will rise in the coming months.

2 Objectives and Methodology

2.1 Objectives

The aim of the work is to describe the changes in the unemployment rate in Kazakhstan for the period from 1991 to 2021. The goal is to build a clear picture of unemployment rate in different period of time and make a subsequent comparison among different regions and genders. Identify in which region the average growth rate of unemployment is the highest. And build a regression with time as an independent variable, to forecast the unemployment rate for the next years.

2.2 Methodology

The theoretical part of the bachelor thesis will be based on selected literature and other scientific sources. In the practical part, an analysis will be made using the IBM SPSS statistics software, Excel and the official data of the unemployment rate in Kazakhstan.

For the analysis of an unemployment rate was used Quadratic Trend Equation formula:

Equation 1 Quadratic Trend function

Quadratic function:

$$y_i' = a + b_1 x_i + b_2 x_i^2 \quad \textbf{(1)}$$

$$an + b\sum x_i + c\sum x_i^2 = \sum y_i$$

$$a\sum x_i + b\sum x_i^2 + c\sum x_i^3 = \sum y_i x_i$$

$$a\sum x_i^2 + b\sum x_i^3 + c\sum x_i^4 = \sum y_i x_i^2$$

where:

y *is dependent variable*

x *is independent,*

a, b*, and* ***c*** *are coefficients, with a not equal to zero.*

The time variable begins at x = 1 corresponding to the first time series observation continues until x = n corresponding to the last time series observation.

To evaluate the Forecasting Model will be used formula Relative Error of Forecast:

Equation 2 Relative Error of Forecast

$$\mathrm{REF} = \left| \frac{\hat{y}_t - y_t}{y_t} \right| \quad \textbf{(2)}$$

where:

y'_t – *Predicted Value*

y_t – *Observed Value*

3 Literature Review

3.1 Unemployment and its measurement

As an unemployed person we consider only those who are able and willing to work, physically and mentally, but unfortunately for various reasons cannot find a job. Unemployed person is older than 16 years old, non-institutionalized person without a job (COWEN, 2015). According to (DIAMOND, 2010) to be consider as unemployed, person must not only be jobless, but also actively look for a job and applying to positions.

Unemployment rate is a percentage of the labour force without a job. Labour force is a part of the population with sufficient physical development and sufficient intellectual (mental) abilities that are necessary for the implementation of a particular labour activity. (MANKIW, 1997)

Equation 3 Unemployment Rate

$$Unemployment\ Rate = \frac{Unemployed}{Unemployed+Employed} \times 100 = \frac{Unemployed}{Labor\ Force} \times 100 \quad \textbf{(3)}$$

3.2 Types of Unemployment and its causes

Without a doubt there are numerous reasons for the occurrence of unemployment. It can be caused by the demand or supply sides, by employers or employees. It is important to know that each type of unemployment has its own reasons. According to (Amadeo, 2022), there are seven causes of unemployment in general and four of them create frictional unemployment. The other two causes lead to structural unemployment. The last one, the seventh, causes cyclical type of unemployment.

3.2.1 Frictional unemployment

It’s easy to get a job if you're prepared to work for minimal wages. On the other hand, it takes considerable time and effort to find a job that meets your desires, at a wage that is mutually agreeable to you and the employer. This process of aligning employees with suitable employers introduces friction in the labor market, leading to what's known as frictional unemployment. In essence, frictional unemployment is a short-term situation caused by the inherent difficulties in matching employees to employers. (COWEN, 2015)

In regards of causes of frictional unemployment, it is possible to mention the individuals' willing decision to quit the position at work because people might decide to change the workplace for better conditions, career or career growth, especially if they have enough savings to afford looking for a new job. The second cause is when workers relocate. They are unemployed until they find a position in the new town (Amadeo, 2022). As it is mentioned by (Gordon, 2023), new entrants into the workforce cause the frictional unemployment, for example, recent college or high school graduates. It can be difficult to find a good option that can fit their knowledge and experience. It is the common problem of unemployment among the adolescents. Moreover, it can be when a person pursues higher education and leaves their job to do so (Herrity, 2023). After that individuals need to re-enter the workforce.

3.2.2 Structural unemployment

Long-lasting shocks or permanent aspects of an economy that create job-finding obstacles for some workers lead to what's known as structural unemployment. This is a form of persistent, long-term joblessness. When we say "persistent, long-term unemployment," we mean that a considerable number of unemployed individuals have been without work for more than a year, signifying a prolonged problem. One factor contributing to structural unemployment is significant, rapid shocks impacting the entire economy. The adjustment to these shocks can result in prolonged unemployment as the economy undergoes a time-consuming restructuring process. (COWEN, 2015).

Firstly, most of the focus is on the shift from manufacturing to services and the subsequent mismatching of the skills of the unemployed with what the service sector now demands in terms of skills (Thomas Janoski, 2014). Due to the technological advancements people have to obtain particular knowledge to be a high-qualified worker, it means that they have to be trained to find a new job. It is an issue of a mismatch of skills that workers have and the skills required by the employer. The replacement of employees by robots and computers leads to the long-term unemployment. Furthermore, it can be caused by job outsourcing. That is when a company moves its manufacturing or call centers to another country. Labor costs are cheaper in countries with a lower cost of living (Amadeo, 2022).

3.2.3 Cyclical unemployment

Cyclical unemployment is unemployment that is linked to the business cycle. The root cause of cyclical unemployment is a topic of contention among economists, primarily because the origins of business cycles themselves are disputed. For some economists, business cycles are primarily seen as reactions to tangible shocks that demand a shift of labor among different sectors. They view a business cycle as just an expression of the volatile, rather than smooth, economic growth process. In this perspective, cyclical unemployment is simply an extension of frictional and structural unemployment.

Other economists, typically of the "Keynesian" persuasion, believe that cyclical unemployment arises from a lack of aggregate demand. This concept of cyclical unemployment can be understood as a discrepancy between the overall wage level in an economy and the price level. The wages that workers seek are not aligned with the price level, making it too costly for companies to employ them. (COWEN, 2015)

Cyclical unemployment is caused by fluctuations in the aggregate demand for goods and services in the economy (Macroeconomics, 2023). Firms and companies start to lose their profit in case there is a decrease in demand from consumer side. Hence, companies are not interested in employing more workers and they can even reduce the number of workers they currently have. It leads to the increase in unemployment and explains its name. A stock market crash can cause this, resulting in consumers losing confidence in the economy and delaying their purchases. (Team, 2022)

3.3 Natural rate of unemployment

The natural unemployment rate is the rate of structural plus frictional unemployment divided by the total number of people in the labour force.

