

Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Economics



Bachelor thesis

Analysis of Unemployment in the Czech Republic

Pampura Evgeniia

© 2015 CULS Prague

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Department of Economics
Faculty of Economics and Management

BACHELOR THESIS ASSIGNMENT

Pampura Evgeniia

Economics and Management

Thesis title

Analysis of Unemployment in the Czech Republic

Objectives of thesis

The aim of the thesis is to determine important factors, which influence the unemployment in the Czech Republic, to analyze relationships among variables, to simulate different scenario and to predict a dependent of interested variable to the future.

Methodology

The regression model is used for determination of important factors, analysis of relationships and for simulations. The estimated model is tested from economic and statistic point of view. Goodness-of-fit and statistical significance of parameters are evaluated. The trend function is used for prognosis purposes. Deduction, induction, synthesis and analysis are used in the thesis as well.

Schedule for processing

month/year	plan
12/2013 – 2/2014	a proposal of aim, methodology, bibliography of the thesis
2/2014 – 5/2014	a literature review (first part)
6/2014 – 8/2014	a literature review (second part)
8/2014 – 12/2014	an analytical part of thesis
1/2015 – 2/2015	a completion of the thesis, conclusion, summary
3/2015	final submission of the thesis

The proposed extent of the thesis

30 - 40 pages

Keywords

unemployment rate, average gross wage, vacancies, direct foreign investments, prognosis of unemployment, regression model

Recommended information sources

Krugman, P., Wells, R. Economics. 3rd Ed. USA: Worth Publishers, 2013. 1158 p. ISBN: 978-1-4292-5163-1.

Krugman, P., Wells, R., and Graddy, K. Essentials of Economics. 3rd Ed. USA: Worth Publishers, 2014. ISBN: 978-1-4292-7850-8.

Maitah, M. Macroeconomics. Praha: Česká zemědělská univerzita v Praze, Provozně ekonomická fakulta, 2009. 180 p. ISBN: 978-80-213-1904-2.

Mankiw, N. G. Essentials of Economics. 5th Ed. USA: Cengage Learning, 2008. 609 p. ISBN: 978-0-324-59002-9.

Mankiw, N. G. Principles of Economics. 6th Ed. USA: Cengage Learning, 2008. 890 p. ISBN: 978-0-538-45305-9.

The Bachelor Thesis Supervisor

Bubáková Petra, Ing.

Last date for the submission

March 2015

Electronic approval: October 6, 2014

prof. Ing. Miroslav Svatoš, CSc.

Head of the Department

Electronic approval: October 6, 2014

Ing. Martin Pelikán, Ph.D.

Dean

Declaration

I declare that I have worked on my bachelor thesis titled „Analysis of Unemployment in the Czech Republic“ 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 copyrights of any third person.

In Prague on 16.3.2015

.....

Pampura Evgeniia

Acknowledgement

I would like to thank Ing. Petra Bubáková for her advice and support during my work on this thesis.

Analýza nezaměstnanosti v České republice

Analysis of Unemployment in the Czech Republic

Summary

This thesis investigates the issues related to unemployment and its consequences. As unemployment is one of the major issues in the regulation of the economic situation in any states, its analysis is essential for understanding and forecasting the future development of any state's national economy. The author of the publication provides a deep theoretical overview of the key aspects of unemployment such as its different types, functions, and consequences in all respects. Also, the author investigates the conditions of unemployment on the Czech labor market, and provides grounded forecasts of the dynamics of those indicators in the near future. The thesis provides a high added value in the field of research of unemployment and its consequences in the economic and social spheres.

Keywords: unemployment rate, average gross wage, vacancies, direct foreign investments, frictional unemployment, cyclical unemployment, seasonal unemployment, natural unemployment, structural unemployment, rate of unemployment, consequences of unemployment.

Souhrn

Tato bakalářská práce zkoumá problém týkající se nezaměstnanosti a jejích následků. Protože nezaměstnanost je jednou z hlavních problémů v procesu regulace ekonomické situace ve všech státech, pak analýza tohoto ukazatele je klíčová pro pochopení a prognózování budoucí vývoj jakékoliv národní ekonomiky. Autorka této bakalářské práce předkládá hlubokou teoretickou analýzu klíčových faktorů nezaměstnanosti, zejména typy nezaměstnanosti, funkce a následky z různých úhlů pohledu. Autorka též zkoumá podmínky nezaměstnanosti na trhu práce v České republice, a poskytuje odůvodněné předpovědi dynamiky vývoje těchto ukazatelů v nejbližší budoucnosti. Bakalářská práce poskytuje vysokou přidanou hodnotu v oblasti výzkumu nezaměstnanosti a jejích následků v ekonomické a sociální sféře.

Klíčová slova: míra nezaměstnanosti, průměrná hrubá mzda, dovolená, přímé zahraniční investice, frikční nezaměstnanost, cyklická nezaměstnanost, sezónní nezaměstnanost, přirozená míra nezaměstnanosti, strukturální nezaměstnanost, následky nezaměstnanosti.

Contents

1	Introduction.....	7
1.1	Aim.....	8
1.2	Methodology	9
2	Theoretical Part.....	12
2.1	Definition of Unemployment	12
2.2	The Significance of the Unemployment Rate	13
2.3	Types of Unemployment.....	14
2.3.1	Frictional Unemployment	14
2.3.2	Structural Unemployment.....	14
2.3.3	The Natural Rate of Unemployment.....	15
2.3.4	Cyclical Unemployment	16
2.3.5	Seasonal Unemployment	16
2.4	Empirical Research of Unemployment during the Last Five Years	17
2.5	Measurement of Unemployment.....	18
2.6	Reasons of Measuring of Unemployment Rate	19
2.7	Reasons of Always Unemployed People	21
2.8	Main Causes of Unemployment.....	22
2.8.1	Minimum Wage	22
2.8.2	Labor Unions	23
2.8.3	Efficiency Wages	25
2.8.4	Public Policy	25
2.9	The Okun's Law.....	27
2.10	Consequences of Unemployment.....	28
3	Practical Part.....	33
3.1	Economic Model and Elementary Analysis of Variables	33
3.1.1	Economic Model.....	33
3.1.2	Elementary Analysis of Variables	34
3.2	Regression Model.....	43
3.3	Statistical Verification of the Model	45
3.4	Utilization of the Model	46
3.5	Discussion of Results	47
4	Conclusion	48
	Bibliography	51
	Appendix.....	53
	Table of figures.....	54

1 Introduction

In the current conditions of globalization, the economic development of countries is very rapid, and the market conjuncture is subject to major changes as a result of the impact of many differently vectored factors. In such conditions, the added value generated by the labor force becomes of the key competitive advantages for reaching economic success on the market for both companies and countries.

As the economic conditions are so much subject to changes, unemployment is inherent of the labor market, and it represents a significant issue for most countries. Obviously, all governments seek to minimize the rate of unemployment in order to increase the actual standards of living for their population, and thus in order to raise its purchasing power.

Measuring and forecasting the rate of unemployment and its dynamics in the future is therefore one of the essential tasks when building up the strategies for the effective development of the national economy. At the same time, governments need to apply particular practical measures for the purpose of effectively regulating the level of unemployment, and can do it using a wide variety of administrative tools. Without the effective regulation of the labor market, the high level of unemployment may lead to substantial detrimental consequences for the state.

In the Czech Republic, the issue of unemployment is particularly important and relevant, as the country is aiming to ensure steady mid- and long-term economic development, and maintain its role as the regional leader in Central Europe. Therefore, it is particularly worth analyzing the measures implemented by the Czech government in the field of regulation of unemployment, and investigating justified forecasts describing the possible scenarios of development of the Czech economy in the context of unemployment on the country's labor market.

1.1 Aim

The aim of this thesis is to create determine significant factors, which influence the unemployment rate most of all, quantify relationships among variables, simulate different scenarios for dependent variable.

In the analytic part, it will be examined how average gross wage, vacancies and direct foreign investments influence the unemployment rate.

Hypothesis

The following hypotheses will be evaluated:

H1: The effect of average gross wage on unemployment is statistically significant.

H2: The effect of vacancies on unemployment is statistically significant.

H3: The effect of direct foreign investments on unemployment is statistically insignificant.

H4: Growth of average gross wage leads to decrease of unemployment rate.

H5: Growth of vacancies leads to decrease of unemployment rate.

H6: Growth of direct foreign investments leads to decrease of unemployment rate.

The main idea of all hypotheses influences on whole welfare of the country. The unemployment rate is one of the main indicator of economic well-being of the country.

When explaining the above hypotheses, it is worth noting that changes in the level of foreign direct investment should rather have insignificant effect on unemployment, as the two indicators are not tightly interconnected in market terms, especially when speaking of the short-term perspective. The funds obtained by a recipient state through FDI can be used for creating new jobs in the long-term perspective. However, it should be understood that the involvement of major foreign investors leads to the higher involvement of foreign companies in the respective country's domestic market. As a result of the increased competition, part of the local entities would have to leave to the market, and thus contribute to the increase in the rate of unemployment, which would be balanced by the new jobs created by foreign investors. Thus, no major decrease in the unemployment rate should be expected in this case. At the same time, the effective development of a country's national economy in all respects generally leads to the creation of new vacancies which provide an opportunity for the local population to find jobs. As a result, the unemployment rate tends to decrease, which contributes to further growth of the economy.

In connectoin with this aim, the objective is also create a proper literature review conected with the analysed issue.

1.2 Methodology

The literature review is based on scientific books and papers. The books were borrowed at public libraries and some internet resources have been used to constitute data analysis.

For analysis about unemployment are used secondary data, that includes annual time series during 2000-2013 years. These data were taken from Czech Statistical Office, European commission and Czech National Bank and are shown in Chapter 5 (Table 1).

