

**Czech University of Life Sciences Prague**

**Faculty of Economics and Management**

**Department of Statistics**



## **Bachelor Thesis**

**Statistical analysis of unemployment in the Republic of  
Tajikistan**

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## BACHELOR THESIS ASSIGNMENT

Shafe Davlatzoda

Economics and Management

Thesis title

**Statistical analysis of unemployment in the Republic of Tajikistan**

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### Objectives of thesis

The purpose of the thesis is to describe the development of unemployment rate in the Republic of Tajikistan and to evaluate the factors that influence this rate. The unemployment rate will also be evaluated separately for selected groups regarding the gender and other factors.

### Methodology

The bachelor thesis will consist of two main parts – theoretical part and practical part. For the theoretical part, data sources such as scientific literature, academic journals and online libraries will be used. The theoretical part is devoted to clarify the important terms of this thesis. The second, practical part, aims to analyze main indicators of labor market and factors which affect unemployment rate in the Republic of Tajikistan using statistical methods for time series analysis and methods of regression analysis. To analyze the data, MS Excel and SAS Studio will be used.

## The proposed extent of the thesis

30-40 pages

## Keywords

labour market, Republic of Tajikistan, statistical analysis, time series, unemployment rate

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## Recommended information sources

Agency on statistics under the President of the Republic of Tajikistan [online]. Available at:  
<https://www.mzcr.cz/>

FIELD, A. Discovering statistics using IBM SPSS Statistics. Thousand Oaks: SAGE Publications, 2013. ISBN 978-1-4462-4917-8.

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Trading Economics [online]. Available at: <https://tradingeconomics.com/>



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### **Declaration**

I declare that I have worked on my bachelor thesis titled "Statistical analysis of unemployment in the Republic of Tajikistan" 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 11.03.2022

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**Davlatzoda Shafe**

## **Acknowledgement**

I would like to express my appreciation to Zuzana Pacáková, my thesis supervisor, for her guidance and assistance. Thank you very much to the university's whole teaching team for assisting me in gaining such valuable knowledge. A huge gratitude to my parents for all their support throughout my studies and throughout my life.

# Statistical analysis of unemployment in the Republic of Tajikistan

## Abstract

This bachelor's thesis explores the issue of unemployment in Tajikistan. The factors that impact the growth or reduction in the unemployment rate are being investigated in this thesis. Furthermore, in the theoretical part of the thesis, the study details the various types of unemployment, as well as their causes and disparities.

The practical section focuses on unemployment rate statistical analysis. A multiple regression model was used as the main analysis, where the unemployment rate was a dependent variable, while average monthly wages, the number of graduates from institutions of higher professional education, and the number of employees who underwent training and retraining, improved their qualifications, and completed an internship were chosen as independent variables, all based on yearly time series data from 2000 to 2020. The purpose of a regression model is to identify statistically significant variables that influence unemployment rate. As a result, it was found that average monthly wages were the most important factor that influenced the unemployment rate in Tajikistan during the 2000–2020 years.

**Keywords:** Labour market, Republic of Tajikistan, statistical analysis, time series, unemployment rate, migration, youth unemployment, education, poor wages, rural unemployment, economy, types of unemployment

# Statistická analýza nezaměstnanosti v Tádžické republice

## Abstrakt

Tato bakalářská práce se zabývá problematikou nezaměstnanosti v Tádžikistánu. V této práci jsou zkoumány faktory, které ovlivňují růst nebo snižování míry nezaměstnanosti. Dále jsou v teoretické části práce podrobně popsány jednotlivé typy nezaměstnanosti, jejich příčiny a rozdíly.

Praktická část je zaměřena na statistickou analýzu míry nezaměstnanosti. Jako hlavní analýza byl použit model vícenásobné regrese, kde byla míra nezaměstnanosti závislou proměnnou, zatímco průměrné měsíční mzdy, počet absolventů vysokých škol a počet zaměstnanců, kteří prošli školením a rekvalifikací, si zlepšily kvalifikaci, a absolvovaná stáž byly vybrány jako nezávislé proměnné, vše na základě ročních časových řad od roku 2000 do roku 2020. Účelem regresního modelu je identifikovat statisticky významné proměnné, které ovlivňují míru nezaměstnanosti. V důsledku toho bylo zjištěno, že průměrné měsíční mzdy byly nejdůležitějším faktorem, který ovlivnil míru nezaměstnanosti v Tádžikistánu v letech 2000–2020.

**Klíčová slova:** Trh práce, Tádžická republika, statistická analýza, časové řady, míra nezaměstnanosti, migrace, nezaměstnanost mládeže, vzdělání, špatné mzdy, nezaměstnanost na venkově, ekonomika, typy nezaměstnanosti

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# 1 Introduction

Unemployment was and remains one of the most discussed problems in the past and now in the labor market. One of the most important indicators of a country's economy is unemployment. A high unemployment rate indicates a poor state of the economy of a particular country. This phenomenon has a negative impact on people's economic and social lives. This creates difficulties for the unemployed people and their families.

Unemployment is a macroeconomic problem that directly and acutely affects people. For majority of people, losing a job means a limited standard of living. Indeed, when people lose their jobs, it can be the hardest economic event in their lives. Usually, the standard of living of most people depends on their labor earnings.

This thesis is devoted to the statistical analysis of unemployment in Tajikistan in order to identify the main factors affecting unemployment. There are some reasons that lead the researcher to write this thesis and identify the main factors influencing unemployment in Tajikistan. The first reason is that unemployment is a serious problem in Tajikistan, and because of this, millions of people migrate to Russia and other countries in search of work. Another reason is that through this way we can find an idea of how to overcome unemployment in Tajikistan.

## 2 Objectives and Methodology

### 2.1 Objectives

The thesis' goal is to show how the unemployment rate in Tajikistan has changed over time and to assess the variables that impact it. In addition, the unemployment rate will be assessed separately for chosen groups based on gender and other criteria.

The following are the precise goals:

- Analyse unemployment rate, average monthly wages, the number of graduates from institutions of higher professional education, and the number of employees who underwent training and retraining, improved their qualifications, and completed an internship.
- Determine whether variables are statistically significant or statistically not significant based on the regression model, and then demonstrate the relationship between them.

### 2.2 Methodology

Scientific literature, academic publications, and internet libraries were employed to conduct the thesis analysis. The agency on statistics under the president of the Republic of Tajikistan and the World Bank were used as a source of data collection for time series analysis in the 2000-2020 years.

Three variables are employed in this study to determine the factors that influence unemployment. The unemployment rate is used as a dependent variable, while average monthly wages, the number of graduates from institutions of higher professional education, and the number of employees who underwent training and retraining, improved their qualifications, and completed an internship are chosen as independent variables. Confirming that the thesis's purpose is achieved. For the computation and analysis of provided data, Microsoft Excel and SAS studio are used.

Multiple regression model:

#### **Formula 1: Multiple regression model**

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \dots + \beta_pX_p + \varepsilon \quad (1)$$

Where Y is the anticipated or predicted value of the dependent variable, X1 to Xp are p unique independent or predictor variables, b0 is the value of Y when all of the

independent variables ( $X_1$  to  $X_p$ ) are equal to zero,  $\varepsilon$  is a random variable referred to as the error term and  $b_1$  to  $b_p$  are the estimated regression coefficients. Every regression coefficient indicates the change in  $Y$  as a function of a one-unit change in the corresponding independent variable. In the case of multiple regression,  $b_1$  is the change in  $Y$  relative to a one unit change in  $X_1$ , while all other independent variables remain constant. The regression coefficients  $\beta_0, \beta_1, \dots, \beta_p$  in (1) are unknown, and must be estimated. (Nisbet, Elder and Miner, 2009) Given estimates, it is possible make predictions using the following equation :

**Formula 2: Estimating regression coefficients**

$$Y = b_0 + b_1X_1 + b_2X_2 + \dots + b_pX_p \quad (2)$$

The parameters are estimated using the OLS method, which is based on the following conditions:

**Formula 3: OLS**

$$\sum_{i=1}^n (y_i - a - b_x x_{1i} - b_x x_{2i})^2 \dots \min \quad (3)$$

The t-test was employed to determine the statistical significance of calculated parameters. The steps of the hypothesis testing procedure:

- Make a null and alternative hypothesis assumption: select a level of significance 1%, 5%, or 10%. Calculating the t-value, finding the critical value and comparing both t-values, and making a decision to reject or not reject the hypothesis

Hypothesis for t-test are:  $H_0: \beta_i = 0, H_1: \beta_i \neq 0$

The final stage is calculating the statistical significance of variables:

- A variable is statistically insignificant if the P-value is more than alfa 0.05.
- A variable is statistically significant if the P-value is less than alfa 0.05.

The goodness of fit for the computed multiple regression equation is measured using multiple coefficients of determination:

**Formula 4: Multiple coefficient of determination**

$$R^2 = \frac{SSR}{SST} \quad (4)$$

In the formula 4, SSR = sum of squares due to regression and SST = total sum of squares.(James, 2021)

Regression diagnostics are used to check model assumptions and determine whether or not there are any data that have a substantial, disproportionate effect on the analysis. The linear regression assumptions are:

- Linearity - The assumption behind linear regression is that your model is linear. If you violate this assumption, it suggests your linear model is probably not very good at estimating your real (non-linear) data.
- Homoscedasticity - When the distribution of scores for your criteria is the same at each level of the predictor, you have homogeneity of variance. Your parameter estimations will be optimum if this assumption is met.
- Independence - Signifies that your model's errors are unrelated to one another.
- Normality - The residuals in the population must be normally distributed in order to provide the best parameter estimations
- Outliers - An outlier is characterized as an observation with a high residual.
- Leverage points - A leverage point is an observation with a value of x that is significantly different from the mean of x.
- Influential observations - Observations distant from the centroid may have an influence on the regression model's fit. The term "influential" refers to the fact that removing that observation might result in a significant change in parameter estimations. (James, 2013)

To check the assumptions above, residual analysis will be used in regression diagnostics.