Equation 4 Natural Rate of Unempployment

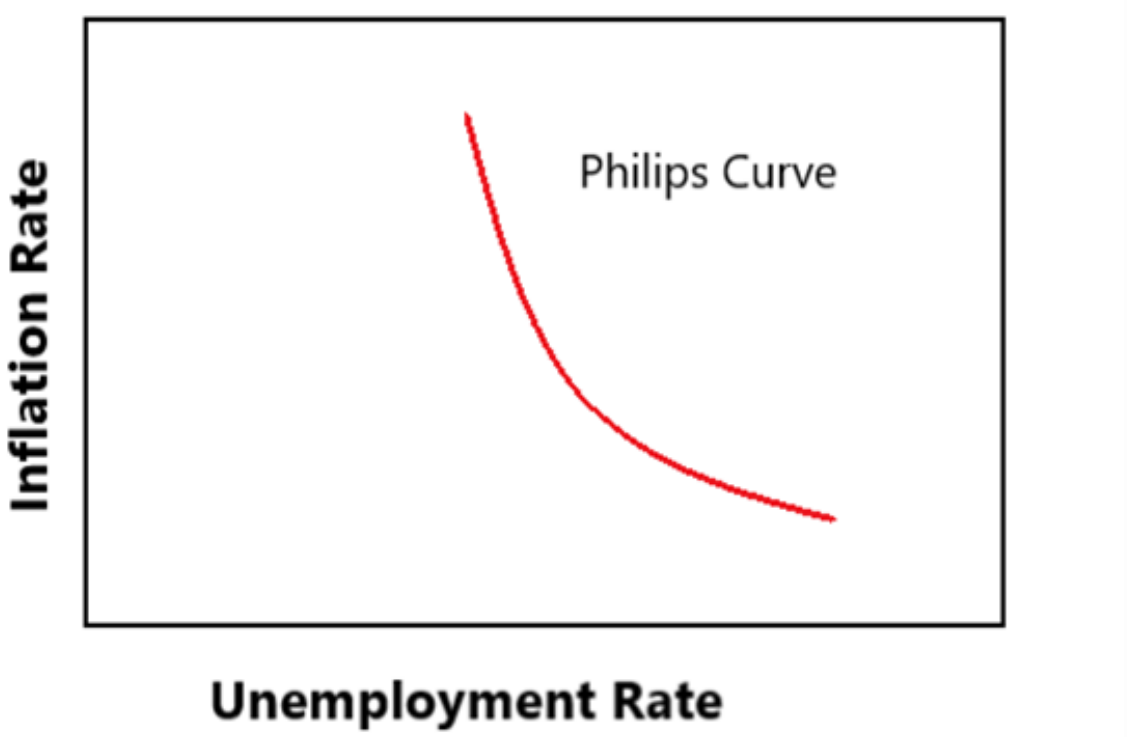
$$Natural\ rate\ of\ unemployment = \frac{(Frictional\ unemployment + Structural\ unemployment)}{(Total\ number\ of\ people\ in\ the\ labour\ force)} \quad \textbf{(4)}$$

The ideas of frictional, structural, and cyclical unemployment are not usually distinct and clear. If an employer put more advertisements and look for workers harder, it means that times are good. We can say that the cyclical rate of unemployment has fallen, but we also can say that the frictional rate of unemployment has fallen. Both meaning of the advance are

true. Likewise, on the strength of economic conditions will depend how effectively an economy swallows replaced auto workers (structural unemployment). An unemployment type can easily turn into another type. As an example, if workers remain unemployed for long, cyclical unemployment can change into structural unemployment, in results it will bring to employment opportunities and degradation of skills. (COWEN, 2015)

3.4 Philips Curve

Figure 1 Philips Curve



Source: (MANKIW, 1997)

The original Phillips curve assumed a trade-off between inflation and unemployment, implying a relationship between low unemployment and high inflation and vice versa. The basic idea of this theory is that as unemployment decreases, labour becomes scarce, forcing employers to offer higher wages to attract workers. This increase in wages in turn leads to higher costs for businesses, which ultimately causes an increase in the prices of goods and services, and therefore inflation.

However, over time, the Phillips curve has been subject to criticism and refinement. Some economists have argued that the relationship between inflation and unemployment is not as

strong or predictable as the original Phillips curve suggested, and that other factors, such as changes in productivity or global economic conditions, can also affect both variables.

Despite these criticisms, the Phillips curve remains a useful tool for understanding the relationship between inflation and unemployment and for informing economic policy decisions, such as the setting of interest rates and the use of fiscal policy measures to stimulate economic growth. (MANKIW, 1997)

3.5 Measurement of Unemployment Rate in Kazakhstan

In Kazakhstan the unemployment rate is defined as a percentage ratio of the number of unemployed to the number of economically active population. It is measured by u of National Statistics (BNS), which is a part of Agency for Strategic Planning and Reforms of the Republic of Kazakhstan.

All data are created according to new standards of employment, the 19th ICLS of the ILO.

Methodology for determining the number of self-employed and unemployed population by BNS:

• The collection of information is carried out by the method of conducting interviews, by direct visits by interviewers to households in the sample. Depending on the responses to the survey questions, the population is classified by labour force participation status into:

a) employed

b) unemployed

c) not in the labour force

In accordance with the ILO recommendations, in Kazakhstan the labour force is measured at the age of 15 years and older.

• Official statistical information on the unemployed population is compiled according to the following groups:

- by type of residence

- by region

- by gender
- by age groups
- by level of education
- for reasons of unemployment
- duration of unemployment. (QAZSTAT, 2023)

3.5.1 Overview of the regions

Figure 2 Regions of Kazakhstan (before 2022)

Source: (Smailov, 2013)

Akmola region

The region is located in the northern part of the republic, formed in 1939. The territory of the region is 146.2 thousand square meters. km. The center of the region is located in the city of Kokshetau. There are 17 districts and 10 cities, 5 settlement districts in the region. (Smailov, 2013)

As of October 1, 2023, the region's population was 788.3 thousand people, including the urban population - 444.8 thousand people (56.4%), rural population - 343.5 thousand people (43.6 %). The population's average per capita cash income in the second quarter of 2023 was

estimated at 163,240 tenge. In the third quarter of 2023, the number of unemployed was estimated at 20.6 thousand people. The unemployment rate was 4.8% of the labour force. The number of people registered as unemployed with employment agencies at the end of October 2023 amounted to 5.8 thousand people or 1.3% of the labour force. (QAZSTAT, 2023)

Aktobe region

The region is located in the northwestern part of the republic, formed as part of the Republic of Kazakhstan in 1932. The territory of the region is equal to 300.6 thousand sq. km. As of October 1, 2023, the region's population was 936,8 thousand. person, including in urban areas - 700.8 thousand. people (74.8%), in rural areas - 236 thousand. man (25.2%). In the II quarter of 2023, the average nominal income of the population was estimated at 157,425 tenge. The number of unemployed in the third quarter of 2023 amounted to 21.8 thousand people, the unemployment rate was 4.7%. By the end of November 2023, the number of people registered as unemployed with employment agencies amounted to 15,347 thousand people, or 3.3% of the labour force. (QAZSTAT, 2023)

Alma-Ata's region

The region is located in the southeast of the republic, formed as part of the Republic of Kazakhstan in 1932. The territory of the region as of January 1, 2013, amounted to 223.8 thousand square meters. km. (Smailov, 2013)As of October 1, 2023, the population of the region was 1524.5 thousand people, including urban residents - 246.4 thousand people (16.2%), rural residents - 1278.1 thousand people (83.8 %). In the second quarter of 2023, average nominal cash income per capita amounted to 130,081 tenge. According to the population employment study, the number of unemployed in the third quarter of 2023 amounted to 34.4 thousand people. The unemployment rate was 4.7% of the economically active population. By the end of October 2023, the number of people registered as unemployed with employment agencies amounted to 22.5 thousand people or 3.0% of the economically active population. (QAZSTAT, 2023)

Atyrau region

The region is located in the west of the republic, formed in 1938. The territory of the region as of January 1, 2013, is 118.6 thousand square meters. km. There are rich deposits of oil and gas (Ural-Emba oil-bearing region), potassium and sodium salts, borate, and others. (Smailov, 2013)

As of October 1, 2023, the population of the region was 701.4 thousand people, including urban residents - 389.1 thousand people (55.5%), rural residents - 312.3 thousand people (44.5 %). According to estimates, in the second quarter of 2023, the population's average per capita nominal monetary income amounted to 337,861 tenge. In the second quarter of 2023, the number of unemployed people amounted to 17,103 people. The unemployment rate was 4.9% of the labour force. By the end of September 2023, the number of people registered as unemployed with employment agencies amounted to 19,571 people, or 5.6% of the labour force. (QAZSTAT, 2023)