The regression model is used for defining correlation between dependent and independent variables. The regression model was estimated by Ordinary Least Squares method. The principle of Ordinary Least Squares is to minimize of sum square errors. The parameters are estimated based on formula:

$$(\mathbf{X}^T\mathbf{X})^{-1}\mathbf{X}^T\mathbf{y}$$

where \mathbf{X} is a matrix of observations of explanatory variables

and \mathbf{y} is a vector of data of endogenous variable

Model of the unemployment rate is evaluated as influenced of average gross wage, vacancies and direct foreign investments, i.e.:

$$\text{Unemployment rate} = f(\text{average gross wage, vacancies, direct foreign investments})$$

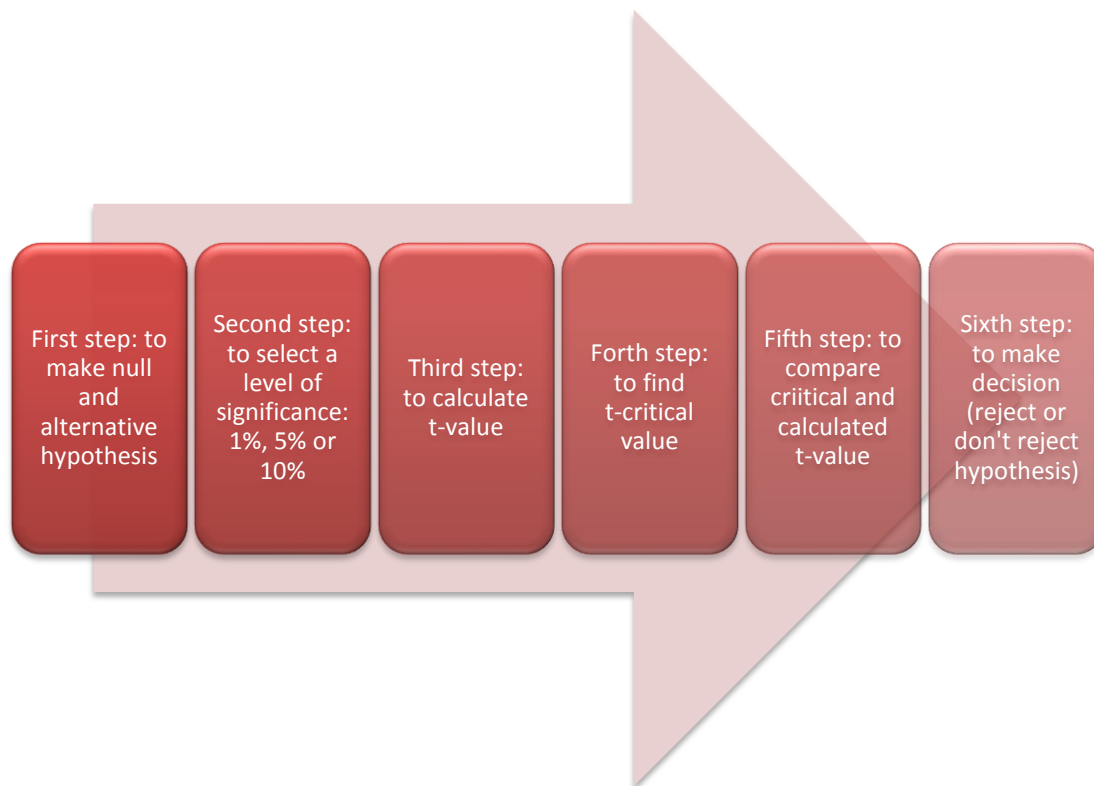
Model is more described in chapter 5.1

The goodness-of-fit is measured by coefficient of determination. It shows how much model explains variability of dependent variable with selected independent variables.

$$R^2 = 1 - \frac{SSE}{SST}$$

The t-test is used for determining statistical significance of estimated parameters. To calculate statistical significance there are several steps (see in Figure 1):

Figure 1: Description of calculation of statistical significance of parameters



Hypothesis of t-test are:

H0: $\beta_i = 0$

H1: $\beta_i \neq 0$

The calculation of t-value is:

$$t\text{-value} = \frac{\beta_i}{\text{standartd error}}$$

T-critical value for two tailed t-test is :

$$t_{\frac{\alpha}{2}} = [n - p] , \quad \text{where}$$

n ... number of observations

p ... number of parameters

n-p ... degrees of freedom

In fifth step there is inequality to compare t-value and critical value:

$$|t| \geq t_{\text{critical}}$$

In sixth step:

- If absolute value of t-value is higher than critical value than null hypothesis is rejected

➡ Parameter statistically significant

- If absolute t-value is lower than critical value than alternative hypothesis is rejected

➡ Parameter statistically insignificant

The final model is used for evaluation of hypotheses and also for simulations of different scenarios.

The software Microsoft Excel 2010 was used for elementary analysis of variables. The Gretl software was used for estimation of regression model.

The methods such as deduction, induction, analysis and synthesis are used in analytical part of the thesis.

2 Theoretical Part

2.1 Definition of Unemployment

In the scientific literature, there are different definitions of unemployment, as researchers tend to investigate the different aspects of this complex economic and social phenomenon, therefore using different basic factors for analyzing the essence of the respective processes.

The simplest definition of unemployment states that this phenomenon stands for the situation when people are deprived of work, but actively seek a job for the purpose of satisfying their economic needs (1). Some researchers further develop this definition and argue that unemployed persons are people aged more than a particular number of years who are not working, but wish to reach their full employment in order to satisfy the basic and other needs (2, 3). This definition is more complex and allows better explaining the phenomenon of unemployment, as in the official statistics of different countries, the rate of unemployment is only calculated for persons which have reached the required age to be include in the national economically active population (2). Finally, part of the researchers abstract from the construction of unemployment with the focus on unemployed people (in the context that unemployed persons always seek suitable job), and state that unemployment is a complex socioeconomic phenomenon under which people making part of the economically active population do not have their application in the economic practice due to the economic conjuncture formed on the market (4).

When investigating the essence and definitions of unemployment, it is also worth understanding that there are different types of unemployment, each of which has its particular features, and is characterized by different specific parameters which are only inherent of it, and aren't typical of the other types of unemployment (3). The detailed classification of unemployment types will be investigate more in detail in the next sections of this thesis.

2.2 The Significance of the Unemployment Rate

The unemployment rate is important for measuring how easy it is to find a job in the current market conditions. When this indicator is high, finding a job is a hard task, otherwise unemployed persons have great opportunities to find a vacancy (1).

The unemployment rate is an important mechanism of theoretical and practical research from two main perspectives. On the one hand, this market indicator allows understanding the real condition of the national economy in terms of the level of involvement of the national labor force in the economic activities within the state. On the other hand, the unemployment rate is important for forecasting the development of events in the national economy, including not only the involvement of the labor force in the economic activities in the country, but also the overall economic output of the state such as its gross domestic product, increase in national wealth, and so on (5).

As a tool used for measuring the level of the total economic output of the country, the unemployment rate is used in different economic models as one of the most essential factors proportionately affecting the level of the national production. The unemployment rate is reversely connected with the level of national production. Thus, when the unemployment rate increases, the gross domestic product value drops. To the contrary, when the unemployment rate is decreased through government measures, the gross domestic product value rises (6).

Despite being an important market indicator, the unemployment rate cannot show the real percentage of people seeking a job, but unable to find one. This is due to the fact that the unemployment rate often exaggerates how difficult it is for people to find a job (1).

At the same time, the unemployment rate is an important tool used in economic forecasting. Econometric models including the unemployment rate are important for calculating the short-, mid- and long-term forecasts of the development of the national economy. Strategic planning used in economics involves the unemployment rate indicator used in the calculations as a proportionate factor negatively affecting economic growth (4). However, it is worth noting that justified econometric models have to include a wide number of indicators in addition to the unemployment rate, and different types of unemployment should be taken into consideration for the purpose of accurately assessing the expected outcome for the national economy (3).

2.3 Types of Unemployment

Changes in the unemployment rate reflect changes in the number of people belonging to the category of unemployed persons. The difference between the inflow and outflow of people in the category of unemployed persons demonstrates for how long people remain unemployed on the average. The duration of unemployment may vary for different years and persons. Thus, according to statistics, 1/3 to 3/5 of all unemployed persons are out of work for a period less than five weeks. Based on the differences in the timeframes of unemployment, frictional, structural and cyclical unemployment can be distinguished (7).

2.3.1 Frictional Unemployment

Frictional unemployment stands for short periods of unemployment. A great amount of frictional unemployment is voluntary. For instance, it includes people quitting their old jobs for the purpose of finding better ones, people taking a vacation before proceeding to the new jobs, or people who are involved in seasonal activities, and temporarily suspend their working activities. Frictional unemployment is necessary for the labor market, as it allows matching demand and supply, and allows people seeking better working conditions (7).

Frictional unemployment doesn't necessarily mean surplus of workforce supply. It exists even when demand and supply are equal. A limited level of frictional unemployment can even be positive for the national economy, as workers become able to find jobs which suit most their skills and interests. Also, it is worth noting that, when the unemployment rate is relatively low, periods of unemployment tend to be shorter, which obviously shows that much of the total unemployment is frictional (1).

“The term frictional unemployment refers to the short periods of unemployment that are needed to match jobs and workers.” (8, p.140).

2.3.2 Structural Unemployment

Structural unemployment stands for long periods out of work, namely with little prospect of finding a suitable job. Such unemployment occurs when particular employees' skills become obsolete due to the changes in the economic conjuncture. This category

equally comprises people with low skills and experience. This kind of unemployment namely affects teenagers and some other groups (7).

Structural unemployment doesn't necessarily mean lack of jobs. For instance, jobs requiring few skills or knowledge and focusing on manual labor such as car washing, cleaning service, fast-food services, etc. are most often always available on the market, but structurally unemployed workers often take them only for short periods, before finding some better vacancies. Due to the employment on such positions, workers tend to get poor work habits, which makes them less attractive for prospective employers (7).