Residual is the difference between a predicted and observed value:

**Formula 5: Residual equation**

$$\text{Residual} = \text{Observed value} - \text{Predicted value}$$

$$e = y - \hat{y} \quad (5)$$

Both the average and the total of the residuals are zero. That is,  $\Sigma e = 0$ . The residual values are often plotted on the Y-axis, while the independent variable is plotted on the x-axis.

## **3 Literature Review**

### **3.1 Introduction to Unemployment**

#### **3.1.1 Definition of Unemployment**

Unemployment is defined differently in various regions, depending on whether the country is developed or developing. A 6-year-old who is unemployed is not considered unemployed. A person who is incarcerated is not counted as unemployed. A 60-year-old grandma and grandfather who are both retired are not unemployed. They are not deemed jobless in three instances. Unemployed persons are considered if they are willing and able to work but cannot find work. In practice, this means that a person must be an adult (16 years or older), not institutionalized (e.g., not in prison), a civilian, and, most importantly, looking for work in order to be counted as unemployed. Similarly, a person must be an adult, noninstitutionalized civilian with a job to be considered as employed. (Cowen and Tabarrok, 2015)

One of the most difficult issues is unemployment. In literature, for example, it has received a wide range of interpretations:

- Unemployment is a segment of a country's population made up of people who have reached working age, are unemployed, and are looking for a job for a set period of time specified by law.
- Unemployment is a socioeconomic phenomenon in which a portion of the labor force is not engaged in productive activity. This is a cyclical phenomenon manifested by an excess of labor supply over labor demand. Unemployment is defined as the lack of employment for economic reasons in a specific segment of the country's working population who is capable and willing to work at any given time. (Cowen and Tabarrok, 2015)

#### **3.1.2 How is unemployment measured**

To begin analyzing the problems of unemployment, it is necessary to first define who should be considered unemployed. The criteria for determining whether a person is unemployed are usually established by law or government documents, and they may differ slightly from country to country. However, several characteristics are common to all definitions. This is:

- Working age, that is, a person must be older than the minimum age allowed by law for work for hire but younger than the age at which an old-age pension is granted. As a result, adolescents under the age of working, men over the age of 63, and women over the age of 58 cannot be considered unemployed, even if they want to work but are unable to find work.
- For a period of time, such as a month or six months, a person does not have a steady source of income.
- A person's demonstrated desire to find work, such as contacting the employment service and visiting the employers to whom he is referred for an interview with an employee of this service.(Likov, 2014)

Only those who fit those categories are considered truly unemployed and are properly considered when calculating the country's overall rates of unemployment, namely the share of the unemployed in the total labor force.(Likov, 2014) This indicator is determined as follows:

**Formula 6: Unemployment rate**

$$Unemployment\ rate = \frac{Number\ of\ unemployed}{Labor\ force} * 100 \quad (6)$$

Measuring unemployment is the responsibility of the Bureau of Labor Statistics (BLS), which is part of the Department of Labor. Every month, the BLS publishes data on unemployment as well as other aspects of the labor market, such as job types, average workweek length, and duration of unemployment. These statistics are derived from the Current Population Survey, a regular survey of approximately 60,000 households.(Mankiw, 2018)

Based on the questionnaire responses, the BLS categorizes each adult (age 16 and older) in each surveyed household into one of three groups:

- **Employed:** Those who worked as paid employees, in their own businesses, or as unpaid employees in a family member's business fall into this category. Full-time and part-time employees also are considered. This category also includes those who were not working but had jobs from which they were temporarily absent due to reasons such as vacation, illness, or inclement weather.

- Unemployed: This category includes people who were unemployed, available for work, and tried to find work in the previous four weeks. It also includes those who are waiting to be recalled to a job from which they were previously laid off.
- Not in the labor force: This category includes people who do not fit into the first two categories, such as full-time students, stay-at-home moms, and retirees.

After categorizing all individuals covered by the survey, the BLS computes various statistics to summarize the state of the labor market. The labor force is defined by the BLS as the sum of employed and unemployed people. (Mankiw, 2018)

## 3.2 Types of Unemployment

### 3.2.1 Frictional Unemployment

Frictional, structural, and cyclical unemployment are the three types of unemployment identified by economists. We start with frictional.

*“Frictional unemployment is shortterm unemployment caused by the ordinary difficulties of matching employee to employer.” (Cowen and Tabarrok, 2015)*

What is the most efficient way to sell a house? Reduce the cost! Any house will sell quickly if the price is low enough. So, selling houses is simple. It's difficult to find a price that both the seller and the buyer are willing to accept. Similarly, if you're willing to work for peanuts, it's always easy to find work. Finding a job that you want at a wage that both you and the employer are willing to accept takes time and effort. The difficulty in matching employees to employers causes labor market friction, and the resulting temporary unemployment is referred to as frictional unemployment. Thus, frictional unemployment is defined as short-term unemployment caused by the usual difficulties in matching employee to employer.

One of the reasons for frictional unemployment is a lack of information. Workers are unaware of all available job opportunities, and employers are unaware of all available candidates and their qualifications. The Internet has most likely reduced the underlying rate of frictional unemployment by making it easier for workers to find work and for firms to find workers.

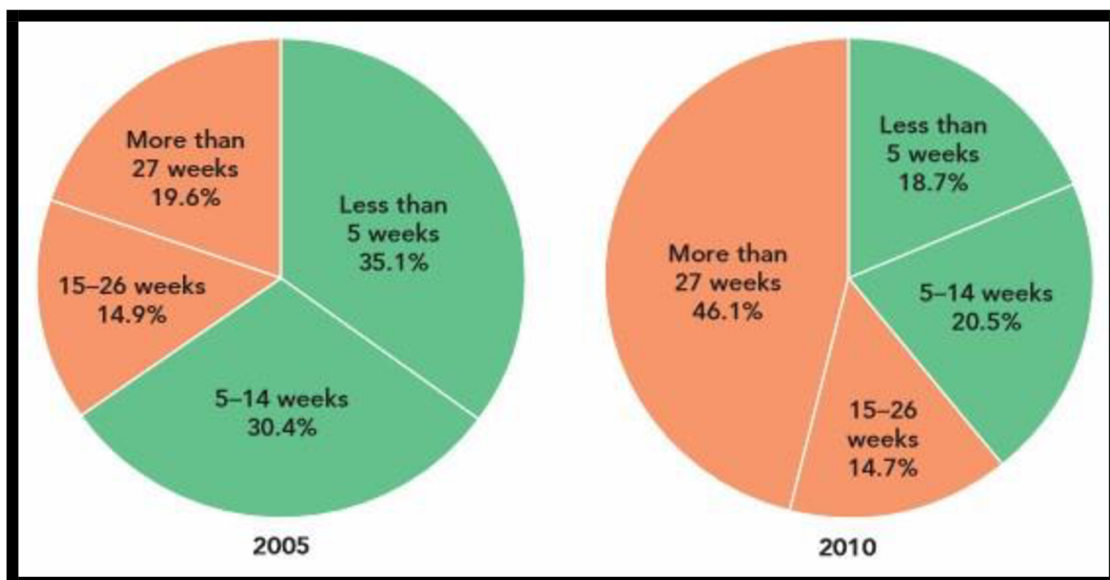
Frictional unemployment typically lasts only a short period of time. If the economy is not in a recession, finding a new job may take a few weeks, or for specialized workers, a few months, but not much longer. Figure 1 depicts the average duration of unemployment in



2005, a no recession year, as well as in 2010 as the economy gradually recovered from the 2007–2009 recession. In 2005, the majority of unemployed people were out of work for a short period of time: 35.1 percent were out of work for less than five weeks, and 30.4 percent were out of work for 5 to 14 weeks. The remaining one-third had been out of work for more than 14 weeks, with 19.6 percent out of work for more than six months. (Cowen and Tabarrok, 2015)

In 2010, the majority of the unemployed had been out of work for more than 14 weeks, and the situation was very different. Indeed, 46.1 percent of the unemployed had been out of work for more than six months as of mid-2010. Since the Great Depression, so many unemployed workers had been out of work for such an extended period of time.(Cowen and Tabarrok, 2015)

**Figure 1: Unemployment duration in 2005 and 2010 in the US**



Source: Cowen, 2015

Frictional unemployment occurs when there is a consistent relationship between the non-coincidence of dismissals from one firm and the hiring of workers by another firm, or when people move from one profession to another, from one industry to another, or from one region to another. This occurs when, for example, some firms or regions expand their production scale, necessitating an increase in the number of hired labor, while others, on the other hand, reduce production, releasing workers. This is the type of unemployment that cannot be eliminated in a market economy. Full employment is also impossible from this perspective if we define it as collective employment. (Pavlenkov, 2004)

### **3.2.2 Structural unemployment**

Long-term, persistent unemployment is referred to as structural unemployment. Isn't it redundant to state that unemployment is long-term and persistent? No, not really. For example, in France, Spain, Italy, and Germany, approximately 40% to 50% of the unemployed had been out of work for more than a year, and this had been the case for approximately 20 years. In the United States in 2010, 46 percent of the unemployed had been out of work for more than six months, and perhaps 20 percent or so had been out of work for more than a year, but this had only been true for about a year. The phrase "persistent, long-term unemployment" denotes that a significant proportion of the unemployed have been unemployed for more than a year and that the problem has persisted for a long time. The proper definition is "*Structural unemployment is persistent, long-term unemployment caused by long-lasting shocks or permanent features of an economy that make it more difficult for some workers to find jobs*". (Cowen and Tabarrok, 2015)