West-Kazakhstan region

The region is located in the western part of the republic, formed in 1932. The territory of the region as of January 1, 2013, is 151.3 thousand square meters. km. There are deposits of oil, gas, oil shale, potassium-magnesium salt, expanded clay, and others. (Smailov, 2013) As of October 1, 2023, the population of the region is 692.1 thousand people. people, including 390.3 thousand residents (56.4%), and 301.7 thousand poisoning of local residents (43.6%). In the second quarter of 2023, the average nominal income of the population per capita amounted to 179,484 tenge. In the second quarter of 2023, the number of unemployed people amounted to 17,255 people. The unemployment rate was 4.9% of the labour force. By the end of September 2023, the number of people registered as unemployed with employment agencies amounted to 17,556 people, or 5% of the labour force. (QAZSTAT, 2023)

Zhambyl Region

The region is located in the south of the republic, formed in 1939. The territory of the region is 144.3 thousand square meters. km. (Smailov, 2013)

As of October 1, 2023, the population of the region was 1,222,000 people, including urban residents - 529,900 (43.4%) and rural residents - 692,100 people (56.6%). In the second quarter of 2023, the population's average per capita cash income was estimated at 130,381

tenge. In the third quarter of 2023, the number of unemployed people amounted to 27,236 people. The unemployment rate was 4.8% of the labour force. By the end of October 2023, the number of people registered as unemployed with employment agencies amounted to 20,606 people, or 4% of the labour force. (Smailov, 2013)

Karaganda region

The region is located in the central part of the republic, formed in 1932. The territory of the region as of January 1, 2013 is 428 thousand square meters. km. The region is rich in mineral resources. (Smailov, 2013) As of October 1, 2023, the population of the region was 1135.6 thousand people, including the urban population - 925.2 thousand people (81.5%), rural population - 210.4 thousand people (18.5 %). In the second quarter of 2023 (calculated), the average per capita cash income of the population amounted to 199,174 tenge. In the third quarter of 2023, the number of unemployed people amounted to 23.6 thousand people. The unemployment rate was 4.1% of the labour force. By the end of September 2023, the number of people registered as unemployed with employment agencies amounted to 9,023 people, or 1.6% of the labour force. (QAZSTAT, 2023)

Kostanay region

The region is located in the northern part of the republic, formed in 1936. The territory of the region as of January 1, 2013 is 196 thousand square meters. km. (Smailov, 2013)

As of October 1, 2023, the population of the region was 830.5 thousand people, including urban residents - 516.7 thousand (62.2%), rural residents - 313.8 thousand people (37.8%). The average per capita cash income of the population in the second quarter of 2023 was estimated at 174,667 tenge. In the second quarter of 2023, the number of unemployed people amounted to 22,465 people. The unemployment rate was 4.7% of the labour force. At the end of September 2023, the number of people registered as unemployed with employment agencies amounted to 6,906 people or 1.5% of the labour force. (QAZSTAT, 2023)

Kyzylorda Region

The region is located in the southern part of the republic, formed in 1938. The territory of the region as of January 1, 2013, is 226 thousand square meters. km. (Smailov, 2013)

As of October 1, 2023, the population of the region was 840.2 thousand people, including urban residents - 394.3 thousand (46.9%), rural residents - 445.9 thousand people (53.1%). In the second quarter of 2023, the average nominal monetary income of the population per capita was estimated at 135,430 tenge per month. In the second quarter of 2023, the number of unemployed people amounted to 17.1 thousand people. The unemployment rate was 4.9% of the labour force. At the end of October 2023, the number of people registered as unemployed with employment agencies amounted to 19.1 thousand people or 5.5% of the labour force. (QAZSTAT, 2023)

Mangistau region

The region is located in the southwestern part of the republic, formed in 1973 as the Mangyshlak region, since 1990 it has been called Mangystau. The territory of the region as of January 1, 2013 is 165.6 thousand square meters. km. The subsoil is rich in reserves of oil, gas, phosphorite, coal, manganese, various salts, and shell rock. (Smailov, 2013)

As of October 1, 2023, the population of the region was 782 thousand people, including urban residents - 355.6 thousand (45.5%) and rural residents - 426.4 thousand. (54.5%). In the second quarter of 2023, the average per capita cash income of the population was estimated at 216,936 tenge. In the third quarter of 2023, the number of unemployed people amounted to 18,231 people. The unemployment rate was 5.1% of the labour force. As of November 1, 2023, the number of people registered as unemployed with employment agencies amounted to 16,649 people or 4.7% of the labour force. (Smailov, 2013)

South Kazakhstan region (Turkestan region)

The region is located in the southern part of the republic, formed in 1932. The territory of the region as of January 1, 2013 is 117.3 thousand square meters. km. (Smailov, 2013)

As of October 1, 2023, the population of the region was 2137.7 thousand people. In the second quarter of 2023, average nominal cash income per capita was estimated to be 101,690 tenge and increased by 19.2% compared to the corresponding period in 2022, and real cash income increased by 3.6%. It is estimated that the number of unemployed in the third quarter of 2023 amounted to 41.7 thousand people. The unemployment rate was 5% of the labour force. At the end of October 2023, the number of people registered as unemployed with

employment agencies amounted to 37.7 thousand people or 4.5% of the labour force. (QAZSTAT, 2023)

Pavlodar region

The region is located in the northeastern part of the republic, formed in 1938. The territory of the region as of January 1, 2013 is 124.8 thousand square meters. km. (Smailov, 2013)

As of October 1, 2023, the population of the region was 754,934 people, including urban residents - 533,478 people (70.7%) and rural residents - 221,456 people (29.3%). In the second quarter of 2023, the average nominal monetary income of the population per capita was estimated at 194,898 tenge. According to a sample survey of the population on employment issues, the number of unemployed in the second quarter of 2023 amounted to 19.5 thousand people, the unemployment rate was 4.8% of the working population. As of the end of October 2023, the number of people registered as unemployed with employment agencies amounted to 9,354 people or 2.3% of the labour force. (QAZSTAT, 2023)

North-Kazakhstan region

The region is located in the northern part of the republic, formed in 1936. The territory of the region as of January 1, 2013 is 98 thousand square meters. km. (Smailov, 2013)

As of October 1, 2023, the population of the region was 531.3 thousand people, including city residents - 259.4 thousand people (48.8%), rural residents - 271.9 thousand people (51.8%). In the second quarter of 2023, the average per capita cash income of the population was estimated at 165,458 tenge. In the third quarter of 2023, the number of unemployed people amounted to 13.5 thousand people. The unemployment rate was 4.7% of the labour force. As of the end of October 2023, the number of people registered as unemployed with employment agencies was 4,445 people, or 1.6% of the labour force. (QAZSTAT, 2023)

East Kazakhstan region

The region is located in the east of the republic, formed in 1932. The territory of the region as of January 1, 2013 is 283.33 thousand square meters. km (Smailov, 2013)

As of October 1, 2023, the population of the region was 727.9 thousand people, including the urban population - 483.6 thousand people (66.4%), rural population - 244.3 thousand

people (33.6 %). In the second quarter of 2023, the average per capita cash income of the population was estimated at 190,682 tenge. The growth of nominal cash income increased by 19.8% compared to the second quarter of 2022, and real cash income increased by 3.3In the third quarter of 2023, the number of unemployed people amounted to 18 thousand people. The unemployment rate was 4.6% of the labour force. As of November 1, 2023, the number of people registered as unemployed with employment agencies was 8,903 people, or 2.3% of the working-age population. (QAZSTAT, 2023)