Structural unemployment occurs when the number of persons seeking a job on a particular market is higher than the number of vacancies at the current level of salaries (1). *“The term structural unemployment refers to a situation in which people spend long periods out of work, ... includes people with few skills and little work experience. Teenagers and some minority groups”* (8, p.140).

2.3.3 The Natural Rate of Unemployment

As frictional unemployment is often inevitable, and structural unemployment is a problem of many economies, a certain level of unemployment can be considered normal, or natural. The natural unemployment rate stands for the normal amount of unemployed persons around which the actual unemployment level fluctuates (1). More specifically, the natural unemployment rate can be defined as the rate which exists when the inflation rate is relatively stable. Researchers tend to believe that the natural unemployment rate should make up 5.5 to 6.0 percent. However, some researchers argue that, as part of the structural unemployment brings harm to job-seekers, calling it natural unemployment is not correct. Instead, they tend to use the term no accelerating – inflation rate of unemployment (NAIRU). In the scientific literature, both terms are used in the same meaning (7). Cyclical unemployment stands for the difference between the actual and the natural unemployment rates. Cyclical unemployment is the amount of unemployment which occurs due to the business cycle downturns. The following formulas can be used for calculating the levels of various types of unemployment:

$$\text{Natural unemployment} = \text{Frictional unemployment} + \text{Structural unemployment}$$

$$\text{Actual unemployment} = \text{Natural unemployment} + \text{Cyclical unemployment}$$

It should be taken into consideration that, despite objectively constantly existing, the natural unemployment rate is subject to changes and can be effectively regulated by government policies implemented on the labor market (1).

“The natural rate of unemployment, frictional and structural unemployment are present in good years as well as bad ones. The sum of frictional and structural unemployment is often referred to as the natural rate of unemployment.” (8, p.140).

2.3.4 Cyclical Unemployment

In the real economic conditions, unemployment does not always remain at its natural level. The national economy goes through periodical cycles of expansion and contraction. In the course of such cycles, the unemployment rate changes. When economic expansion takes place, the unemployment rate may drop below the natural unemployment rate. During such periods, it becomes very easy to find a vacancy, and the periods of unemployment tend to substantially decrease, which results in reduction of the number of people unemployed due to frictional and structural reasons. To the contrary, during the cycles of contraction, the unemployment rate normally exceeds its natural level. In such periods, even people with perfect skills and long work experience may become sacked due to the overall stagnation of production and economic processes. The average unemployment duration rises above the ordinary frictional plus structural levels. The difference between the actually existing unemployment rate and the natural unemployment rate is commonly referred to as cyclical unemployment. During the periods of economic slowdowns, cyclical unemployment is added to frictional and structural unemployment. During the periods of expansion, cyclical unemployment has negative values (7).

“Cyclical unemployment – the deviation of unemployment from its natural rate.” (9, p.597).

2.3.5 Seasonal Unemployment

Seasonal unemployment is expected as well. It is connected with people's seasonal activities. For instance, some activities are only carried out in the summer (for instance, such as lifeguards on the sea), while some only exist in the winter (ski resorts). During such seasons, people engaged in the respective activities earn their yield for the entire year.

Their unemployment raises greater concerns than the one of frictionally unemployed persons (7).

Reaching full employment is the goal of any national economy. However, different researchers tend to construe the definition of full employment in different ways. Most economists define full employment in terms of the percentage of the unemployed labor force (7).

2.4 Empirical Research of Unemployment during the Last Five Years

There have lately been many publication dedicated to the empirical investigation of unemployment, namely in the context of its interconnection with the performance of the national economy. Among the most prominent papers in this field, can be found following: (12), (13), (14), (15).

In his paper, Robert Shimer investigates the factors which predefine the unemployment rate in different respects, their weight and shares in the respective impact, and the outcomes which unemployment brings to the national economy. The author provides empirical data gathered for the countries of the European Union, the United States, and Latin America. The researcher investigates the differences between the impact of unemployment on developing and developed countries based on the aforementioned empirical data presented in his paper. The research is particularly valuable as it provides an overview of the changes in the impact of unemployment on the development of the national economy in countries with different levels of development (12).

The publication by Syh Han Ang and Nanthakumar Loganathan deals with the trends in unemployment in Asian countries. The authors provide statistical data related to the correlation between the unemployment rate and gross domestic product in different states of the Asian region. The analysis is practically valuable, as it describes the current tendencies with unemployment and economic development in countries which have lately been demonstrating the highest growth pace around the globe, namely in China, India, Japan, etc. (13).

Lawrence J. Christiano, Mathias Trabandt, and Karl Walentin investigate another particularly interesting aspect of the impact of unemployment on the development of national economies. Namely, the authors focus on small countries with a high level of involvement in the international economic relations such as Luxembourg or Switzerland,

and provide an overview of the changes in their economic development in recent periods, with particular attention paid to the impact of unemployment (14).

In their paper, Jochen Clasen and Daniel Clegg largely focus on the economic development of the European Union member states, with the focus on the recent changes in the level of unemployment in them. The authors critically evaluate the theoretical approaches to the investigation of unemployment, namely the Okun's law, and provide their own empirical findings related to the statistics of unemployment and national performance in European countries. The research is particularly valuable as the authors use different econometric models for extrapolating their results to other countries, and for forecasting the development of financial indicators and unemployment in Europe in the near future (15).

2.5 Measurement of Unemployment

Measurement of unemployment is the function of the Bureau of Labor Statistics (BLS) within the structure of the Department of Labor. BLS prepares data on unemployment and other parameters of the labor market on a monthly basis, namely data such as kinds of employment, average work duration, etc. Such information is gathered from the so-called Current Population Survey (9).

Based on the answers obtained to the above survey, BLS categorizes all adults (16 years old or more) into one of the categories given below:

Employed: "It's easy to define employment: you're employed if and only if you have a job." (1, p.348). This category comprises people who worked on a paid basis, in their own business, or in their family member's business on an unpaid basis, either as part- or full-time employees. Also, this category comprises employees who were temporarily absent due to illness, vacation, etc. Overall, employment can be defined as the total number of currently employed people, both full- and part-time employees (9).

Unemployed: This category includes people who were unemployed, but were ready to start working, and had searched for work for the last four weeks (9). "Unemployment is defined as the total number of people who are actively looking for work but aren't currently employed." (1, p.348).

Not in the labor force: This category comprises people not included in the two previous categories, for instance, students or retired persons.

Based on the approach of BLS, labor force is counted as the sum of employed and unemployed people:

Labor force = Number of employed + Number of unemployed.

The unemployment rate is counted by BLS as the percentage of unemployed labor force:

$$\text{Unemployment rate} = \frac{\text{Number of unemployed}}{\text{Labor force}} \times 100.$$

The BLS calculates labor force both for the entire population, and across particular groups segregated by gender, age, etc.

The labor-force participation rate is computed by BLS as the percentage of adult population included in labor force:

$$\text{Labor-force participation rate} = \frac{\text{Labor force}}{\text{Adult population}} \times 100.$$

Similarly to the unemployment rate, the labor-force participation rate is calculated both for the entire adult population and for various individual groups (9).

2.6 Reasons of Measuring of Unemployment Rate

Measuring unemployment is quite hard. The main task is to distinguish between persons who are unemployed and persons who are not included in the labor force (9).

The processes of movement into and out of the labor force are constant, and over 30% of unemployed persons have recently entered the labor force. Such persons are young workers seeking a job for the first time, or people who have left their work, but now return to the working activities (9).

Due to such numerous movements into and out of the labor force, the statistics on the current number of the labor force are hard to gather and compute. Some people can passively seek a job and call themselves unemployed just in order to be eligible for governmental support programs, or just for the purpose of avoiding excessive taxes imposed on their earnings. Such persons should rather be considered as out of the labor force, or even as employed. On the other hand, some persons who are counted as out of the

labor force may wish to start working. For instance, they may have sought a job, but stopped after unsuccessful endeavors. Such persons are referred to as discouraged workers, and they are not shown in statistics, despite being in fact unemployed workers (9).

Due to this, BLS calculates other labor underutilization indicators, in addition to the unemployment rate.

U-1: Persons unemployed for fifteen weeks or more, as a percentage of the civilian labor force (only people unemployed for very long periods).

U-2: People who have lost their job or have completed some temporary job, as a percentage of the civilian labor force (not including job leavers).

U-3: The total number of unemployed, as a percentage of the civilian labor force (official unemployment rate).

U-4: The total number of unemployed, and discouraged workers, as a percentage of the civilian labor force plus discouraged workers.

U-5: The total number of unemployed, and all marginally attached workers, as a percentage of the civilian labor force plus all marginally attached workers.

U-6: The total number of unemployed, and all marginally attached workers, and the total number of employed part-time for economic reasons, as a percentage of the civilian labor force plus all marginally attached workers (9).

The Bureau of Labor Statistics construes the terms above as follows:

Marginally attached workers are persons who presently are not working or seeking a job, but wish to find a job, are ready to start working, and have recently sought a job (9). “*These are people who say they would like to have a job and have looked for work in the recent past but are not currently looking for work.*” (1, p.350).

Discouraged workers are marginally attached workers who have a job-market-related reason for which they aren’t presently seeking a job (9). “*Individuals who want to work but have told government researchers that they aren’t currently searching because they see little prospect of finding a job given the state of the job market ...*” (1, p.349).

Persons employed part-time for economic reasons are people who want to start working and are ready to do it, but have had to work under a part-time schedule.

Therefore, the unemployment rate should rather be construed as an important, but imperfect indicator of the total unemployment (9).

2.7 Reasons of Always Unemployed People

On the market, prices tend to adjust to match the demand and supply of goods. On an ideal labor market, this function is performed by wages which bring into balance the volumes of labor supplied and demanded. Thanks to such adjustment, it is ensured that all workers are fully employed. However, the real labor market is not ideal. There are always people without a job, even when the market conjuncture is overall positive. Thus, the unemployment rate is never equal to zero, but rather fluctuates around the natural unemployment rate (9).