The concept structural unemployment refers to a situation in which people are out of work for extended periods of time with little chance of finding suitable employment. This prolonged unemployment is due, in part, to the changing structure of the economy, which has rendered their skills obsolete. People with few skills and little work experience are also included in this category of workers. This type of unemployment disproportionately affects teenagers and certain minority groups. (Maitah, 2017)

What are the root causes of structural unemployment? Large, economy-wide shocks that occur in a short period of time are one cause. Adjusting to these shocks can result in long-term unemployment as the economy restructures. The oil shock, globalization, and new information technologies such as the computer and the Internet were examples of such in the US economy, causing the economy to restructure from a manufacturing to a service economy. (Cowen and Tabarrok, 2015)

### **3.2.3 Cyclical unemployment**

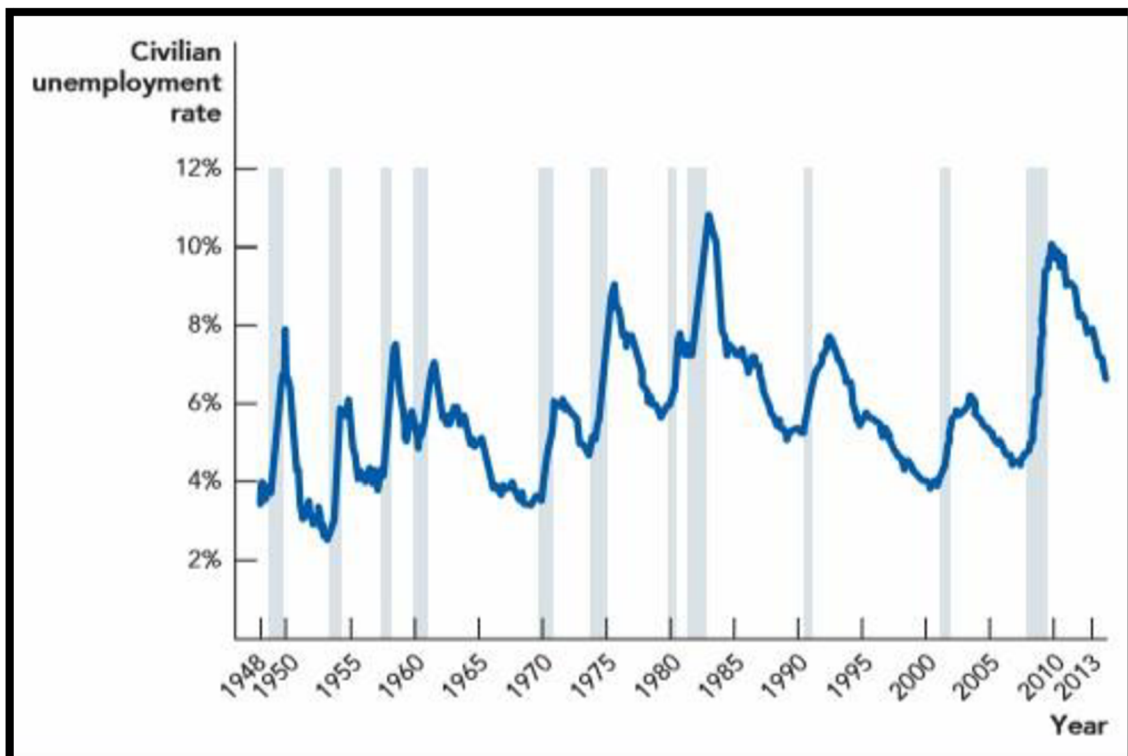
Cyclical unemployment is a type of unemployment that fluctuates in size, duration, and composition in response to the business cycle. The scale and duration of it reach a peak during an economic recession (crisis) and a minimum during an economic recovery. As a result, the size of the labor market fluctuates in tandem with the business cycle. Cyclical unemployment characterizes both the best (rising) and worst (falling) states of the labor market as a whole, but to varying degrees in relation to different groups of hired labor. The

most vulnerable are young and older workers, women, and non-indigenous people.(Pavlenkov, 2004)

The final type of unemployment is cyclical unemployment, which is linked to the business cycle's ups and downs. Figure 2 on the following page depicts the unemployment rate in the United States since 1948. Recessions are depicted by the shaded areas. It is worth noting that unemployment rises dramatically during every recession.

For two reasons, slower growth is usually accompanied by higher unemployment. First and foremost, when GDP falls, businesses frequently lay off workers, increasing unemployment. The second reason is a little more subtle. When unemployment is high, fewer people are employed to produce goods and services. When employees are idle, it is likely that related capital is idle as well. Unoccupied labor and idle capital cannot be used to maximize growth. An economy's ability to create more jobs will be hampered.(Cowen and Tabarrok, 2015)

**Figure 2: The unemployment increase during recession in the US**



Source: Cowen, 2015

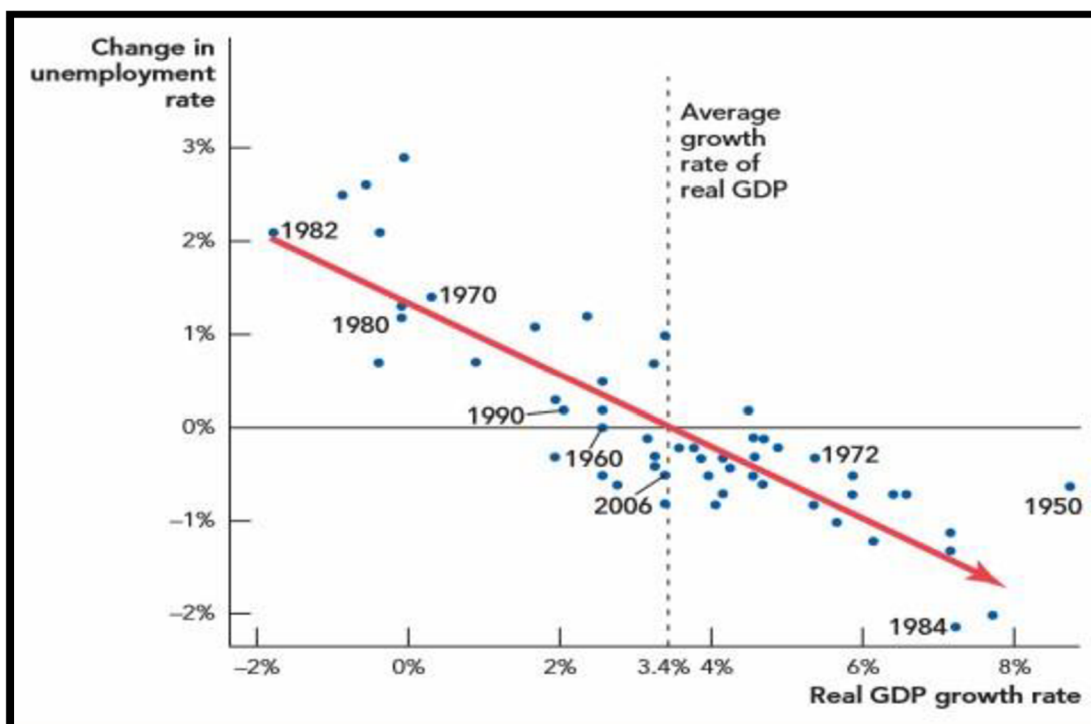
Figure 3 emphasizes the inverse of the idea that slower growth is associated with higher unemployment—faster growth is associated with lower unemployment. Figure 3 depicts

changes in the unemployment rate in the United States on the vertical axis versus growth on the horizontal axis. As can be seen, faster real GDP growth reduces unemployment. In fact, when growth is above average, unemployment falls, and when growth is below average, unemployment rises. For example, during a deep recession in the United States' economy in 1982, the unemployment rate increased by 2.1 percent. In contrast, unemployment fell when real GDP increased at a rate of 7% per year for the first two years of 1984. (Cowen and Tabarrok, 2015)

Some economists believe that business cycles are primarily the result of real shocks that necessitate a reallocation of labour across industries. A business cycle, according to these economists, is nothing but the economic expansion process in action—growth is volatile, not smooth. Thus, cyclical unemployment is just another form of frictional and structural unemployment, according to these economists.