4 Practical Part

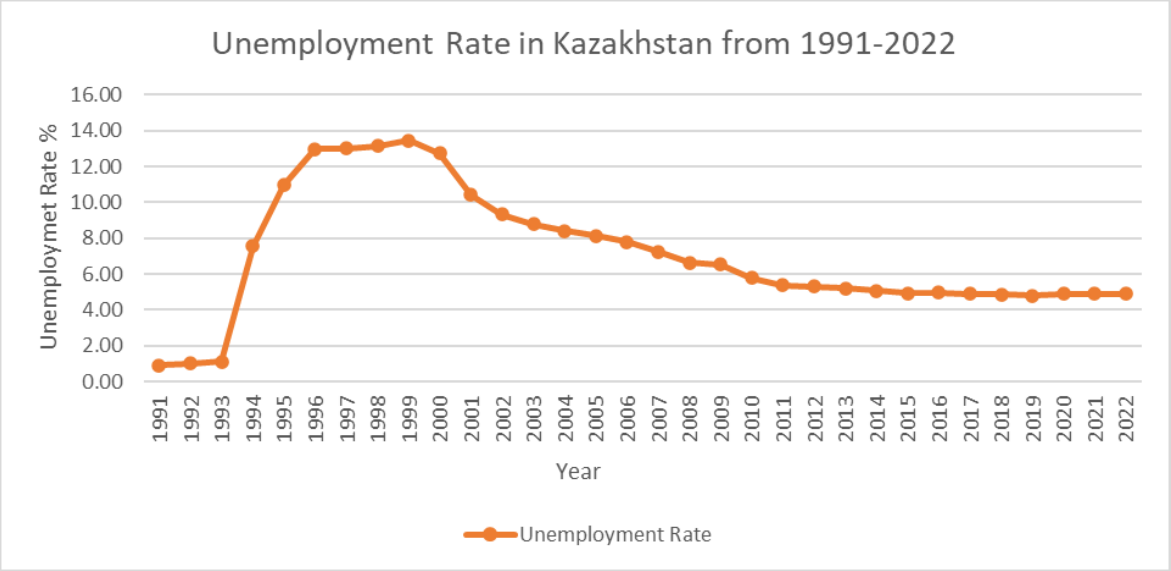
The following chapters will contain information about unemployment in Kazakhstan among different regions and gender. Before 2022 Kazakhstan was divided into 14 regions. Three new areas were created in 2022. All of the following data were collected up to 2022 and for this reason provide information only about 14 regions. For further analysis will be used Excel and IBM SPSS.

4.1 Unemployment rate in Kazakhstan

After the collapse of USSR, the most serious problem for Kazakhstan was structural unemployment, which became an integral element of market transformations in the country from the first days of transformation socio-political structure of the state. Many enterprises in Kazakhstan were forced to stop production, causing mass unemployment in the early 90s. During 90s there was the Labor Exchange of Kazakhstan, which registered the unemployed people according to the rules adopted in developed countries with market economy, so unemployment statistics for this period was highly reliable. The Labor Exchange registered the unemployed, assigning official unemployed status to up to 90 percent of people who have lost their jobs, directing them to retraining and public works. Not having enough resources, the Labor Exchange failed to fulfill its responsibility for financial support of unemployed people. Therefore, it was liquidated at the end of 1998.

Currently, there is no functioning Labor Exchange in Kazakhstan, which is a problem for maintaining accurate statistics of unemployed. From 2000 the unemployment rate started to decrease. It was achieved mainly through informal employment and sustainable growth in rural employment. The price for low unemployment in Kazakhstan is low labor productivity, deterioration of skills and qualifications of labor resources and the growth of informal employment. All noted facts take place in the economy of Kazakhstan, and together they lead to reduction in the efficiency of the national economy. (KULEKEEV, 2016, p. 191)

Figure 3 Unemployment rate in Kazakhstan 1991-2022

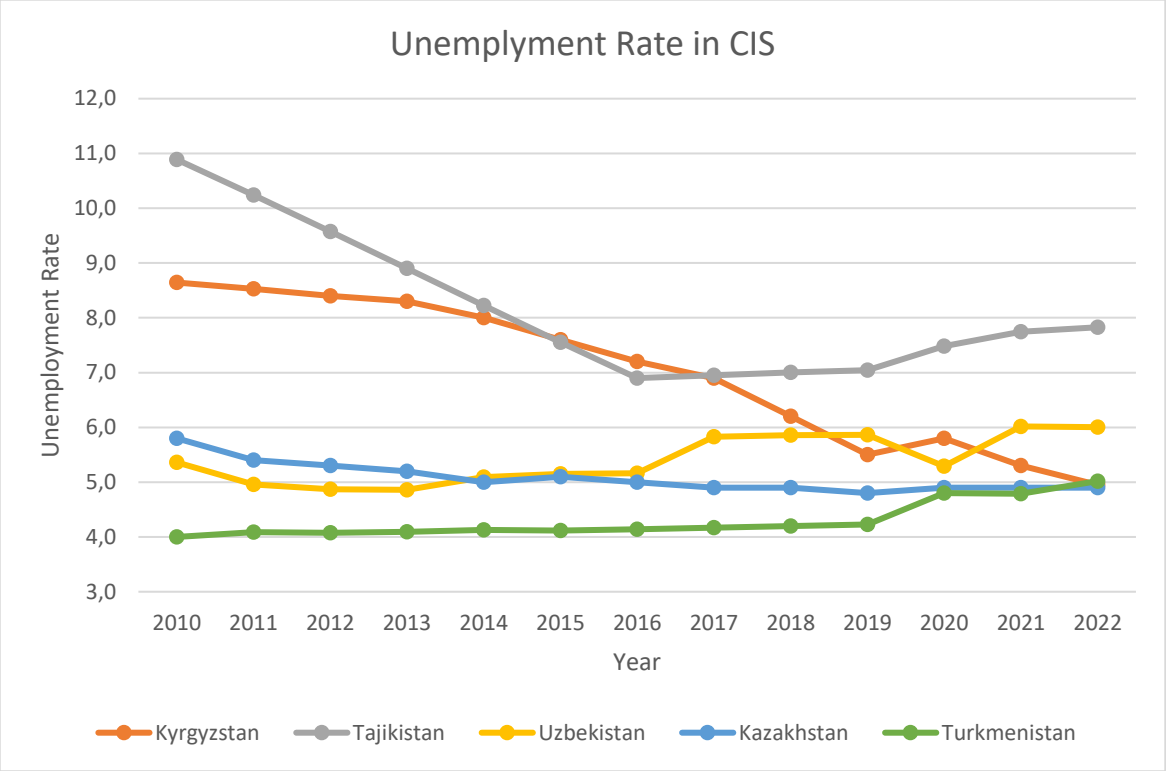


Source: author, based on (QAZSTAT, 2023)

Figure 3 describes the unemployment rate in Kazakhstan from 1991 to 2022. The lowest values were recorded in 1991. There was a slight increase in 1992-1993, but in 1994 the unemployment rate has increased rapidly. After the collapse of the USSR and Kazakhstan's acquisition of independence, the state faced many problems. Kazakhstan experienced a transition from a planned economy to a market economy, which was associated with chaos and uncertainty. This entailed the loss of sales markets and trade relations, which could also negatively affect the unemployment rate.