Overall, there are four explanations of unemployment. The first explanation is that people require time to find suitable jobs. The unemployment rate which arises from the process of matching workers with jobs is referred to as frictional unemployment, and this definition is often used to describe short-term unemployment. The rest of explanations show that the number of vacancies currently available on the labor market may be insufficient to match the labor supply, i.e. this situation occurs when the volume of labor supply exceeds the amount of labor demand. This kind of unemployment is commonly referred to as structural unemployment, and this definition is often used to describe longer periods of unemployment. This type of unemployment arises when wages are set above the level bringing into balance labor supply and demand (9).

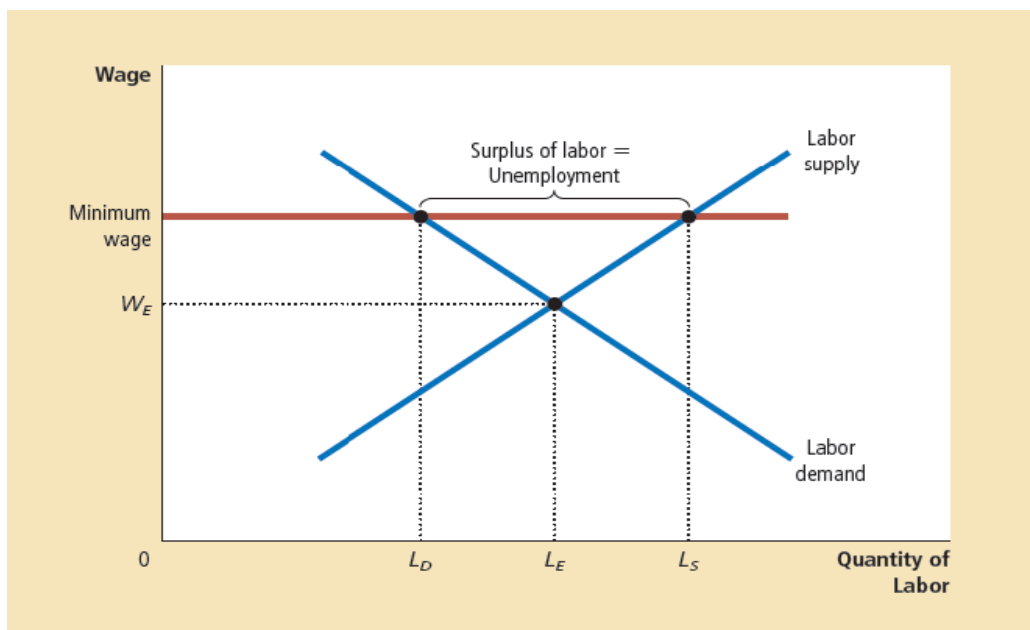
One of the reasons leading to the existence of unemployment is job search. *“Workers who spend time looking for employment are engaged in job search.”* (1, p.355). Job search stands for the process undergone by workers seeking a suitable job. This situation exists due to the difference in different workers' level of skills, knowledge and work habits. Moreover, workers differ in terms of their preferences and attributes. Finally, information on job candidates and vacancies is disseminated relatively slowly on the labor market. Due to this, job search objectively always exists (9).

2.8 Main Causes of Unemployment

2.8.1 Minimum Wage

Like any other market, the labor market is characterized by supply and demand of products (labor). In these terms, the minimum wage is determined as the price floor for labor (see in Figure 2), (7). “Minimum wage is a government-mandated floor on the price of labor.” (1, p.356).

Figure 2: Unemployment from a Wage above the Equilibrium Level



Source: (9, p.607)

Figure 2 above depicts the mechanism of minimum wages. When the minimum-wage law makes the wage stay at a level higher than the one bringing the levels of labor supply and demand into balance, the quantity of labor supplied increases, and the volume of labor demanded drops as compared with the equilibrium value. Thus, a surplus of labor exists, and some workers remain unemployed (9).

However, although the minimum-wage laws are one of the causes for the existence of unemployment on the labor market, they do not necessarily affect all workers. For instance, many workers' wages are far above the legal minimum wages, so in this case, the above laws do not prevent wages from bringing the levels of labor supply and demand into balance. Minimum-wage laws mostly affect workers with low level of skills or knowledge,

most often involved in manual activities. The equilibrium levels of wages are rather low, and thus are more likely to fall below the minimum value (9).

Figure 2 shows that, if the wage remains above the equilibrium level, this results in unemployment. The minimum-wage laws partly lead to the situation when wages are excessively high. Other reasons for it are labor unions and efficiency wages (9).

Here, it is worth noting that the structural unemployment level arising in the situation of wages above the equilibrium level is substantially different from the frictional unemployment rate which is due to job search. The process of job search is objectively predefined by people's need to find jobs which suit most their skills, knowledge and personal preferences, and it is not due to the inability of wages to bring labor demand and supply into balance. To the contrary, when the wage is higher than the equilibrium level, the quantity of labor supply is higher than the quantity of labor demand. Thus, workers remain unemployed as they are waiting for suitable vacancies (9).

2.8.2 Labor Unions

A labor or trade union is an association of workers which holds negotiations with employers on wages and conditions of work. The role of labor unions is very high in many European countries, and has recently diminished in the United States. In the US, only 12% of workers belong to labor unions, while the same figure exceeds 50% in Belgium, Norway, Sweden, and some other European states. In Germany and France, the activities of labor unions set wages for many workers who themselves do not belong to such unions. In these particular cases, the level of wages is not set by the equilibrium of labor supply and demand on the market (9). *“Unions occur where workers get together to bargain collectively for wages and benefits. A labor union is a classic monopolist.” (7, p.103).*

The economics of unions

A labor union is in fact a kind of cartel. As such, a labor union is a group of sellers who join their forces to reach more solid market positions. In the United States, most workers discuss their wages and other working conditions with their employees directly as individuals (11). In the case of labor unions, workers hold such negotiations as a group. The process of such group negotiations is referred to as collective bargaining (9).

In the process of collective bargaining, a labor union asks the company for higher wages and improved working conditions. If no agreement is reached between the labor union and the company, the union can hold a strike, i.e. an organized withdrawal of employees from labor (10). As strikes reduce the levels of production, sales, and thus profits, companies often tend to agree to pay higher wages to their employees that they would otherwise do. According to researchers' estimate, employees belonging to labor unions generally have wage 10 to 20% higher than other workers (9).

By raising the wage above its equilibrium value, the labor union increases the volume of labor supply, and reduces labor demand. This leads to unemployment (9). “... *labor unions push the wage that workers receive above the equilibrium wage. Consequently, there are more people willing to work at the wage being paid than there are jobs available. Like a binding minimum wage, this leads to structural unemployment.*” (1, p.358). Due to this, labor unions are often believed to provoke conflict between different groups of employees: the so-called insiders benefiting from the labor unions' activities, and the so-called outsiders not getting the union vacancies (9).

The outsiders have two scenarios to respond to their status. Some outsiders remain unemployed, waiting to get a chance to enter the group of insiders, while some prefer taking jobs outside labor unions. Therefore, by raising the wage in part of the economy, labor unions make labor supply increase in its other parts. Due to this, wages decrease in non-unionized industries (9).

The role labor unions play in the national economy to a large extent depends on the legislation governing their activities, and namely collective bargaining. In contrast to corporate cartels, labor unions are not subject to similar restrictive legislation imposed by the state. This is due to the fact that, according to the widespread opinion, workers require greater protection and guarantees as they bargain with their employers (2). The legislation governing the activities of labor unions is a source of debate among policymakers. For instance, the so-called right-to-work laws allow people in unionized firms working without entering the respective labor union. In case there are no such laws, unions can force workers to enter them. Also, laws have been proposed in the US for preventing companies from hiring workers as permanent replacements for those employees who are currently on strike (3). Such laws would definitely raise the power of labor unions, thus making expenses connected with strikes substantially higher for companies. The development of

the legislation governing labor unions' activities will to a large extent determine the future development of labor unions (9).

2.8.3 Efficiency Wages

Efficiency wages are wages set by employers above the equilibrium level as an incentive for better work results. Efficiency wages are caused by the following reasons: a – To attract more qualified workers (adverse selection) b - As an incentive to reach better work results (moral hazard) (7).

The theory of efficiency wages

According to this theory, companies reach better operating results, if wages exceed the equilibrium value. Thus, it may be beneficial to companies to keep wages high even in case of labor surplus. The unemployment due to the efficiency wages is somehow similar to the one caused by minimum-wage laws and labor unions. However, there is a major difference as well. In the case of minimum-wage laws and labor unions, companies are prevented from reducing the level of wages when there is a surplus of labor. Proponents of the theory of efficiency wages to the contrary argue that this constraint is unnecessary, as companies may often be interested in keeping high wages. Although keeping high wages increases companies' costs, thus leading to lower profits, according to the efficiency-wage theory, companies may be interested in bearing such additional costs, as they get an opportunity to raise the operating efficiency of their workers (9).

The efficiency-wage theory can be conditionally divided into four different types: worker health, worker turnover, worker quality, worker effort.

2.8.4 Public Policy

Public policy can significantly affect the amount of structural unemployment. If the government provides the unemployed persons with higher unemployment benefits, the latter will tend to wait longer prior to taking a job. Similarly, if the government imposes restriction on dismissals, the job search processes will slow down (7).

Public policy and job search

Although, frictional unemployment is inevitable, it can be reduced. The economy can more rapidly match workers with jobs, if information on vacancies and prospective candidates is disseminated more rapidly on the labor market. The Internet and government policies play a key role in those processes. By reducing the time spent by unemployed persons on finding a job, the natural unemployment rate can be consecutively reduced as well. Different government programs aim at facilitating job search by applying different approaches. For instance, government agencies can provide information on job vacancies, thus accelerating the dissemination of information. Another approach is public training programs destined to allow workers shifting their position from stagnating to rapidly developing industries. Such programs can make the economy function in a more effective way through decreasing the unemployment rate and easing the process of employees' adaptation to the existing labor market conjuncture (9).