Cyclical unemployment is caused by a discrepancy between an economy's aggregate wage level and its price level. Workers' wages are out of step with the level of prices, making workers too expensive to hire from the perspective of firms. (Cowen and Tabarrok, 2015)

**Figure 3: Faster Growth in Real GDP Decreases Unemployment**



Source: Cowen, 2015

To use a simple example, whether a company wants to hire another employee is determined not only by the employee's wage, but also by the wage's relationship to the price of the company's product. If Apple can sell Macbook for \$2000, it has a better chance of increasing production and hiring more employees than if it can sell Macbook for \$1000. However, when potential employees make salary requests, they may not be completely aware of the prices and consequently profits accessible to their employers. Wage demands can be excessively high in comparison to what the firm considers profitable, resulting in cyclical unemployment. However, if overall demand for goods and services was stronger, larger salary expectations might be justifiable, and workers might be hired. In any case, we can see that cyclical unemployment remained high in 2010, even when compared to previous recessions, following the recent recession. These are the processes that are commonly referred to as "jobless recovery." (Cowen and Tabarrok, 2015)

### **3.3 Reasons for the always existence of the unemployed**

#### **3.3.1 There are some people always unemployed**

As you are aware, unemployment arose and progressed to its current state in tandem with the emergence and development of the market economy, and it is a significant component of the labor market. This alone leads to the conclusion that the capitalist market economy is the most common cause of unemployment and its inevitability. After all, the unemployed are carriers of the unsold commodity "labor power" of their potential to work, and they are a unique carrier of commodities that only appeared under capitalism. (Pavlenkov, 2004)

As a result, the capitalist market economy is a common source of unemployment. It would be naive to suppose that unemployment occurs at the employee's wish or at the employer's request. Unemployment is created by objectively acting, according to science. The mechanism of market self-regulation and the laws of market competitiveness operate regardless of people's wishes. Every employer (businessman, entrepreneur) tries to stay ahead of the competition by focusing all of their efforts on improving and expanding their company. However, everyone understands that in a capitalist market, companies, even the largest ones, will go bankrupt. And, as a result of the bankruptcy and bankruptcy of the firm, there is a vast mass of employed persons behind the bankrupt firm's doors, who appear as unemployed on the circulating labor market. (Pavlenkov, 2004)

The above-mentioned discussion theory does not explain why economies experience unemployment. Prices adjust in most marketplaces to bring amount provided and quantity desired into balance. Wages would change in a perfect labor market to balance the supply and demand for labor. This pay adjustment would guarantee that all employees always are employed. (Mankiw, 2018)

Of course, reality does not correspond to this ideal. Even while the economy is doing well, there are always some employees who are out of work. To put it another way, the unemployment rate never reaches zero, instead fluctuating around the natural rate of unemployment.

To summarize our findings, there are four possible explanations for long-term unemployment. The first reason is that it takes time for workers to find jobs which are a good fit for them. The unemployment caused by the procedure of matching employees and jobs is known as frictional unemployment, and it is commonly thought to clarify relatively short periods of unemployment. (Mankiw, 2018)

The next three theories for unemployment show that the amount of job vacancies in particular labor markets may not be enough to accommodate everyone who desires one. This happens when the amount of labor supplied exceeds the amount demanded. This situation is sometimes referred to as structural unemployment, and it is frequently thought to clarify longer periods of unemployment. When wages are placed above the level that puts supply and demand towards equilibrium, this type of unemployment occurs. Minimum-wage laws, unions, and efficiency wages will all be investigated as potential causes of above-equilibrium wages. (Mankiw, 2018)

### **3.3.2 Minimum-Wage Laws**

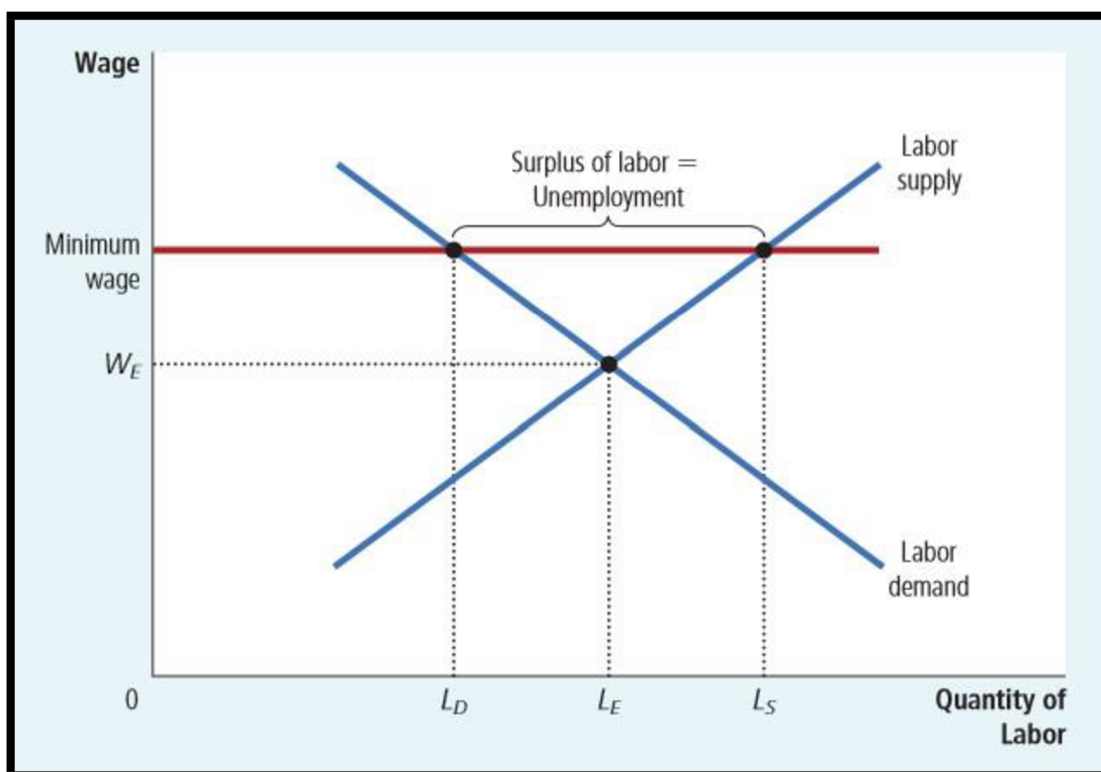
To clarify structural unemployment, we must first examine how minimum-wage regulations might result in rising unemployment. In the economy, minimum wage laws are not the primary cause of unemployment, but nevertheless, they have a significant impact on certain groups with disproportionately high levels of unemployment. Furthermore, an examination of minimum wages is a natural place to begin in order to comprehend some of the other reasons of structural unemployment. (Mankiw, 2018)

Figure 4 summarizes the fundamental economics of a minimum wage. When a minimum-wage rule keeps the wage above the point at which supply and demand are balanced, in comparison to the equilibrium level, it increases the quantity of labor supplied while

decreasing the quantity of labor demanded. Some workers are unemployed because there are more people who want to work than there are jobs. As a result, there is a labour surplus.

Minimum-wage laws are one of the reasons for the existence of unemployment in most of the countries, but they really do not affect everyone in certain countries. Because most of workers earn significantly more than the legal minimum wage, the legislation does not prohibit most wages from adjusting to keep supply and demand in balance. Minimum-wage rules are particularly important for the least skilled and experienced workers, such as adolescents. Their equilibrium wages are typically low, and as a result, they are more likely to fall under the legal minimum. Only between all these workers does the existence of unemployment be explained by minimum-wage laws.(Mankiw, 2018)

**Figure 4: Unemployment from a Wage above the Equilibrium Level**



**Source: Mankiw,2018**

Figure 4 depicts the effects of a minimum-wage law while simultaneously illustrating a larger lesson: Unemployment occurs when the wage remains above the equilibrium level for any reason. Wages could be too high for a variety of reasons, including minimum-wage laws.

Though it is important to stress at this point that, unlike frictional unemployment, which occurs during the job search process, structural unemployment occurs when wages are above equilibrium. The need for job searching is not a result of wages failing to stabilize labor supply and labor demand. When job seeker is the reason for unemployment, workers are looking for jobs that match their interests and skills. When the wage is higher than the equilibrium level, however, the amount of labor supplied exceeds the amount of labor demanded, and employees are unemployed while they wait for positions to become available.(Mankiw, 2018)

### **3.3.3 Unions**

A union is an organization of workers who get together to negotiate wages, benefits, and working conditions with their employers. As history shows, unions still play a big role in many European countries. As an example, most of the workers in Sweden, Belgium and Norway are belongs to this kind of unions but also in some other countries in Europe, such as Germany and France, the wages of the workers are set by law, however some of these workers are members of unions. In these circumstances, wages are not decided by the equilibrium of supply and demand in competitive labour markets. (Mankiw, 2018)

When a union negotiate with a company, it demands greater salaries, better benefits, and improved working conditions than the company would provide without a union. If the union and the company cannot come to some agreement, the union might call a strike to remove workers from the company. A company facing a strike is more likely to agree to pay greater salaries than it would otherwise since a strike affects output, sales, and profit. Economists studying the impact of unions often conclude that union employees earn 10% to 20% more than equivalent workers who are not members of a union.

When a union increases the wage over the equilibrium level, it increases the supply of labour while decreasing the demand for work, resulting in unemployment. Workers who keep their higher-paying jobs are better off, whereas those who were previously working but are now jobless are worse off. Moreover, unions are often seen as causing friction among various groups of workers—between insiders who benefit from increased union pay and outsiders who do not acquire union positions.(Mankiw, 2018)

Non-members might respond to their stance in two ways. Some choose to remain unemployed and wait for the chance to join the union and earn substantial union wages. There is only one route for non-members to get work in non-unionized enterprises. As a



result, when unions boost wages in one sector of the economy, labour supply rises in other sectors. Because of the rise in worker supply, salaries in non-union industries will decrease. According to various explanations, unionized employees profit from collective bargaining while non-union workers bear part of the expenses.

The regulations that regulate union organization and collective bargaining have a function in the economic role of unions. Workers required more market power when bargaining with employers, according to the politicians who established the antitrust laws. Several laws have been enacted to facilitate the creation of unions. The Wagner Act of 1935, in instance, prohibits companies from interfering with employees' attempts to form unions and compels employers to deal with unions in good faith. (Mankiw, 2018)

### **3.3.4 Efficiency Wages Theory**

The idea of efficiency wages suggests a fourth reason why countries always have some unemployment, in addition to job seeking, minimum-wage regulations, and unions. Firms run more effectively, according to this hypothesis, if salaries are higher than the equilibrium level. As a result, even if there is a labour surplus, it may be beneficial for businesses to maintain wages high.(Mankiw, 2018)

In some respects, the unemployment caused by efficiency wages is comparable to that caused by minimum-wage laws and labour unions. In all three situations, unemployment is caused by wages that are higher than the level at which the amount of labour provided and required are balanced. However, there is a significant distinction. In the case of a surplus of labour, minimum-wage laws and unions restrict employers from decreasing wages. According to efficiency-wage theory, in many situations, a wage limitation is unnecessary since businesses may be better off retaining wages beyond the equilibrium level.