According to the statistics committee, in 1994 there were 536.4 thousand unemployed people in the country, and the unemployment rate was 7.5%. Both indicators have been growing very fast for several years and peaked in 1999. In 2000, the Government of the Republic of Kazakhstan adopted the "State program to combat poverty and unemployment for 2000–2002", then in 2003 – "State program for poverty reduction in the Republic of Kazakhstan for 2003 - 2005". Within these programs, the main efforts were not aimed to provide financial support to the unemployed, but to create new workplaces. From 2005 the indicators started to decrease and from 2010 to 2022 the unemployment rate remains under 6%. (KULEKEEV, 2016, p. 38)

Figure 4 Unemployment rate in CIS



Source: author, based on (STATISTA, 2023)

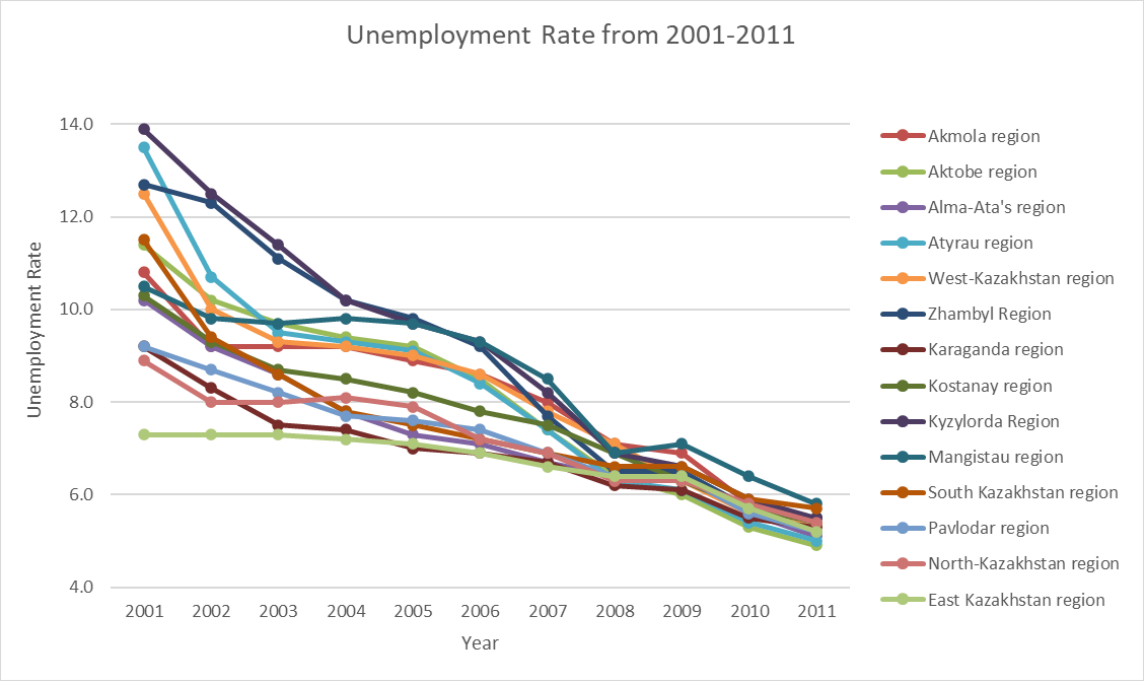
Figure 4 provides the information about unemployment rate in different CIS countries, to compare unemployment rate in Kazakhstan with other countries from the same region, such as Tajikistan, Kyrgyzstan, Uzbekistan and Turkmenistan From 2010 the values in Kazakhstan has remained relatively low compared to the other countries and continued to decline until 2019. In 2019 due to impact of COVID19 the unemployment rate increased by only 0.1 percentage points to 4.9%, which is not a significant growth compared to others. For example, in Turkmenistan it raised from 4.2% to 4.8%. In 2022 the lowest unemployment rate was in Kazakhstan and Kyrgyzstan - 4.9%. In Turkmenistan 5%, Uzbekistan – 6,0% and the highest value 7,8% in Tajikistan. Relatively low unemployment rate in Kazakhstan can be explained by different factors, including implementation of programs to stimulate employment growth in the economy and increasing employment in the public sector. (Mussayeva, 2021)

4.2 Unemployment Rate in different regions of Kazakhstan

In any modern state, the employment model of the population is formed under the influence of socio-economic and demographic processes occurring both at the country level and in its

individual regions. The study of regional aspects of employment is an extremely important task, because without system analysis of accumulated problems in individual areas, considering their specific features, cannot be smoothed out existing imbalances in the labor market. There are currently inequalities in the employment of the population by region, due to existing differences in the level of several regionally determined factors. First, favorable natural and climatic conditions in the southern regions, a more severe climate in the rest parts of the country have become a determining factor in the heterogeneous territorial distribution of the population by region long before the start of a large-scale transformation of the economic and social sphere of the country. Due to these circumstances 42% of the country's total working population concentrated in three southern regions, Almaty, Zhambyl, South Kazakhstan regionю (KULEKEEV, 2016, p. 141)

Figure 5 Unemployment rate from 2001 to 2011



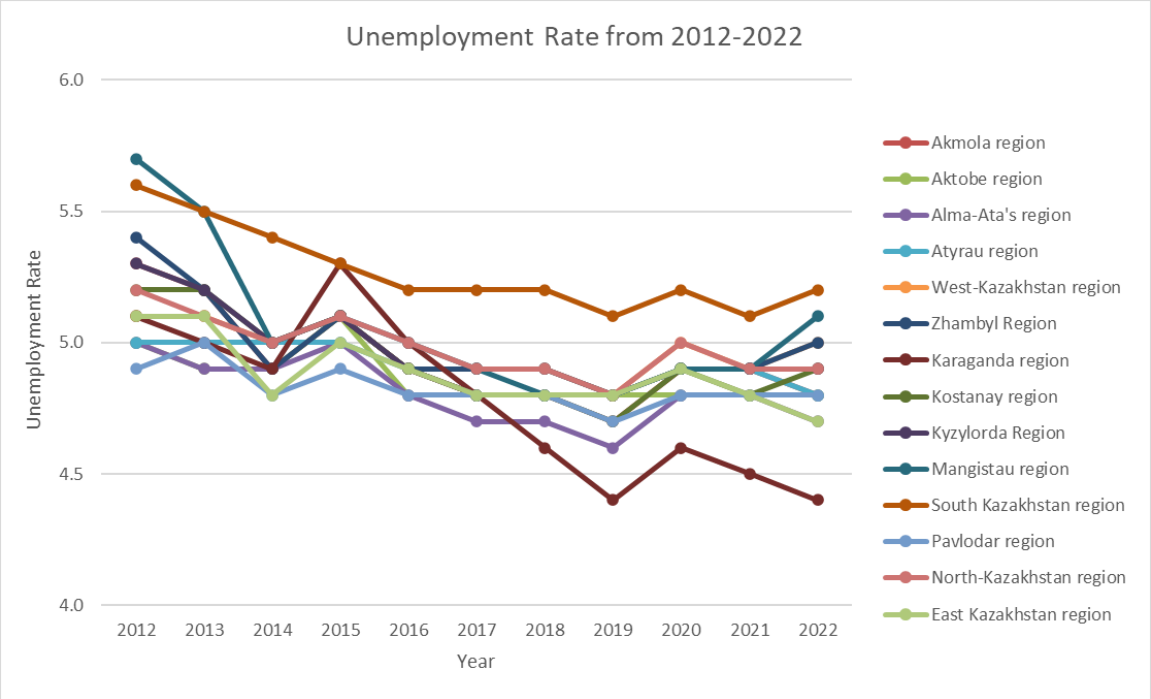
Source: author, based on (QAZSTAT, 2023)

Figure 5 shows the unemployment rate from 2001 to 2011 in Kazakhstan's regions. The highest indicators for all regions were in 2001 and since then the unemployment rate has started to decrease. The highest unemployment rate in 2001 among all regions is 13.9%, was in Kyzylorda region, in Atyrau region the unemployment rate was 13.5%, in other regions it was from 7.3% – 12.7%. The lowest value 7.3% was in East-Kazakhstan region. In following

year, the East Kazakhstan region shows the lowest unemployment rate for most of the period (from 2004 to 2018), reaching a minimum in 2010 (5.7).