Unemployment insurance

Unemployment insurance is one of the government programs which increase the frictional unemployment level, without purposely intending to do so. This program aims at providing workers with certain protection against loss of job. Unemployed persons quitting their job, entering the labor market for the first time, or fired for due cause are not allowed to get benefits under such programs. Only those employees who were sacked due to the fact that their employers no longer required their skills are eligible. The terms and conditions of such unemployment programs can significantly vary across different states. For instance, in the United States, a worker covered by unemployment insurance receives on the average 50% of his former wages for 26 weeks (9). In European countries, unemployment benefits generally tend to be higher, and cover longer periods of time (1).

Although unemployment insurance indeed eases the burden of unemployment, it at the same time increases the unemployment rate. This is due to the fact that workers respond to incentives. As unemployment insurance is no longer paid when an unemployed person finally finds a job, he generally tends to put less effort into the job search process, and is also more inclined to reject job offers unattractive in financial or any other terms. Also, as unemployment benefits reduce the burden of unemployment, workers tend less to seek job security guarantees when discussing the conditions of employment with their employers. The structure of the unemployment insurance system implemented by the state

influences the efforts put by unemployed persons in the job search process, unemployment benefits reduce the job search efforts (9).

The analysis of unemployment benefits proves that the unemployment rate is not a perfect tool for measuring the overall well-being of the economy. According to most researchers, eliminating unemployment benefits would allow decreasing the total unemployment level in the national economy. However, there are debates among economists on whether national well-being would be improved by such changes (9).

2.9 The Okun's Law

The outcomes in the labor market such as the level of wages and the equilibrium unemployment rate are tightly interconnected with the real output of the national economy, i.e. the gross domestic product. This interconnection can be represented by the following production function: $Y = F(A, L, K)$, where Y is output, A stands for technology progress, K is capital, and L stands for the level of employment in the national economy. It is obvious that, if the level of employment rises, the final output of the national economy will increase as well. Employed persons make their contribution to the production of goods and services in the national economy, while unemployed persons don't. Increase in the level of unemployment is connected with decrease in the real GDP amount. This relationship between unemployment and GDP is commonly referred to as Okun's law named after the researcher who first discovered it (7).

The Okun's law is one of the main theoretical instruments used in the scientific literature to describe the relationship between the output of the national economy and the unemployment rate in the state. This economic law is also commonly referred to as the Okun's rule of thumb. According to the arguments of Okun, an increase in cyclical unemployment equal to 1% leads to a 2% decrease in the gross domestic product value (3). Other important interconnections found by Okun assume that a 2% increase in the level of a country's GDP leads to a 1% decline in the level of its cyclical unemployment, a 1% increase in the rate of labor productivity, and a 5% increase in the level of labor force participation (10).

Okun's findings which found their reflection in the economic law formulated by the researcher were derived from the empirical investigations of the interconnection between the level of GDP and the rate of cyclical unemployment in different countries. However,

according to Okun, the value of a country's gross domestic product is predefined by factors other than cyclical unemployment as well. Nevertheless, as the author abstracts away from their investigation, he notes that the possible discrepancies in the results of calculations under the economic law proposed by him may reach 30% (2).

The Okun's law is widely used in the theoretical and practical research related to the investigation of the interdependence between unemployment and the output of the national economy. However, some researchers argue that the findings of Okun may often be misleading, as in the conditions of volatility of the market, other factors may play a much more significant role for the changes in the level of gross domestic product (1). Moreover, the Okun's law is more suitable for short-term forecasts, while in the mid- and long-term perspectives, the percentage figures presented by the researcher tend to differ from the real ones obtained through empirical research (11).

2.10 Consequences of Unemployment

The Costs of Unemployment

Voluntary and involuntary unemployment should be clearly distinguished. Private costs associated with voluntary unemployment have to be lower. Namely, private costs for involuntarily unemployed persons include the following:

- Loss of income – though many households have substantial financial liabilities (mortgage, loans, etc.)
- Decrease in the standards of living
- Increase in health risks (namely for persons who are unemployed for long periods of time):
 - a) Stress
 - b) Reduction in healthiness of diet
 - c) Negative social effects due to loss of income and job
- Loss of marketable skills and motivation. The chances of finding an appropriate job tend to decrease with the course of time as the unemployed people seek a job: they become less attractive to their prospective employers (7).

Economic Consequences for Businesses

Economic consequences can be negative or positive. Negative effects include the following:

- Decrease in demand for goods and services. This is predefined by the fact that the unemployed people's purchasing power decreases, as they lose their jobs, and thus the source of income. As a result, they are forced to seek reduction in the amount of their purchases, and start seeking the items of expenses which can be contracted (5). According to the theory of needs, people tend to contract their secondary needs in the first turn, depending on the level of their income. Thus, for instance, unemployed persons most often tend to stop purchasing luxury goods, doing tourist trips, consuming exotic food products, etc. At the same time, the savings of unemployed people or their respective unemployment benefits are directed by them to the payment of their primary needs. For instance, unemployed persons tend to use such funds for purchasing basic food products, clothes, paying for the rent of their apartments and utilities, and so on (15). However, even when speaking of such basic needs, unemployed persons are forced to significantly decrease their purchase budget, and therefore their demand on the market is much lower than the demand of employed persons. As a result, the aggregate demand for goods and services in the national economy tends to drop as well (8).

- Decrease in demand for businesses on the supply chain. Increase in the rate of unemployment not only provokes a large contraction of customer demand, but also has an overall negative effect on the business activities in the respective country. Thus, as people tend to purchase less goods and services, companies generate lower revenues, and the least competitive of them fall below the level of acceptable profitability. As a result, such companies are forced to stop their activities, as they become an excessive element in the supply chain. In its turn, this causes negative consequences for the market competition, and narrows the choice of customers (12).

- Negative multiplier effects from the closure of major employers in cities. The contraction of business activities in the country causes the bankruptcy and insolvency, and thus stoppage of activities of many employers, including major companies. This entails a number of events which multiply the negative consequences suffered by the national economy. Thus, as a result of the insolvency of major employers, the rate of unemployment only further increases; the supply on the market, and thus the choice of

customers and the level of business competition decrease; the tax revenues of the state budget drop, and as a result, the state may face difficulties with the payment of unemployment benefits and the creation of new jobs, as its resources decrease (7).

Positive effects are as follows:

- Greater surplus labor available. Although this is still a problem in case the structural unemployment rate is high, the surplus of labor available in the market may be an effective way for companies to reorganize the profile of their activities, and for the government to re-boost the development of the country's national economy (10). As it has already been stated, unemployment may emerge as a result of the surplus of particular professions and specialties on the market, and therefore as a result of the lack of demand for them among companies. Such employees are forced to see jobs among other companies, and in case of the lack thereof, they need to get new qualifications in order to find another job. Therefore, the surplus of labor available on the market as a result of unemployment allows effectively re-distributing employees across different economic sectors and branches, and thus naturally filling the vacancies available on the market, at the same time optimizing the structure of the labor force (9).

- Lower pressure to pay higher wages. As a result of unemployment, the wages on the labor market are getting equalized to the objective level preconditioned by the market conjuncture. Thus, as natural unemployment rises, there are more jobless employees on the market who seek vacancies to be fulfilled for the purpose of ensuring their income for living. Therefore, as the number of candidates is higher than the number of vacancies, companies get an opportunity to reduce wages, since the level of competition among employees is higher than among employers. This allows companies sparing circulating funds, and therefore more effectively financing their activities on all levels and in all respects (5).

- Fewer risks of strikes – fear of job losses – leading to decreased power of labor unions. As the number of employed persons on the labor market rises, the labor unions lose their members. The unemployed persons seeking vacancies to be fulfilled most often accept jobs without the need to participate in labor unions. As a result, the role of labor unions rises, and in its turns, this preconditions the decrease in the level of wages claimed by the employees, and also reduces the risks of strikes and other similar events promoted by labor unions for dictating their conditions to companies (7).

Consequences for the Government (Fiscal Policy)

The consequences for the government (also commonly referred to as the fiscal policy) can be as follows:

- Increased expenditures associated with unemployment insurance and other income. The unemployment benefits paid by the state to unemployed persons can be quite high, and they represent a major share in the state budget's social expenditures. Here, the state needs to find an optimum balance in order to ensure the normal living conditions of unemployed persons, but without discouraging them from finding a job (4).

- Decreased revenue from income and consumer spending taxes. As unemployed persons do not get their working income, they do not pay the personal income tax. At the same time, as their purchasing power drops, they spend less on purchases, and therefore consumer spending taxes drop as well. This leads to lower budget revenues for the state (2).

- Decreased profits – reduction in revenue from corporate income tax. As unemployment leads to decreased economic activity, companies tend to lose part of their profits. As a result, the amounts of taxes paid by them to the state budget decrease, and the state loses part of its revenues (11).

- May cause sharp increase in government borrowings, and thus budget deficit. As the level of economic activity in the state decreases, the government may be forced to seek borrowing funds for creating new jobs, and thus re-boosting economic development (7).

Consequences for the Economy As a Whole

The consequences for the economy as a whole are as follows:

- Lost GDP from unemployed people
- Unemployment is an ineffective way to allocate resources – labor market failure
- Some of the long-term unemployed persons may ultimately leave the labor force which leads to decrease in potential GDP
- Increase in the inequality of income distribution, and the consequent rise in relative poverty (7).