Why should businesses be motivated to keep salaries high? This choice may seem strange at first, since wages account for a significant portion of a company's expenses. Profit-maximizing businesses are often expected to keep costs and hence wages as low as feasible. The unique idea of efficiency-wage theory is that paying high salaries may be lucrative since it increases a company's worker efficiency.(Mankiw, 2018)

### **3.3.5 The Natural Rate of Unemployment**

There are several explanations why unemployment has always been a positive. Not every employee can do all tasks. Unemployment in Detroit and openings in Seattle occur at the same time when there is a shortage of autoworkers and a quantity demanded for software engineers. We called this form of unemployment structural in the previous theory. On the other hand, some employees will always switch employment. Frictional unemployment is the name given to this last form of unemployment. Even when the economy is fully employed, structural and frictional unemployment contribute to positive unemployment. The natural rate of unemployment is the rate of unemployment that happens when the economy is operating at full capacity.(Stiglitz and Walsh, 2006)

## **4 Practical Part**

### **4.1 Unemployment in Tajikistan**

In the middle of the twentieth century, the Soviet Union began to face a major problem unemployment. One of the key reasons for the Soviet Union's demise was this. Tajikistan gained independence on September 9, 1991, as the Soviet Union fell. Since Tajikistan was formerly a part of the Soviet Union, it had the same unemployment problems. From 1992 until 1995, there was a civil war in which the population were divided into two groups, one of whom sought a Communist society and the other an Islamic republic. During this civil conflict, residents are confronted with another issue food scarcity.

The Tajik economy is struggling to keep up with the country's expanding population. GDP increased by an average of 7.2 % each year between 2003 and 2013. Employment, on the other hand, grew at a rate of only 2.1 percent each year. Nonetheless, Tajikistan's fertility rates are still high, and the working-age population (15–64 years old) increased from 3.31 million in 2000 to 5.23 million in 2015, with an average of 40,000 individuals joining the labor force each year.(Strokova and Ajwad, 2017)

According to official data published by the Agency on Statistics under the President of the Republic of Tajikistan, the registered unemployment rate was 2.2% in 2018. It is important to note that the Agency on Statistics under the President of the Republic of Tajikistan provides information based on registered unemployed people in the public employment service. The data which provide Public Employment Service does not correspond real unemployment rate because just 20 % of the unemployed registered. Given the unemployed lack of information about these services' activities, the poor quality of services supplied, the unappealing openings, and, in general, their lack of trust in the operations of the Public Employment Service. According to the Labour Force Survey, there were 196,000 unemployed persons at the end of 2004, compared to 38,800 officially unemployed people.

The total unemployment rate in Tajikistan was 16.0 percent in 1999, according with Tajikistan Living Standards Survey. According to the Poverty Reduction Monitoring Survey from 2002, the number is 11.4 percent. Both surveys were carried out with the help of the World Bank and the State Statistics Committee.

In Tajikistan, the overall unemployment rate in cities is two times greater (21.1%) than in rural regions. This percentage is up to six times greater in some age groups than in rural regions. When looking at the unemployment rate by area, it is similarly excessive. The Dushanbe area (23.2%) and the Gorno-Badakhshan Autonomous Province (Pamir, 16.2%) have the greatest overall unemployment, while the Sughd area has the lowest (4.5%). According to table 1, in general, the unemployment rate among women is lower than among men. When looking at age groups, the youth unemployment rate (15–29 years old) is 10.6%, which is twice as high as among the population aged 30–75 years. Male unemployment in urban areas is extremely high(12.1%).

**Table 1: Unemployment rate by gender and age groups, Survey labour force 2016**

Category	Total	Male	Female	Urban		Rural	
				Male	Female	Male	Female
<b>Total in %</b>	6,9	7,9	5,5	12,1	9,1	6,3	4,4
<b>15-19 years old</b>	9,9	12,4	6,6	40,4	35,1	6,4	3,7
<b>20-24 years old</b>	12,5	14,7	9,4	22	18,8	12,1	7,8
<b>25-29 years old</b>	9,3	10,2	7,8	10,6	10,6	10	7,1
<b>30-75 years old</b>	4,2	4,8	3,1	7,7	4,7	3,7	2,5

**Source:** *(Agency on statistics under the President of the Republic of Tajikistan, no date) Own work*

According to table 2 unemployment can be caused by a variety of factors. Sixty-two percent of the population is unemployed due to a lack of work experience, primarily young people aged 15 and above entering the labor market for the first time. Another 7.7% of workers have lost their employment as a consequence of business closures, and another 7.5% are unsatisfied with their current wages.

**Table 2: Reasons for unemployment in Tajikistan**

	Total	Urban	Rural	Men	Women
<b>Total unemployed</b>	<b>196,950</b>	<b>108,800</b>	<b>87,150</b>	<b>101,600</b>	<b>94,350</b>
<b>Reasons for unemployment(%)</b>					
<b>Dismissal due to staff reduction/cost savings</b>	4,1	5,0	3,1	4,1	4,2
<b>Closure of enterprise</b>	7,7	7,8	7,6	11,6	3,6
<b>Closure of personal business</b>	1,7	1,7	1,6	2,2	1,1
<b>Employee resignation</b>	2,4	3,6	1,0	3,1	1,7
<b>Contract termination</b>	2,3	2,6	1,9	3,2	1,3
<b>Discharge from army</b>	0,3	0,5		0,5	
<b>Change of residence</b>	2,6	3,3	1,8	1,5	3,9
<b>Termination on health grounds</b>	1,8	1,3	2,4	1,2	2,4
<b>Dismissal on compassionate grounds (personal reasons)</b>	4,4	5,3	3,3	1,8	7,2
<b>Retirement</b>	0,9	0,9	0,8	0,6	1,2
<b>Poor wages</b>	7,5	8,5	6,1	8,0	6,9
<b>No working experience</b>	62,7	57,1	69,7	58,7	73,6
<b>Other</b>	1,6	2,3	0,7	2,1	

Source:(European Training Foundation, 2010) Own work

Unemployment is mostly caused by a lack of job experience both between males and females in both urban and rural regions, but especially among women. Unemployment among young people aged 15 to 29 is significant, and the major cause is a lack of job experience, which is exacerbated by a lack of professional training.

**Table 3: The duration of unemployment in Tajikistan 2018**

	Unemployed	<1 months (thousands of people)	1-3 months (thousands of people)	3-6 months (thousands of people)	6-12 months (thousands of people)	More than 1 year (Thousand of people)	Unemployment aver.duration (month)
<b>Total</b>	49662	2537	11545	11990	9633	13957	8,4
<b>Rural</b>	37203	1837	7000	8788	7419	12159	9,1
<b>Youth (15- 29 years old)</b>	29334	1556	5410	6982	6034	9352	9,1
<b>Women</b>	25472	1551	6166	6681	4700	6374	7,9

Source: (Agency on statistics under the President of the Republic of Tajikistan, no date)  
Own work

Table 3 shows that the length of unemployment is getting longer, with the long-term unemployment rate reaching more than 8 months on average. Long-term unemployment in rural areas is a third higher than in urban areas, at more than 9 months on average. Youth job seekers have a longer search duration than middle-aged job seekers. Women job seekers have a shortest job search duration, as you can see.

In Tajikistan in 2018, about 49 thousand people were registered as unemployed, based on statistics under the president of the Republic of Tajikistan. Of this number, just over 3500 of them had higher professional education. For obvious reasons, the shorter a person's job search duration is the better their educational level.

Due to a scarcity of jobs in Tajikistan, labour migration has risen, with remittances becoming a significant source of income for Tajiks in recent years. A considerable portion of the workforce, as many as one million working-age persons, or around 30% of the labour force, has chosen to leave the nation in search of employment and salary. In the Russian Federation, around 90% of migrants work. Growing remittances have resulted in a significant reduction in poverty, which has dropped from almost 65 percent in 2003 to 23.5 percent in 2009. Tajikistan is the world's most remittance-dependent country, with remittances accounting for around 40% of GDP. This, along with the economy's limited export base, makes it sensitive to foreign shocks, particularly events in the Russian Federation. (Strokova and Ajwad, 2017)

#### **4.1.1 Youth unemployment in Tajikistan**

Tajikistan has a large youth unemployment issue. 60-65 % of young individuals aged 15-29 who are listed with the employment services are unemployed in general. According to European training foundation in 2004 statistically, the unemployment rate among economically engage young people was 9-11 %. Unemployed persons were on average 29.6 years old. Of the overall number of unemployed youths, 70% are actively seeking for work and 30% are attempting to start their own enterprises.

Unemployed young people commonly seek physical labour employment (38%), over 30% seek jobs related to their profession, and 9% want administrative or management positions. Unemployed youth are frequently offered inappropriate occupations, and 64 % of them decline such offers. The major reason for this is poor wages.