The most significant decrease in unemployment rate for the entire period was in the Atyrau region, in 2002 the indicator was 10.7, it was about 21% lower compared to the 2001(13.5). The same situation was in West-Kazakhstan region, the unemployment rate went down by 20% (from 12.5 to 10.0). Most regions, in general, showed a significant decrease in unemployment rate by 2011 compared to the beginning of the period.

Figure 6 Unemployment rate from 2012 to 2022



Source: author, based on (QAZSTAT, 2023)

Figure 6 shows the period 2012-2022, the unemployment rate was relatively the same for every region, the highest value 5.7% was in Mangystau region in 2012 and the lowest 4.4% in Karaganda region. South Kazakhstan is the region with the highest unemployment rate compared to the rest regions during observed period. While Karaganda region had the most significant increases in unemployment rate, the first was in 2015, from 4.9(2014) it went up by 8%, to 5.3. And again in 2019 increased by 5%. The most stable values are in Aktobe region, from 2017 to 2022 the unemployment rate remained the same at 4.8.

Table 1 Average growth rate for during COVID19

Region	Average Growth Rate for the period 2001-2022	Average Growth Rate during COVID19
Akmola region	-3.6%	4.3%
Aktobe region	-3.9%	0.0%
Alma-Ata's region	-3.5%	4.3%
Atyrau region	-4.6%	2.1%
West-Kazakhstan region	-4.1%	4.2%
Zhambyl Region	-4.2%	2.1%
Karaganda region	-3.4%	4.5%
Kostanay region	-3.4%	4.3%
Kyzylorda Region	-4.7%	2.1%
Mangistau region	-3.2%	2.1%
South Kazakhstan region	-3.6%	2.0%
Pavlodar region	-3.0%	2.1%
North-Kazakhstan region	-2.7%	4.2%
East Kazakhstan region	-2.0%	2.1%

Source: author, based on (QAZSTAT, 2023)

The table 1 provides information about average growth rate for the whole observed period and average growth rate for during COVID19.

First column shows the decrease in unemployment rate among all Kazakhstan's regions, since 2001 in Kyzylorda region unemployment rate decreased by 4.7% and in Atyrau by 4.6%. Which are the two highest values among all regions. One of the conditions ensuring an increase in the level of employment is an active creation of new work places. The region department of employment and social programs holds monthly "Job Fairs", which are an effective form of rapid employment for the unemployed. (GOVKZ, 2023)

In West Kazakhstan and Zmambyl regions unemployment rate decresed by 4.1 and 4.2%. East Kazakhstan, North Kazakhstan and Pavlodar regions had the smallest decrease in unemployment rate, and acording to (QAZINDUSTRY, 2023) they were ensured by the continuing outflow of population to neighboring countries. Along with the population decline, the labor force is decreasing and employment is decreasing. The rest regions shows comparatively similar results.

Karaganda region which main activities are based on mining, had the highest jump in the unemployment during COVID19, it can be explained by the fact that main activity of the region is mining, manufacturing, which could be the reason why during quarantine, people were not able to work online. (QAZINDUSTRY, 2023) In Akmola, Alma-Aty, West Kazakhstan, Kostanay and North Kazakhstan the average growth rate of unemployment was almost the same, about 4.2%. In all other regions the increase was by 2.0 - 2.1%, except Aktobe region, where the average growth rate is zero percent.

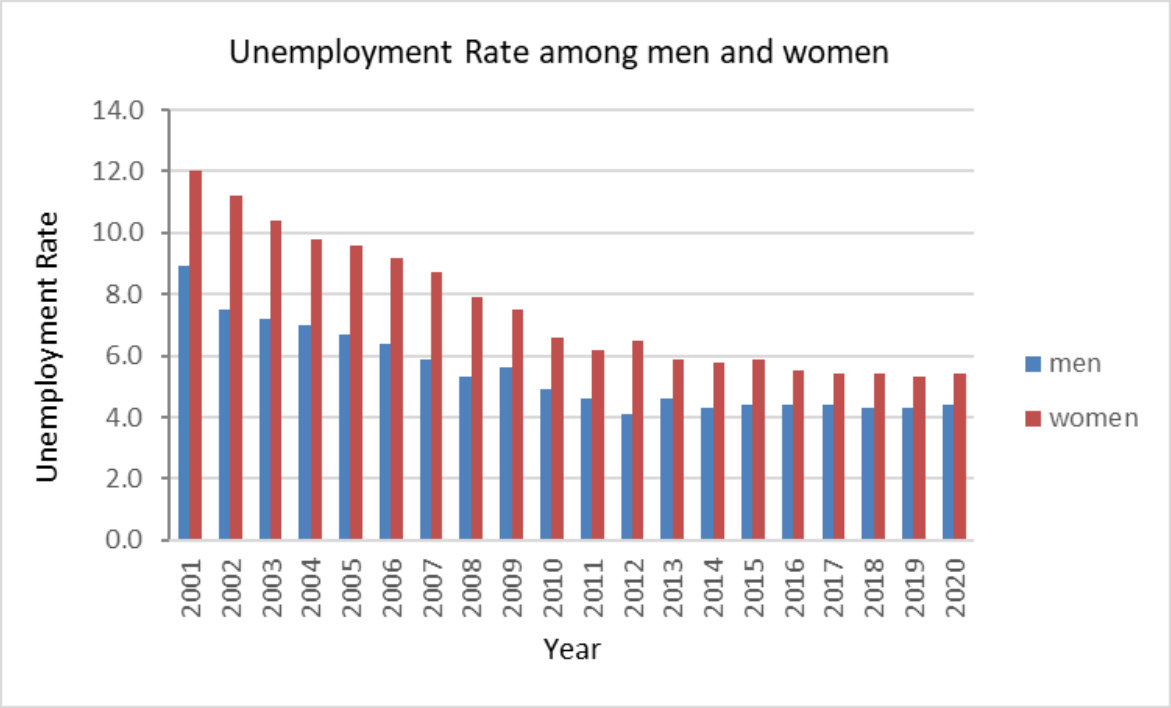
According (Mussayeva, 2021) COVID19 has had a noticeable impact on the labor market in Kazakhstan. More than half of companies, including the education sector, have completely switched to remote work. Losses are borne by small businesses, especially in the service sector, tourism and restaurants, airlines, etc. The spheres where digital technologies were improved suffered less.