Lowers of Unemployment

Active expenditures on the labor market stand for government policies implemented for the purpose of increasing employment and reducing unemployment. One of the possible government policies is to improve the dissemination of information on job vacancies, and organizations of trainings for employees. Measures destined to increase labor demand, and thus reduce cyclical unemployment, are as follows:

- Decreased interest rates (monetary incentive)
- Decreased direct taxes (fiscal incentive)
- Government expenditures on major projects (for instance, improvement of the transport infrastructure)
- Employment subsidies
- Stimuli aimed at boosting the flows of foreign investment in the Czech Republic

Measures to improve labor supply, and thus reduce frictional and structural unemployment, are as follows:

- Increased expenditures on education and training programs, including a focus on lifetime training. This is an essential prerequisite for increasing the performance of employees, and thus for raising the effectiveness of the national economy. As employees become more qualified, they get an opportunity to reach higher career growth by bringing more added value to their company (3).

- Improved dissemination of information on vacancies. This step is crucial in order to ensure the effective information coverage of the labor market, and thus for rapidly matching the demand and supply currently existing on it. For companies, this allows quickly finding the employees required for their particular vacancies, and for employees, such information provides an opportunity to quickly find a job, and thus stable income for living (15).

- Changes in income tax and benefits aimed at improving incentives to find a job. In case the rate of the income tax is reduced, this may help raise the economic activity of the population, and thus reduce the aggregate rate of unemployment. The same effect can be reached through the regulation of the level of unemployment benefits, as an optimum balance should be found in them (7).

3 Practical Part

3.1 Economic Model and Elementary Analysis of Variables

3.1.1 Economic Model

The Economic model is following:

“Unemployment rate of Czech Republic is affected by average gross monthly wage, vacancies and foreign direct investments to Czech Republic.”

With mathematical notation the model can be express as:

$$\text{UNEMPLOYMENT} = f(\text{WAGE}, \text{VACANCIES}, \text{INVESTMENTS})$$

Data

Table 1: Annual time series during 2000 – 2013 years in Czech Republic

Period	unemployment rate, %	Average wage, thous. CZK	Vacancies, thous. units	Direct investments,bill. CZK
2000	10.6	13.22	52.06	192.42
2001	9.9	14.38	52.08	214.59
2002	9	15.52	40.65	277.69
2003	9.9	16.43	40.19	59.32
2004	9.9	17.47	51.20	127.84
2005	9.8	18.34	52.16	279.18
2006	8.8	19.55	93.43	123.43
2007	6.7	20.96	141.07	211.94
2008	5.6	22.59	91.19	110.13
2009	7.7	23.34	30.93	55.79
2010	8.5	23.86	30.80	117.27
2011	7.9	24.46	35.78	41.01
2012	7.0	25.06	34.89	156.31
2013	7.0	25.08	35.18	97.67

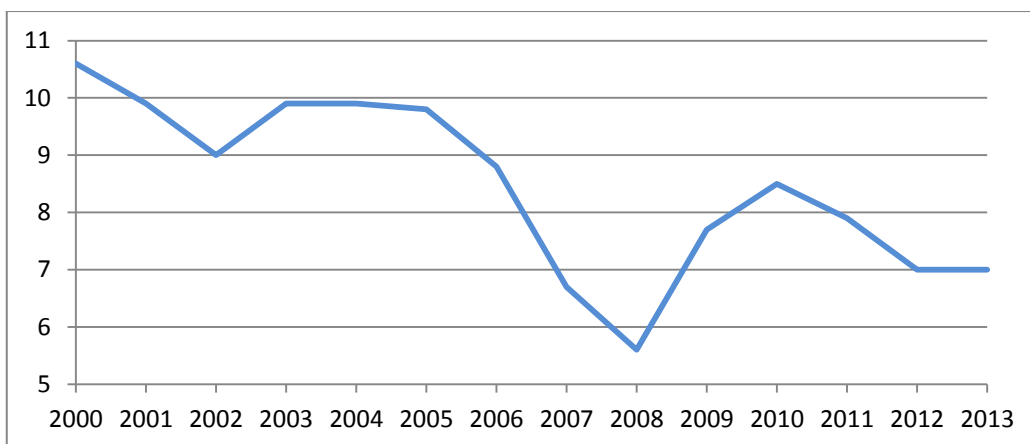
Source: (Eurostat, Czech national Bank, Czech Statistical office)

According to the table, can be concluded that the unemployment rate over the past 2 years has remained stable and kept at around 7%, which is an acceptable value. While the most maximum level of unemployment in the analyzed period amounted 10.6% in 2000, and the most minimum level observed in 2008 and amounted 5.6%. Also according to the table can be seen that the average gross wage and the availability of jobs increased, but the increase is not significant. The direct investments in the fight against the unemployment in 2013 compared to 2012 decreased by 1.6 times. Thus, while reducing the volume of injections in the fight against unemployment, its level remains stable, which is a positive factor and reflects the effectiveness of the measures taken.

3.1.2 Elementary Analysis of Variables

Unemployment rate

Figure 3: Unemployment rate, percentages, period 2000 – 2013, Czech Republic



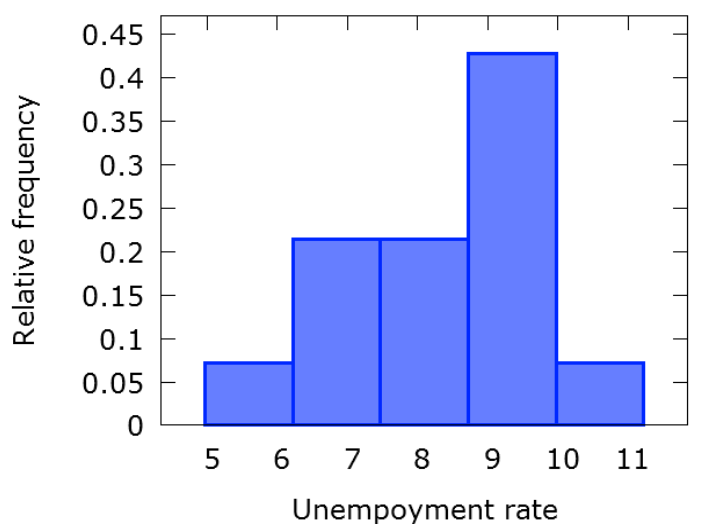
Source: <http://epp.eurostat.ec.europa.eu>-European commission

The unemployment rate in Czech Republic was stabled during years 2000 -2006. The lowest point of the unemployment rate was observed in 2008. The reasons of this situation were growth of new enterprises, development of trade and services. From 2008 till 2010 the unemployment level increased dramatically, because of the world crises.

- Description of summary statistics of unemployment rate:

Number of observation	14	Annual time-series of unemployment rate during 2000 – 2013 years
Mean	8.45	An average of unemployment rate of Czech Republic is 8.45% per year during 2000 - 2013
Median	8.65	Median bigger than mean. It means that in the sample there is some low values that made mean smaller. Difference between mean and median is not so big, it means that there is no low outliers.
Minimum	5.6	The lowest value of unemployment rate is 5.6% per year in Czech Republic in 2008
Maximum	10.6	The highest value of unemployment rate is 10.6% per year in Czech Republic in 2000
Standard Deviation	1.50	Average deviation from mean of unemployment rate is 1.50% per year
Coefficient of Variation	0.18	Observations deviate from a mean of unemployment rate by 18%

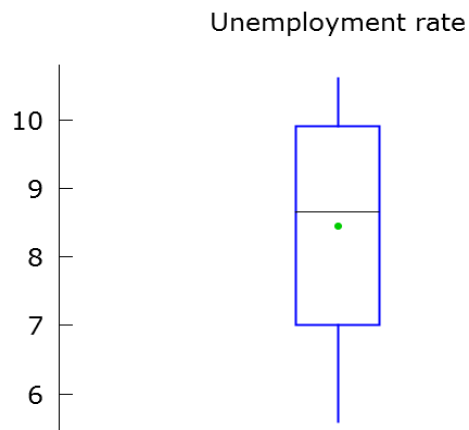
Figure 4: Histogram of unemployment rate



Source: own calculations, sw. Grelt

The most frequent values of unemployment during 2000-2013 varies between 8.73 to 9.98%/year with 42.86% frequency. The second groups varies between 6.23 to 7.48 and 7.48 to 8.73/year. The frequency of these values is 21.43%.

Figure 5: Box-plot of unemployment rate

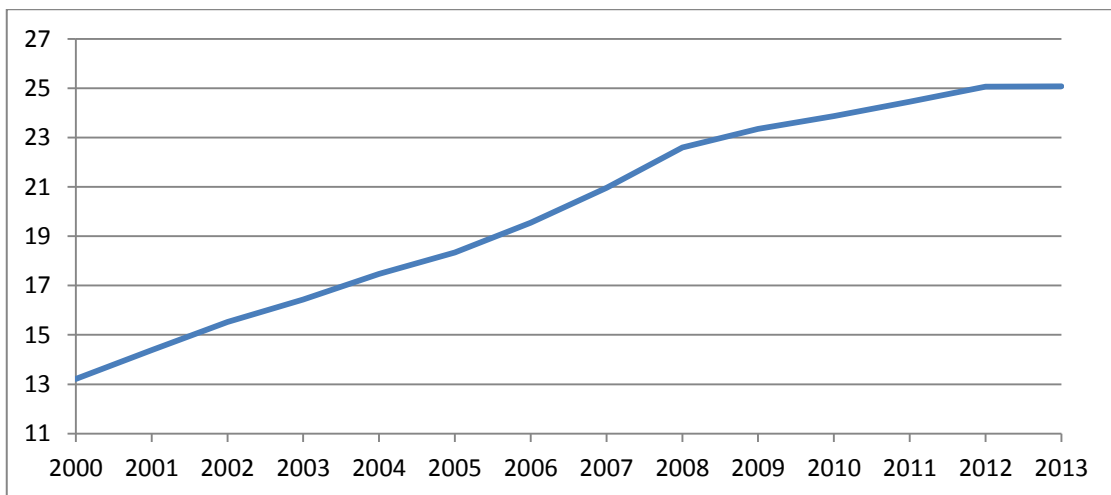


Source: own calculations, sw. Grelt

Figure 5 shows that maximum is higher than 10%, minimum is lower than 6%, mean is over 9% and 25% of observation is from 5,6 to 7%.