Around 40% of jobless young people are willing to relocate to another country to find work, and another 16% are willing to relocate inside the country, based on the European Training Foundation, indicating that unemployed youth have a high degree of mobility. Young people living in rural areas are more mobile, with 22% of women in rural areas preferring to relocate to the capital. Lack of education was the most common barrier to young people obtaining work (25.7%), while lack of work experience was cited by another 12.8 %. Poor wages were deemed unacceptable by 22% of respondents, and almost 20% viewed a lack of work options to be a severe barrier in their job search. More than 42% of young people believe that having a professional degree is beneficial. According to a study, the majority of jobless adolescents (37-40%) in both rural and urban regions feel that higher education is required to find work, and 12-14 % believe that an apprenticeship with a company is beneficial. In summary, the survey finds that school students, unemployed and economically inactive adolescents, and notably females, are all interested in higher education. (European Training Foundation, 2010)

The percentage of young people who are unemployed is determined by their level of education. Based on Peer Review of Youth Employment Policies in the Republic of Tajikistan, roughly 23.5 % of all graduates remained unemployed as of the end of 2011, including 11% of graduates from higher educational institutions, 64% of graduates from secondary vocational schools, and 50% of graduates from basic schools. Youth unemployment is linked to the lack of experience and understanding that vocational education does not match labour market demands. Higher education graduates are in great demand, although 20% of individuals with a postsecondary degree work in blue-collar jobs. (Pouchkin and Surina, 2015)

#### 4.1.2 Index analysis

**Table 4: Index analysis of unemployment rate by gender in Tajikistan**

Year	Unemployment rate male in %	Basic index	Chain index	Unemployment rate female in %	Basic index	Chain index
2000	15,5	1,00		14,0	1,00	
2001	15,1	0,97	0,97	13,6	0,97	0,97
2002	14,8	0,95	0,98	13,2	0,94	0,97
2003	14,4	0,93	0,97	12,9	0,92	0,98
2004	14,0	0,90	0,97	12,4	0,89	0,96
2005	13,6	0,88	0,97	11,9	0,85	0,96
2006	13,0	0,84	0,96	11,3	0,81	0,95
2007	12,4	0,80	0,95	10,8	0,77	0,96
2008	12,0	0,77	0,97	10,4	0,74	0,96
2009	12,1	0,78	1,01	10,4	0,74	1,00
2010	11,5	0,74	0,95	9,6	0,69	0,92
2011	10,9	0,70	0,95	8,9	0,64	0,93
2012	10,3	0,66	0,94	8,1	0,58	0,91
2013	9,7	0,63	0,94	7,4	0,53	0,91
2014	9,0	0,58	0,93	6,7	0,48	0,91
2015	8,4	0,54	0,93	6,0	0,43	0,90
2016	7,8	0,50	0,93	5,4	0,39	0,90
2017	7,7	0,50	0,99	5,4	0,39	1,00
2018	7,6	0,49	0,99	5,3	0,38	0,98
2019	7,5	0,48	0,99	5,2	0,37	0,98

Source:(World Development Indicators | DataBank, no date) own work

The table 4 shows basic and chain index analysis for male and female unemployment rate in Tajikistan. Index analysis allows to compare results in dataset from year 2000 to 2019 and it shows how it has developed from time to time.

The basic index describes a change in a specific year with the base year which is 2000. According to table 4, there is only a decrease in both cases. The biggest decrease in the male unemployment rate was in the year 2019, where the basic index was 0.48, which means that the male unemployment rate decreased by 52% compared to the year 2000. For the female unemployment rate, the biggest decrease was also in the year 2019. The basic index for the female unemployment rate in 2019 was 0,37, which means that unemployment for females has decreased by 63% compared to the year 2000.



The yearly changes are represented by the Chain index. There was just one increase in the male unemployment rate in 2009, when the chain index was 1,01, indicating that unemployment was slightly higher than the previous year, 2008. (0,97). The largest drop, 0.93, was repeated three times. In 2014, compared to 2013, it decreased by 7%, in 2015, compared to 2014, and in 2016, compared to 2015. There is no increasing in the female unemployment rate. The largest drop was replicated twice, yielding a result of 0.90. In 2015, compared to 2014, and in 2016, compared to 2015, the female unemployment rate reduced by 10%.

## 4.2 Economic and Time series data

**Table 5: Annual Time Series, period 2000 - 2020**

Year	Unemployment rate, in %	Average monthly wages(USD\$)	Number of graduates from institutions of higher professional education (thousands)	Number of employees who underwent training and retraining, improved their qualifications, and completed an internship (thousands)
2000	15,0	7,8	13,6	12818
2001	14,6	10,7	12,0	5736
2002	14,3	10,5	11,6	5991
2003	13,9	14,4	13,4	11515
2004	13,4	20,4	14,4	11785
2005	12,9	26,8	15,1	13190
2006	12,4	35,2	10,8	15660
2007	11,8	47,4	19,3	11869
2008	11,4	67,5	21,3	20411
2009	11,5	68,6	23,3	20932
2010	10,9	80,9	27,7	17785
2011	10,2	95,9	28,0	14180
2012	9,5	116,6	36,2	20297
2013	8,9	145,8	29,1	19730
2014	8,2	165,4	30,2	22173
2015	7,5	142,6	29,5	21888
2016	6,9	122,8	33,2	29987
2017	6,8	133,8	38,5	46507
2018	6,7	134,0	44,6	46800
2019	6,7	140,0	45,3	48546
2020	7,5	130,5	45,8	39342

Source:(*World Development Indicators | DataBank, no date; Agency on statistics under the President of the Republic of Tajikistan, no date*) Own work

The yearly time series data in table 5 is based on the unemployment rate, average monthly wages, number of graduates from institutions of higher professional education, and the number of employees who underwent training and retraining, improved their qualifications, and completed an internship from 2000 to 2020.

The following economic model is constructed with the purpose of identifying statistically significant or statistically insignificant variables:

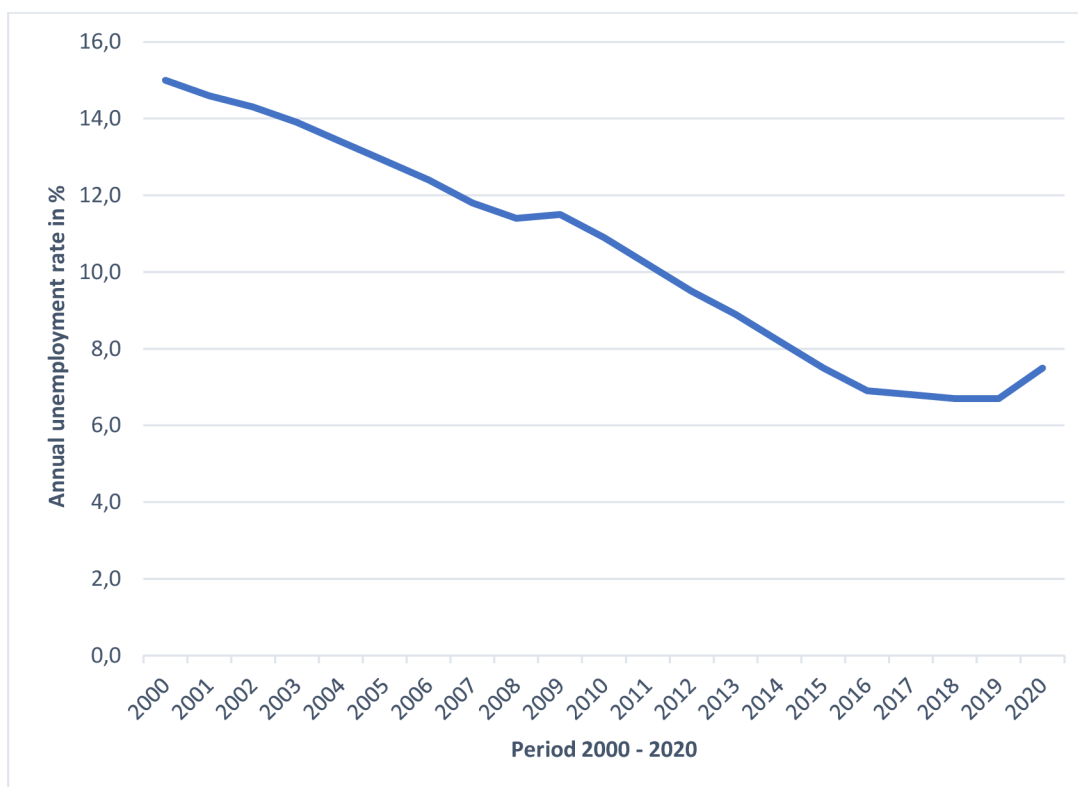
- The unemployment rate in the Republic of Tajikistan is affected by average monthly wages, the number of graduates from institutions of higher professional education, and the number of employees who underwent training and retraining, improved their qualifications, and completed an internship.

Each variable will be estimated and analyzed in Linear regression models to discover the statistically significant variable.