The Government is taking "Anti-crisis measures" to support the unemployed, socially vulnerable groups of the population and small businesses; funds have been allocated from the National Fund. The State Enterprise "Employment Roadmap 2025" has been developed, which will provide jobs for 250 thousand unemployed, 130 thousand jobs have been created within 6.5 thousand projects, 35% of them are young people. (Mussayeva, 2021)

4.3 Unemployment Rate among males and females

In this chapter the Author will provide some information about the gender aspect of unemployment in Kazakstan. One of the characteristic features of unemployment in Kazakhstan is the predominance of the share of women in the structure of the unemployed population. Situation with female unemployment is influenced by various factors. For example, the peculiarities of national traditions, as well as difficulties in combining work with family responsibilities. Increased competition in the labor market in many CIS countries, the displacement of women from traditionally female industries and areas of the economy, has a significant impact on the gender structure of employment and unemployment. (KULEKEEV, 2016)

Figure 7 Unemployment rate among men and women



Source: author, based on (QAZSTAT, 2023)

Figure 7 shows the unemployment rate of men and women from 2001 to 1022, the difference between men and women is quite noticeable. The highest gap was in 2002, when men's unemployment rate was 7.5, while women's was 11.2. From 2004 the difference between male and female started to decrease and the highest decrease was in 2009, when the gap went down from 2.6 to 1.9. In 2012 the difference increased to 2.4, the unemployment rate for males was 4.1 and for females 6.5. Generally, the difference between the two genders is decreasing over time and from 2016 the distinction is remaining roughly the same.

Considering the representation of men and women in various sectors of the economy, it should be noted that a significant proportion of employed men are employed in traditionally "male" areas: construction, industry, agriculture, forestry and fishing, transport and warehousing. Women are less represented in the agricultural sector, industry and construction, but predominate in such areas of economic activity as trade, providing accommodation services and nutrition, education, health and social services. (GOVKZ, 2023)

Figure 8 Age Structure of Unemployment Rate, 2022

Source: author, based on (QAZSTAT, 2023)

Figure 8 represents the unemployment rate among males and females in different age groups, started from 15 years to 64 years old. In Kazakhstan the unemployment rate is defined as a percentage ratio of the number of unemployed to the number of economically active population. The economically active population are individuals aged 15 years and older who are employed or actively seeking employment. The retirement age for men is 63 years, for women – 60 years (in 2021). In accordance with Article 207 of the Code of the Republic of Kazakhstan.

In 2022 the largest percentage of unemployed men was between the ages of 55-59. The highest percentage of unemployed women was between the ages of 15-19. It could happen because in Kazakhstan the majority of young girls from 15-24 can still be supported by their parents. In the next age group 20-24 there was the lowest unemployment rate among males overall. While among females in the same age group (20-24) unemployment rate has decreased a lot, from 9.4 to 4.8. In the age group 25-29 the unemployment rate increased among both males and females. The age group from 30-34 shows a noticeable increase in the level of unemployment, especially among women. For subsequent groups the level decreases noticeably and remains stable about 4.2% among males and about 4.5% for females. Age group 50-54 according to the schedule, also has problems finding a job due to

the age, since employers prefer to hire younger specialists. Summing up all of the above, unemployment among women is much higher than among men. The highest unemployment rate is among the age groups 15-19 and 50-54.

4.4 Index Analysis

Table 2 Index Analysis

Year	UR	1st difference	Chain Based Index
2001	10.40		
2002	9.30	-1.10	0.89
2003	8.80	-0.50	0.95
2004	8.40	-0.40	0.95
2005	8.10	-0.30	0.96
2006	7.80	-0.30	0.96
2007	7.30	-0.50	0.94
2008	6.60	-0.70	0.90
2009	6.60	0.00	1.00
2010	5.80	-0.80	0.88
2011	5.40	-0.40	0.93
2012	5.30	-0.10	0.98
2013	5.20	-0.10	0.98
2014	5.00	-0.20	0.96
2015	5.10	0.10	1.02
2016	5.00	-0.10	0.98
2017	4.90	-0.10	0.98
2018	4.90	0.00	1.00
2019	4.80	-0.10	0.98
2020	4.90	0.10	1.02
2021	4.90	0.00	1.00
2022	4.90	0.00	1.00

Source: author, based on (QAZSTAT, 2023)

Table 2 shows a decrease in unemployment rate over the years. From 2001 to 2022 the unemployment rate has decreased from 10.4 to 4.9. The highest lowering occurs in 2002, descend by 1.1 compared to 2001, while the highest and the only increase in unemployment rate was 2020, it increased by 0.1 compared to 2019. Slight increase in 2020 can be explained by the COVID-19 pandemic and subsequent economic crisis. 1st difference column indicates the difference in unemployment rate compared to the previous year. In the most years it decreases, in some years it remained the same, but generally from 2012 the changes in

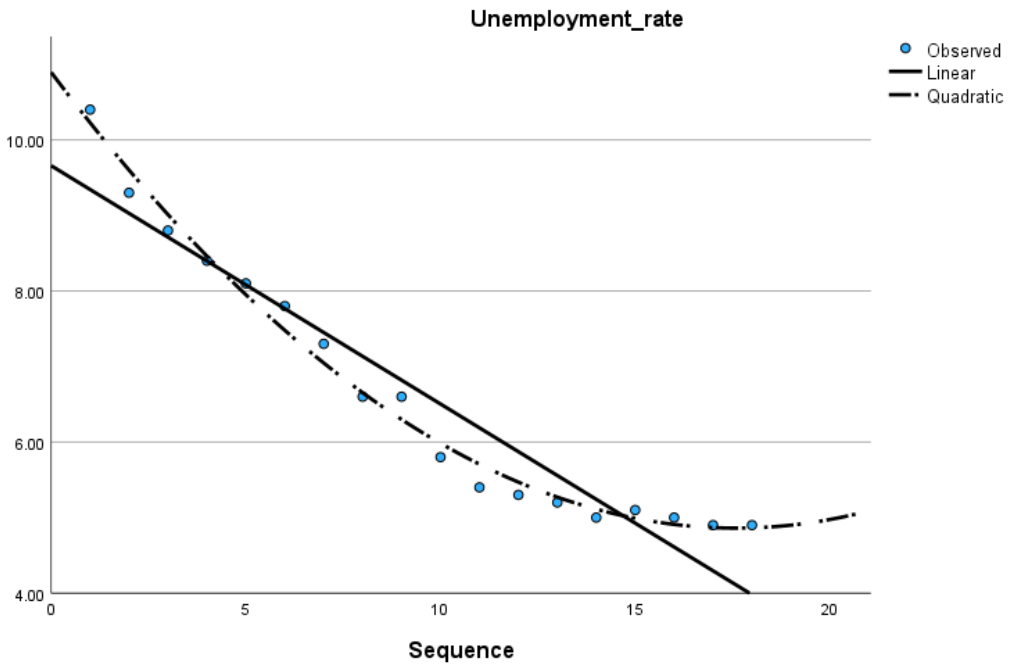
unemployment rate were very small. The column Chain Based Index shows the percentage change in unemployment rate relative to the previous year. For example, in 2010, the unemployment rate decreased by 0.80 percentage points compared to the previous year, which corresponds to a chain base index of 0.88. It means, the unemployment rate in 2010 was about 12% lower than the previous year (2009).

4.5 Time Series. Quadratic Trend Equation

To make a more accurate analysis, the data from 2019-2022 will be excluded from the analysis due to the impact of COVID19.

The time series plot in graph 6 shows some up and down during the observed years. The values of a time series tend to rise or fall at a rate that is not constant, it changes over time. As a result, the trend is not a straight line. The quadratic trend line shown in Figure 9 fits the observed data more than the linear trend line, therefore, Quadratic Regression will be used to forecast a time series.

Figure 9 Unemployment rate: Quadratic and Linear Regression



Source: author, based on (QAZSTAT, 2023)

In the regression analysis section, the estimated regression equation quadratic relationship between two variables. In mathematical terms, a quadratic equation is a second-degree polynomial equation, and its general form is:

$$y = ax^2 + bx + c \qquad (1)$$

where:

y is Unemployment Rate

x is the Time Variable,

a, b, and c are coefficients, with a not equal to zero.