Average gross wage

Figure 6: Average gross monthly wage, thous. CZK, in period 2000 – 2013, in Czech Republic



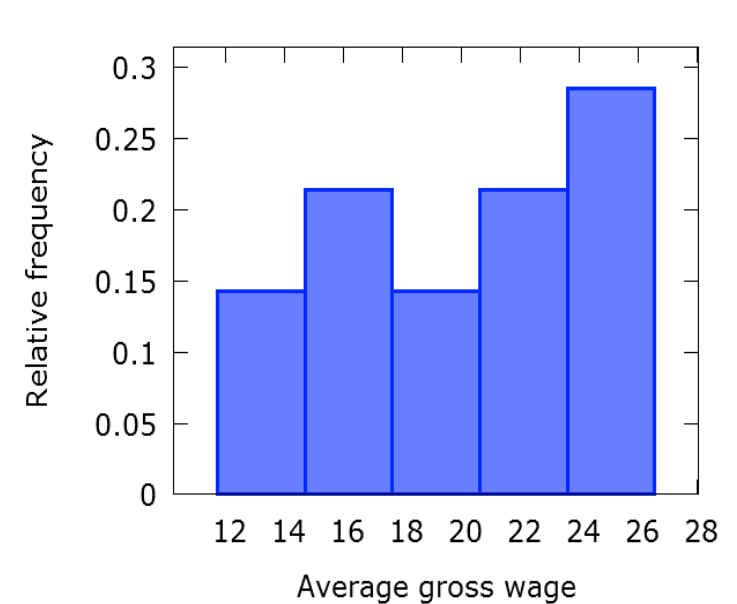
Source: <http://www.czso.cz/>-Czech Statistical office

The average gross monthly wage was growing year by year and reached highest value in 2012 year.

- Description of summary statistics of average gross wage:

Number of observation	14	Annual time-series of average gross income during 2000 – 2013 years
Mean	20.02	An average of gross wage of Czech Republic is 20.02 thousand CZK per month during 2000 - 2013
Median	20.25	Median bigger than mean. It means that in the sample there is some low values that made mean smaller. Difference between mean and median is not so big, it means that there is no low outliers.
Minimum	13.22	The lowest value of average gross wage is 13.22 thousand CZK per month in Czech Republic in 2000
Maximum	25.08	The highest value of average gross wage is 25.08 thousand CZK per month in Czech Republic in 2013
Standard Deviation	4.16	Average deviation from mean of average gross wage is 4.16 thousand CZK per month
Coefficient of Variation	0.208	Observations deviate from a mean of average gross wage by 20.8%

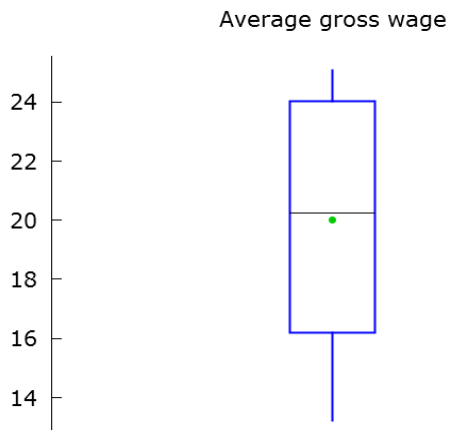
Figure 7: Histogram of average gross wage



Source: own calculations, sw. Grelt

The most typical values of average wage during 2000 – 2013 are higher than 23 thous.CZK/year with 28.57% frequency. The second most typical wages are between 14.7 and 17.67 and 20.63 to 23.59 thous.CZK/year with 21.43% frequency. The last often wages can be found between 17.67 to 20.63 and lower than 14.7 thous.CZK/year with 14.29% frequency.

Figure 8: Box-plot of average gross wage

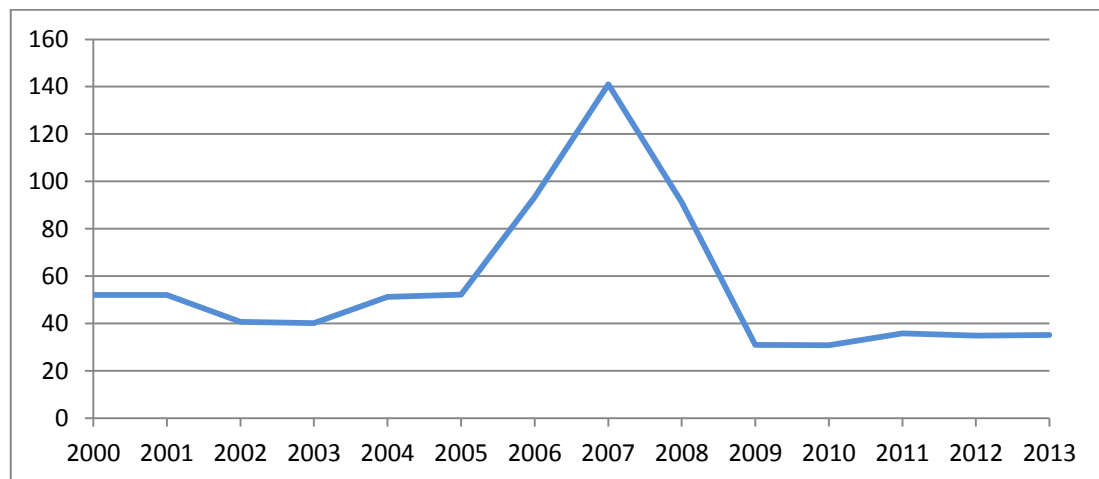


Source: own calculations, sw. Grelt

Figure 8 shows that minimum lower than 14 thous.CZK, maximum is about 24 thous.CZK, mean is about 20 thous.CZK, 50% of observation is about 16 to 24 thous.CZK.

Vacancies

Figure 9: Vacancies, thousand units, in period 2000 – 2013, in Czech Republic



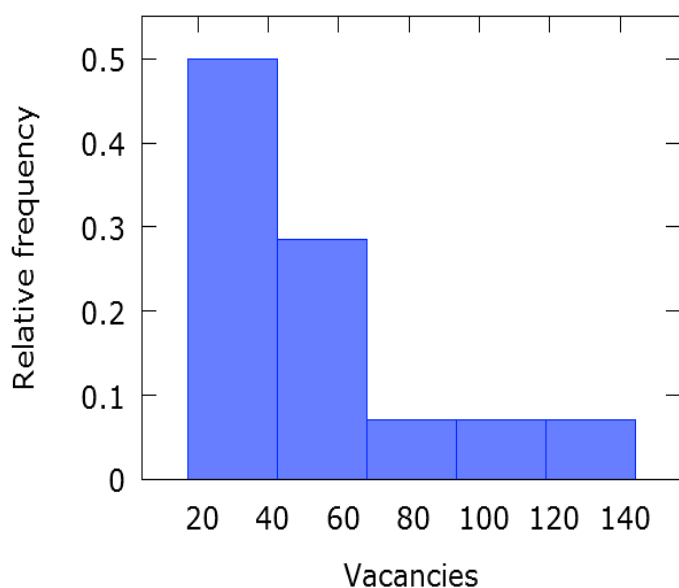
Source: <http://www.czso.cz/>-Czech Statistical office

Vacancies in Czech Republic was stabled during years 2000 -2005. The biggest amount of vacancies can be found in 2006, 2007, 2008. But the highest value was in 2007. The lowest point can be found in 2009. The reason was the world economic crisis.

- Description of summary statistics of vacancies:

Number of observation	14	Annual time-series of vacancies during 2000 – 2013 years
Mean	55.83	An average of vacancies of Czech Republic is 55.83 thousand units per year during 2000 - 2013
Median	45.93	Median smaller than mean. It means that in the sample there is some high values that made mean bigger. Difference between mean and median is not big, it means that there is no high outliers.
Minimum	30.80	The lowest value of vacancies is 30.8 thousand units per year in Czech Republic in 2010
Maximum	141.07	The highest value of vacancies is 141.07 thousand units per year in Czech Republic and occur in 2007
Standard Deviation	31.60	Average deviation from mean of vacancies is 31.6 thousand units per year
Coefficient of Variation	0.566	Observations deviate from a mean of vacancies by 56.6%

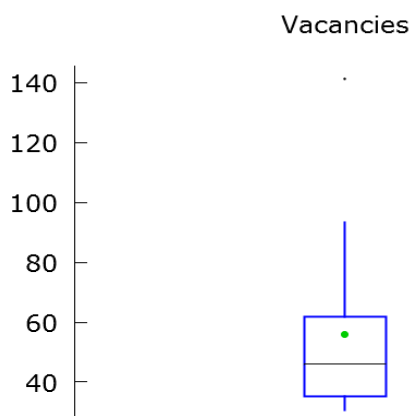
Figure 10: Histogram of vacancies



Source: own calculations, sw. Grelt

The most frequent values of vacancies during 2000 – 2013 is lower than 42.49 thousand units/year with 50% frequency. The second most frequent group is 42.49 to 67.95 thousand units/year with 28.57% frequency. Medium values and values higher than 140 thousand units/year appeared very rarely.