### 4.3 Descriptive analysis

#### 4.3.1 Unemployment rate

**Figure 5: Unemployment rate in Tajikistan during 2000 – 2020**



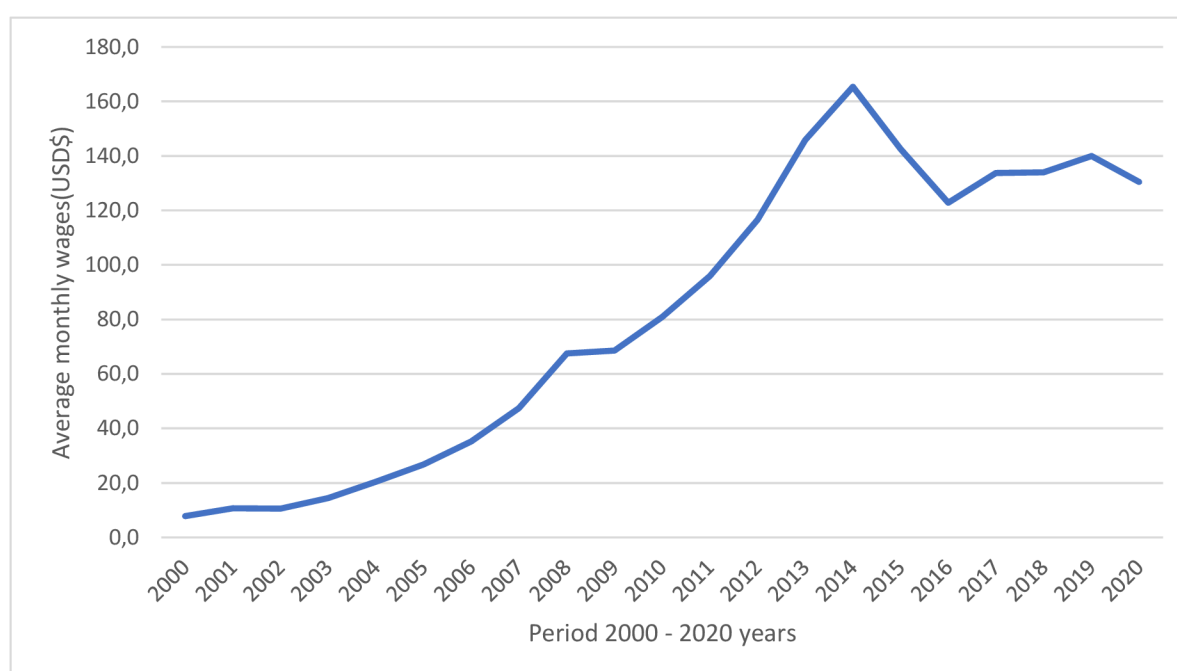
Source : (World Development Indicators | DataBank, no date) Own work

Figure 5 shows how in the Republic of Tajikistan, the unemployment rate has decreased from 2000 to 2019, starting with 15% and reaching its lowest level of 6.7% in 2019. According to the theory mentioned above, unemployment falls as real GDP grows faster. There was a sharp rise that significantly affected the unemployment rate. Tajikistan experienced faster GDP growth, at an average of 7.2% annually between 2003 and 2013. And until now, the economy continues to grow every year by 6-7%. The COVID-19 pandemic had a negative impact on the economy of Tajikistan, the GDP growth rate decreased to 1% per year. In 2020, the unemployment rate was 7.5%, up from 6.7% the previous year.

After reviewing all of the data, it can be determined that the highest unemployment rate was 15% in 2000 and the lowest was 6,7% in 2019. Between 2000 and 2020, the average (mean) rate was 10%.

#### 4.3.2 Monthly average wages

**Figure 6: Monthly average wages in Tajikistan**



**Source: (Agency on statistics under the President of the Republic of Tajikistan, no date) Own work**

According to figure 6 above, the average monthly wages have dramatically increased over the past years in the Republic of Tajikistan. The reason for this faster growth, as

indicated in the chapter above, is that since the civil war in Tajikistan, the economy has been growing by 6-7% every year.

Consequently, the average wage reached a high of \$ 165,4 at the end of 2014, with a low of \$ 7,8 at the start of 2000. Over a twenty-one-year period, the average wage was \$ 81,8 dollars.

## 4.4 Regression model and estimation

### 4.4.1 Regression model

In the regression model, the economic model from the earlier chapter is applied. The final regression model estimation provides a clear picture of the relationships between the dependent variable (unemployment rate) and the independent variables (average monthly wages, the number of graduates from institutions of higher professional education, and the number of employees who underwent training and retraining, improved their qualifications, and completed an internship). The following is the regression model:

$$y_t = \beta_0 + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + t + \varepsilon_t$$

Where:

$y_t$  = Unemployment rate

$\beta_0$  = Y- Intercept

$X_{1t}$  = Average monthly wages

$X_{2t}$  = The number of graduates from higher professional education institutions

$X_{3t}$  = The number of employees who underwent training and retraining, improved their qualifications, and completed an internship.

$t$  = time series

$\varepsilon$  = Residual value

The purpose is to determine which variable is statistically significant, and statistically insignificant variables will be eliminated based on the results. The unemployment rate is chosen as a dependent variable in the SAS studio in the regression task, while average monthly wages, the number of graduates from institutions of higher professional education, and the number of employees who underwent training and retraining, improved their qualifications, and completed an internship are chosen as independent variables, all based on yearly time series data from Table 5.

The outcome of the first estimation is shown in Table 6, and it can be concluded that the P-value of the number of employees who underwent training and retraining, improved their qualifications, and completed an internship 0.1071 is bigger than  $\alpha$  0.05, indicating that the variable is not statistically significant. One additional regression model will be created and estimated by removing the number of employees who underwent training and retraining, improved their qualifications, and completed an internship.

**Table 6: Estimation of variables**

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	164.26323	41.06581	243.82	<.0001
Error	16	2.69486	0.16843		
Corrected Total	20	166.95810			

Root MSE	0.41040	R-Square	0.9839
Dependent Mean	10.52381	Adj R-Sq	0.9798
Coeff Var	3.89974		

Parameter Estimates						
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	Intercept	1	15.12529	0.25399	59.55	<.0001
Time	Time	1	-0.35180	0.07634	-4.61	0.0003
Average monthly wages(USD\$)	Average monthly wages(USD\$)	1	-0.01803	0.00555	-3.25	0.0051
Number of graduates from institu	Number of graduates from institutions of higher professional education (thousands)	1	0.05485	0.02879	1.90	0.0749
The number of employees who unde	The number of employees who underwent training and retraining, improved their qualifications, and completed an internship (thousands))	1	-0.00003099	0.00001815	-1.71	0.1071

Source: Own calculation, SAS Studio

#### 4.4.2 Regression model without first not significant variable

Table 7 demonstrates the estimate of a new regression model with the unemployment rate as the dependent variable and average monthly wages and the number of graduates from institutions of higher professional education as the independent variables. As mentioned above, because of its insignificance, the number of employees who underwent training and retraining, improved their qualifications, and completed an internship was excluded.

**Table 7: Estimation of variables without the number of employees who underwent training and retraining, improved their qualifications, and completed an internship**

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	163.77224	54.59075	291.30	<.0001
Error	17	3.18586	0.18740		
Corrected Total	20	166.95810			

Root MSE	0.43290	R-Square	0.9809
Dependent Mean	10.52381	Adj R-Sq	0.9776
Coeff Var	4.11354		

Parameter Estimates						
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	Intercept	1	15.23531	0.25915	58.79	<.0001
Time	Time	1	-0.41374	0.07085	-5.84	<.0001
Average monthly wages(USD\$)	Average monthly wages(USD\$)	1	-0.01328	0.00507	-2.62	0.0179
Number of graduates from institu	Number of graduates from institutions of higher professional education (thousands)	1	0.03581	0.02800	1.28	0.2182

**Source: Own calculation, SAS Studio**

The P-value of the number of graduates from institutions of higher professional education 0.2182 is bigger than alfa 0.05 based on estimation without the number of employees who underwent training and retraining, improved their qualifications, and completed an internship, indicating that the number of graduates from institutions of higher professional education is statistically insignificant. One more final regression model will be developed and evaluated by removing the number of graduates from institutions of higher professional education variable.

#### 4.4.3 Final regression model

**Table 8: Final estimation**

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	2	163.46580	81.73290	421.27	<.0001
Error	18	3.49229	0.19402		
Corrected Total	20	166.95810			

Root MSE	0.44047	R-Square	0.9791
Dependent Mean	10.52381	Adj R-Sq	0.9768
Coeff Var	4.18549		

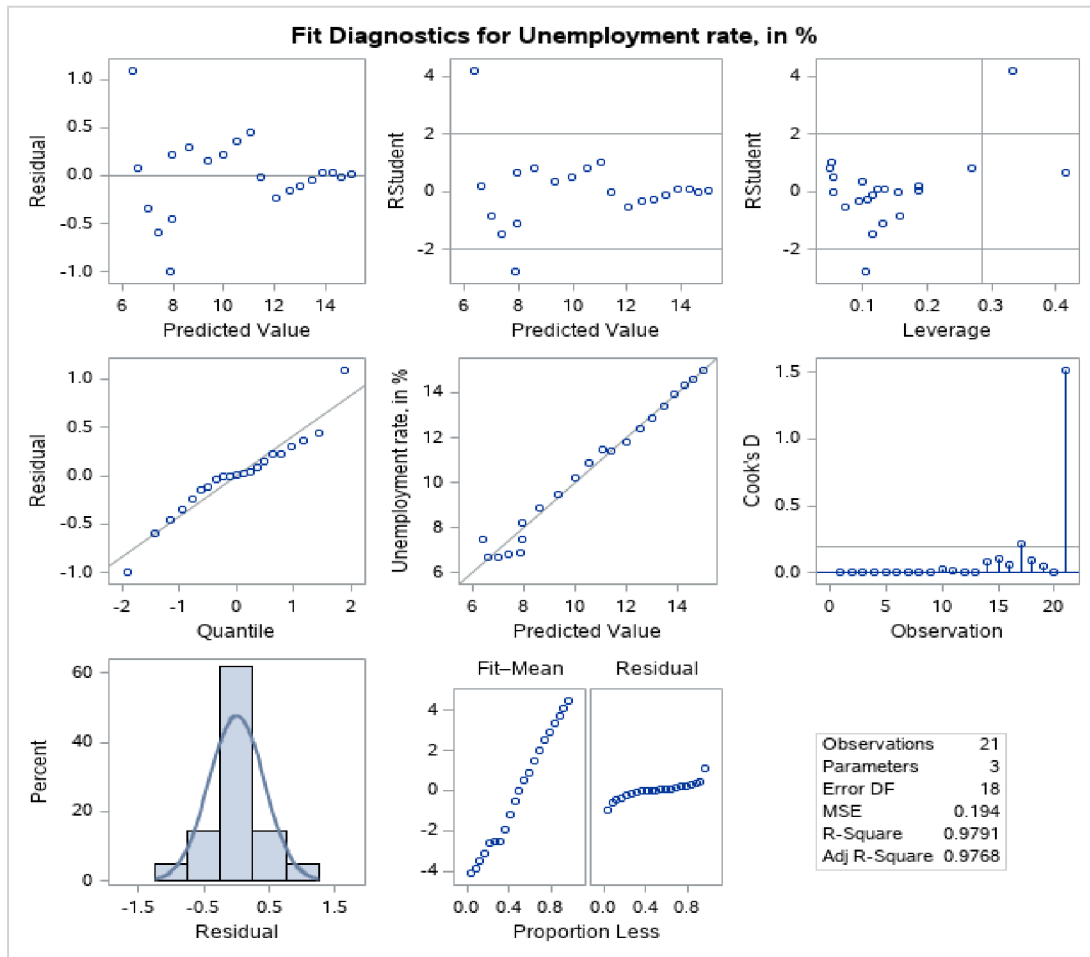
Parameter Estimates						
Variable	Label	DF	Parameter Estimate	Standard Error	t Value	Pr >  t
Intercept	Intercept	1	15.44454	0.20448	75.53	<.0001
Time	Time	1	-0.34310	0.04513	-7.60	<.0001
Average monthly wages(USD\$)	Average monthly wages(USD\$)	1	-0.01402	0.00512	-2.74	0.0136