Based on the OLS equation system the author estimates both parameters of the quadratic trend function.

Figure 10 Model Summary and Parameter Estimates

Model Summary and Parameter Estimates

Dependent Variable: Unemployment_Rate

	Model Summary					Parameter Estimates		
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2
Quadratic	.988	604.643	2	15	<.001	10.894	-.686	.020

Source: author, based on (QAZSTAT, 2023)

The quadratic trend equation is:

y = 10.894 – 0.686x + 0.020x^2

B parameter describes the average yearly change in the unemployment rate, that decreased by 0.686 per year.

R Square describing the quality of the function and the closer to 1, the better the model is.

R Square = 0.988.

Assuming that the past eighteen-year trend is a good indicator of the future, this trend equation can be used to develop forecasts for future time periods.

Using IBM SPSS – Curve Estimation, Quadratic Model, forecast of the unemployment rate in 2019, 2020, 2021, 2022.

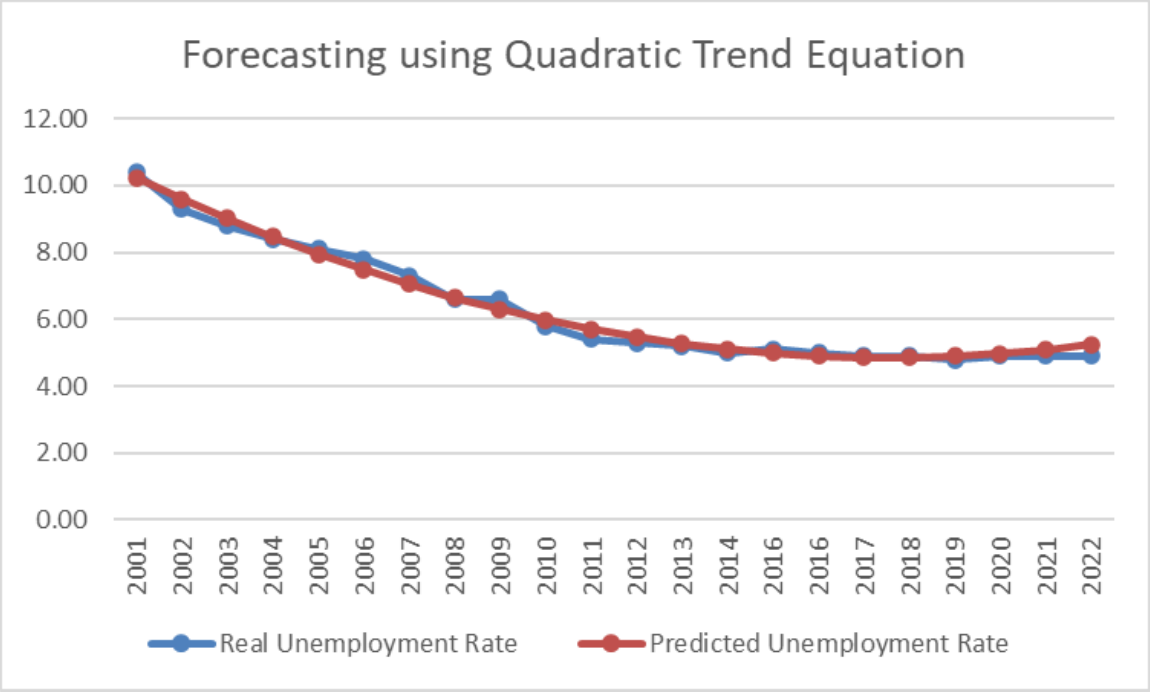
Table 3 Forecast of the unemployment rate 2019-2022

Year_	Unemployment_ Rate	Predicted
2019	4.80	4.86
2020	4.90	4.93
2021	4.90	5.03
2022	4.90	5.17

Source: author, based on (QAZSTAT, 2023)

5 Results and Discussion

Figure 11 Forecasting using Quadratic Trend Equation



Source: author, based on (QAZSTAT, 2023)

The line graph represents the Real Unemployment Rate in Kazakhstan and the values that the author predicted using quadratic trend equation. The difference between these two variables is very small, even though the author excluded the data during COVID19 years, in 2021 there is a slight increase in predicted values compared to the real numbers. For 2021 the predicted unemployment rate is 5.3% and for 2022 it is 5.4% compared to the real values

2021 – 4.9%, 2022 – 4.9%. To evaluate the forecasting model will be used Relative Error of Forecasting, that will be calculating using IBM SPSS for Statistics.

Figure 12 Relative Errors of Forecast

Year	REF_Quadratic
2019	.01
2020	.01
2021	.03
2022	.06

Source: author, based on (QAZSTAT, 2023)

The relative error for 2019 and 2020 are very small – 0.01. And for the following years the relatives error: 2021 – 0.03, 2022 – 0.06.

The results showed that this model fits the real data quite accurately. However, it cannot be said that this model shows a 100% accurate result, since mathematically the model may be suitable, but in reality, the unemployment rate is influenced by many other factors that must also be taken into account.

6 Conclusion

The labor market is a large and extensive topic that is unfortunately difficult to fully cover, while the unemployment is one of the most important problems in the world. Unemployment leads to deterioration not only economically, but also socially. A slowdown in economic growth, deprivation of the population's means of subsistence, loss of qualifications in the working population, all these are consequences of unemployment, therefore it is important for the state to take timely measures to reduce it.

This thesis conducted a statistical analysis of unemployment from 2001 to 2022. The analysis showed that the unemployment rate in Kazakhstan has remained at approximately stable decreasing level for the last 10 years, with a slight increase of 0.1% in 2020 due to Covid19. And although in the 90s after the collapse of the USSR, Kazakhstan faced many difficulties, by 2010 the state was able to bring the economy to the international level, as well as maintain the unemployment rate at a level lower than in many CIS countries.

In all regions of Kazakhstan, the unemployment rate has decreased significantly compared to previous years. Aktobe region showed the most stable indicators, while Kyzylorda region is the region with the highest indicator. During COVID19, industrial areas showed a jump in the unemployment rate, due to the nature of the professions that are in demand there. Unfortunately for factories and mining sites it has become impossible to operate online, like in the regions where for example the office worker profession is in demand.

Kazakhstan can be called more masculine country than feminine, which of course affects the difference in employment between women and men. The unemployment rate among women is much higher than among men, but in recent years the gap started to get smaller. In 2022, the highest unemployment rate was among girls aged 15-19, while the highest percentage of unemployed men was between age group 55-59.

Controlling the unemployment rate is an important task of the state. In the practical part, for a more complex analysis, a quadratic trend function was used, based on which the unemployment forecast was made. For a more accurate analysis, Covid19 years were excluded, although this did not greatly affect the results. The predicted unemployment rate and the real data were not very different, however, in order to evaluate the model, relative errors of forecasting were used, which showed that this model fits the real data quite

accurately. However, it cannot be said that this model shows a 100% accurate result, since mathematically the model may be suitable, but in reality, the unemployment rate is influenced by many other factors that must also be taken into account.

In general, Kazakhstan shows stable indicators, but there is room for improvement. The state still does not have an official labor exchange that is supposed to monitor and register the unemployed, and although there are online labor exchanges and other commercial agencies where you can register, many people do not know about them and do not use their services. The creation of a labor exchange could help the state collect more accurate data on the state of the labor market as well as in the fight against unemployment.

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