Table 8 shows that the P-value of average monthly wages 0.0136 and time series 0.0001 are both less than 0.05, indicating that both variables are statistically significant. The R-square of the predicted regression model is 97.91%, while the adjusted R-square is 97.68%. The final estimated regression model is interpreted as follows:

$$y = 15.44454 - 0.01402x_1t - 0.34310t$$

- According to the equation, average monthly wages have a negative relationship with the unemployment rate, meaning an increase in average monthly wages have a positive effect on the unemployment rate.
- The R square in the final model is 0.9791, which indicates that 97.91% of the variation in unemployment rate is explained by independent variables.
- The number of graduates from higher professional education institutions and the number of employees who underwent training and retraining, improved their qualifications, and completed an internship were found to be statistically non-significant.

**Table 9: Diagnostic of the model**



According to the table above, the points for this model are close to the diagonal line in the unemployment graph in the centre, which indicates that the model fits the data well. The residual versus the predicted values plot shows there is no particular pattern and the linearity assumption is not violated. The data likewise appears to be homoscedastic since residuals appear to be uniformly distributed around the line, which also indicates that residuals are independent. The second graph is studentized residuals, which indicates that for these data, one observation has negative large residuals and one positive, as the observations exceed the interval of  $\pm 2$ . It can be seen from the quantile plot that the points are located close to the diagonal line, which indicates a normal distribution of the residuals. This is also confirmed by the histogram of residuals.



## 5 Results and Discussion

The analysis of the practical part shows that the highest unemployment rate was 15% in 2000, since the Tajik economy was in a very difficult state after the civil war, and the lowest unemployment rate was registered in 2019 at 6.7%, which indicates a decrease in the level of unemployment every year. According to the index analysis, the female unemployment rate is lower than the male unemployment rate in Tajikistan. This estimate gives a clearer picture of how unemployment among men and women has changed over time. Based on this analysis, it is proved that the unemployment rate among men in 2019 decreased by 52% compared to 2000, and among women by 63%. Youth unemployment in Tajikistan is significant among 15–29-year olds, and the duration of unemployment in the country on average is more than 8 months, especially in rural areas.

The first regression model was created using annual time series data, with the unemployment rate as the dependent variable and the average monthly wages, time series, number of graduates from institutions of higher professional education, and number of employees who underwent training and retraining, improved their qualifications, and completed an internship as independent variables. Following the estimate, it was discovered that the P-value of the number of employees who underwent training and retraining, improved their qualifications, and completed an internship is bigger than  $\alpha$ , indicating that the variable is statistically insignificant.

The second regression model was created by removing the number of employees who underwent training or retraining, improved their qualifications, and completed an internship while leaving the other variables unchanged. The unemployment rate is the dependent variable, whereas the average monthly wages, the number of graduates from higher professional education institutions, and time series are the independent variables. The number of graduates from institutions of higher professional education has a P-value greater than  $\alpha$ , indicating that the variable is statistically insignificant.

The number of graduates from institutions of higher professional education was excluded from the final regression model. The unemployment rate is the dependent variable, whereas average monthly wages and time series are the independent variables. The P-values of average monthly wages and time series were determined to be lower than  $\alpha$ . They were discovered to be statistically significant variables because of this. Furthermore, the negative relationship between average monthly wages and unemployment rate was verified.

According to the European Training Foundation's 2010 research,(European Training Foundation, 2010) the main reason for unemployment was a lack of job experience, particularly among young people aged 15 and over, which was exacerbated by a lack of professional training. But as we can see from our regression analysis, despite the fact that the number of employees who underwent training and retraining, improved their qualifications, and completed an internship is rising every year, it does not confirm a relationship between unemployment and professional training. Also, lack of education was the most common barrier to young people obtaining jobs, and our second model shows there is no relationship between the number of graduates from institutions of higher professional education and the unemployment rate. In addition, a study by the European Training Foundation has shown that low wages also are one of the major causes of unemployment in Tajikistan. Therefore, most people find the salary in Tajikistan unacceptable and migrate to other countries in search of work. And our latest regression model confirms this by showing the significance of the average monthly wages and the unemployment rate. It demonstrates that when wages are rising, unemployment will decrease.

The economic model's understanding from part 4.2 will be updated to:

- Unemployment rate is affected by average monthly wages and time series

**Table 10: Comparison of adjusted R-square**

	<b>1-Model</b>	<b>2-Model</b>	<b>Final model</b>
<b>Adj R-Sq</b>	97,98%	97,76%	97,68%

In table 10, it is possible to compare the adjusted R-square for all regression models. Based on the table above, the first model has an adjusted R-square of 97,98%, the second model has an adjusted R-square of 97,76%, and in the final model the adjusted R-square is 97,68%. We can conclude that there is a small increase in adjusted R-square and it will improve model fit if we include all non-significant variables in the final model.

**Table 11: Comparison of t-values and P-values**

	<b>t-value</b>	<b>P-value</b>	<b>Significance</b>
<b>average monthly wages</b>	-2,74	< 0.0001	Significant
<b>Time series</b>	-7,6	< 0,0001	Significant
<b>number of graduates from institutions of higher professional education</b>	1,28	0,2182	not significant
<b>number of employees who underwent training and retraining, improved their qualifications, and completed an internship</b>	-1,71	0,1071	not significant

Table 11 shows the comparison of t-values and p-values. The final regression model indicated that average monthly wages and time series are statistically significant. In the final regression model adjusted R-square was 0.9768. Keeping in mind that our model explains 97.91 percent of variance on average, just one scenario is suggested as an example of how the unemployment rate would change:

$$y = 15.44454 - 0.01402x1t - 0.34310t$$

## 6 Conclusion

Unemployment has mostly negative economic, political, and societal implications. Regardless of the positive characteristics, liquidating it is both impossible and inconvenient. Unemployment at a certain level is even beneficial to the country—a natural unemployment rate. In light of all of this, it is reasonable to conclude that unemployment will remain and vary even in prosperous times. One thing is known to each of us: the economy of a certain country is always changing. Change is the only way to progress. The theories in the chapters above paint a clear picture of unemployment definitions and estimates.

The main aim of this thesis was to identify whether average monthly wages, the number of graduates from institutions of higher professional education, and the number of employees who underwent training and retraining, improved their qualifications, and completed an internship contributes to the unemployment rate in Tajikistan. The statistical analysis is the foundation of the thesis. Furthermore, the researcher gathered information from official sources. Moreover, after gathering the data, the researcher conducted different analyses to determine whether certain variables have an impact on the unemployment rate in Tajikistan. There was an index analysis, a descriptive analysis, and a regression analysis. According to the regression results, there is a significant relationship between average monthly wages and Tajikistan's unemployment rate. As a result, employers' poor wage payments are the primary cause of high unemployment rate. Another significant item to note is that average monthly wages have a negative association with the unemployment rate, implying that a rise in monthly wages has a positive effect on the unemployment rate.

In general, unemployment over the past 20 years has been declining every year. The lowest average monthly wage was \$7.8 in early 2000, and the highest in 2014 was \$165. It can be concluded that over the past 20 years, the average monthly wage has increased due to economic growth. It is important to note that the Tajikistan economy is growing annually by 6-7%. Therefore, the government is obliged to do everything possible for the growth of the economy. On the other hand, the structure of the minimum wage should be reviewed and changed as necessary to ensure that people do not leave the country in search of work.

Despite the analysis showing that the number of graduates from institutions of higher professional education, as well as the number of employees who underwent training and retraining, improved their qualifications, and completed internships, are statistically insignificant, they are one of the important indicators affecting unemployment. Most academics feel that internships, cooperation, supplementary courses, training to achieve a certificate, and contributing to the development of soft skills have a significant impact on students' preparedness for future professional activities. It can be seen that the number of graduates of institutions of higher professional education has been increasing over the past 20 years, however, as we said at the beginning of the practical part, most of the unemployed do not have education, especially young people. Youth unemployment may be greatly decreased by increasing education levels, which is dependent on educational institutions' ability to adapt flexibly to labor market requirements, as well as the successful interaction of universities and businesses.

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