Figure 11: Box-plot of vacancies

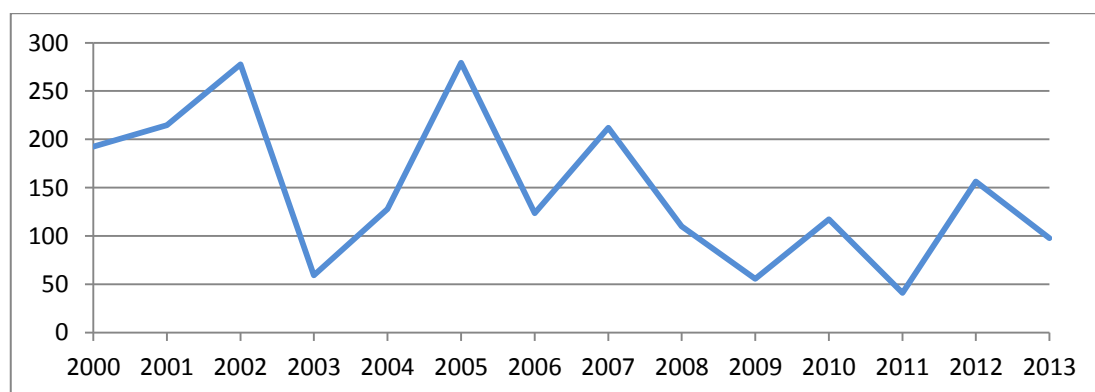


Source: own calculations, sw. Grelt

Figure 11 shows that maximum is 100 thous. units, minimum is lower than 40 thous. units, mean is about 50 thous. units, top 25% of observations are from 70 to 100 thous.units. There is one extreme value, which is equal to 141.07.

Direct foreign investments

Figure 12: Direct foreign investments to Czech Republic, bill. CZK, in period 2000 - 2013



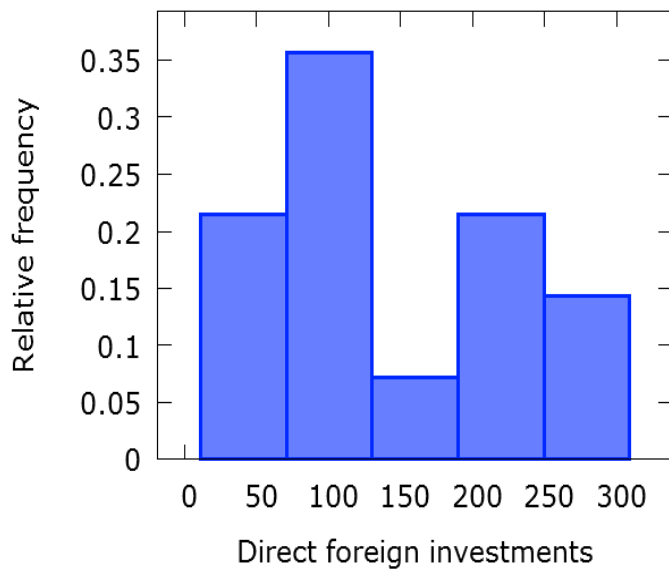
Source: <http://www.cnb.cz>-Czech national Bank

This table represents investments to the Czech Republic from all over the world. The graph fluctuated roughly. The minimum investment was in 2011, it totaled 41,01 billion CZK, and the maximum investment was in 2005, it totaled 279,18 billion CZK. Also the biggest points of investments can be found in 2005, 2002, 2007 and the lowest points of investments in 2003, 2011, 2009. The main cause of decreasing of investments in 2011 in Czech Republic was the post-crisis condition. The main cause of decreasing of investments in 2003 was political crisis and joining to the European Union.

- Description of summary statistics of direct foreign investments:

Number of observation	14	Annual time-series of direct foreign investments during 2000 – 2013 years
Mean	147.47	An average of direct foreign investments of Czech Republic is 147.47 billion CZK per year during 2000 - 2013
Median	125.64	Median smaller than mean. It means that in the sample there is some high values that made mean bigger.
Minimum	41.01	The lowest value of direct foreign investments is 41.01 billion CZK per year in Czech Republic in 2011
Maximum	279.18	The highest value of direct foreign investments is 279.18 billion CZK per year in Czech Republic in 2005
Standard Deviation	77.62	Average deviation from mean of direct foreign investments is 77.62 billion CZK per year
Coefficient of Variation	0.526	Observations deviate from a mean of direct foreign investments by 52.6%

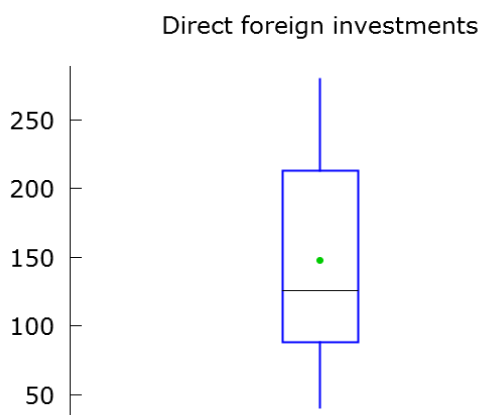
Figure 13: Histogram of direct investments



Source: own calculations, sw. Grelt

The most frequent values of direct investments during 2000 – 2013 varies between 70.78 to 130.33 bill.CZK/year with 35.71% frequency. The second most frequent groups are 189.87 to 249.41 and lower than 70.78 bill.CZK/year with 21.43% frequency. The third most frequent values is higher than 249.41 bill.CZK/year with 14.29% frequency.

Figure 14: Box-plot of direct investments



Source: own calculations, sw. Grelt

Figure 14 shows that minimum lower than 50 bill.CZK, maximum higher than 250 bill.CZK, mean is about 125 bill.CZK, 50% of observation is about 220 bill.CZK.

3.2 Regression Model

Regression model is based on economic model from previous chapters. The estimation of model will provide information about relationships between unemployment rate and variables such as, average gross wage, vacancies and direct foreign investments. Regression model is as follows:

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

where

y_t – unemployment rate in percentages per year.

x_{1t} – average gross wage in thousand CZK per person per month.

x_{2t} – vacancies in thousand units per year.

x_{3t} – foreign direct investments in billions CZK per year.

The model is estimated by OLS. The result can be seen in Table 2.

Table 2: Estimation output from GRETL

Model 1: OLS, using observations 2000-2013 (T = 14)					
Dependent variable: yt					
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	15.9338	1.56054	10.2104	<0.00001	***
x1t	-0.313324	0.0611546	-5.1235	0.00045	***
x2t	-0.0182097	0.00701069	-2.5974	0.02661	**
x3t	-0.0013219	0.00336976	-0.3923	0.70308	
Mean dependent var	8.450000	S.D. dependent var	1.504736		
Sum squared resid	5.965312	S.E. of regression	0.772354		
R-squared	0.797339	Adjusted R-squared	0.736541		
F(3, 10)	13.11453	P-value(F)	0.000844		
Log-likelihood	-13.89347	Akaike criterion	35.78694		
Schwarz criterion	38.34317	Hannan-Quinn	35.55031		
rho	0.332188	Durbin-Watson	1.330286		

Source: own calculations, sw. Grelt

The final model can be written as:

$$\hat{y}_t = 15.9338 - 0.3133x_{1t} - 0.0182x_{2t} - 0.0013x_{3t}$$

The model can be interpreted as follows:

If average gross income, vacancies and foreign direct investments are equal to zero, then unemployment rate will be 15.9338 % per year.

If average gross wage increases by 1000 CZK per person per month, the unemployment rate decreases by 0.3133 % point per year.

If vacancies increase by 1000 units, the unemployment rate decreases by 0.0182 % point per year.

If direct foreign investments increase by 1 billion CZK per year, the unemployment rate decreases by 0.0013% per year.

3.3 Statistical Verification of the Model

The statistical significance of parameters and goodness of fit must be evaluated. The results of these can be found in Table 3.

Table 3: Estimation output from GRETL – statistical verification and R-squared

Model 1: OLS, using observations 2000-2013 (T = 14)					
Dependent variable: yt					
	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-ratio</i>	<i>p-value</i>	
const	15.9338	1.56054	10.2104	<0.00001	***
x1t	-0.313324	0.0611546	-5.1235	0.00045	***
x2t	-0.0182097	0.00701069	-2.5974	0.02661	**
x3t	-0.0013219	0.00336976	-0.3923	0.70308	
Mean dependent var	8.450000	S.D. dependent var	1.504736		
Sum squared resid	5.965312	S.E. of regression	0.772354		
R-squared	0.797339	Adjusted R-squared	0.736541		
F(3, 10)	13.11453	P-value(F)	0.000844		
Log-likelihood	-13.89347	Akaike criterion	35.78694		
Schwarz criterion	38.34317	Hannan-Quinn	35.55031		
rho	0.332188	Durbin-Watson	1.330286		

Source: own calculations, sw. Grelt

Goodness – of – fit in this model is 79.73 %.

79.73 % variability of the unemployment rate was explained by this model with selected variables.

To determine statistical significance of parameters were used T–test. The hypotheses are:

$$H_0: \beta_i = 0 \Rightarrow \text{Parameter is not statistically significant}$$

$$H_1: \beta_i \neq 0 \Rightarrow \text{Parameter is statistically significant}$$

The level of significance is chosen as 10 % level of significance.

The critical value is:

$$t_{critical\ value} = t_{\frac{\alpha}{2}}[n - p] = t_{0.05}[14 - 4] = t_{0.05}[10] = 1.812$$

The comparison of t-values and t-critical values is shown in Table 4.

Table 4: Comparison of t-value and t-critical

t-ratio	$t_{critical\ value}$	sign		
10.2104	1.812	>	Reject	Significant
5.1235	1.812	>	Reject	Significant
2.5974	1.812	>	Reject	Significant
0.3923	1.812	<	Don't Reject	Not Significant

Source: own calculations, sw. Grelt

As we see from the table 3 parameters $\beta_0, \beta_1, \beta_2$ are statistically significant at 10 % of level. Parameter β_3 is statistically insignificant at 10 % level of significance. Consequently, effect of parameter β_3 is too small.

3.4 Utilization of the Model

This chapter presents three different scenarios of changing the unemployment rate:

1st scenario

What happened with unemployment rate if average wage increases at 26 thousand CZK, vacancies and direct foreign investments are the same as in 2013 year.

$$\hat{y}_t = 15.9338 - 0.3133 * 26 - 0.0182 * 25 - 0.0013 * 100 = 7.203 \%$$

In the first scenario growth of average wage leads to decrease of unemployment rate.

2nd scenario

What happened with average gross wage if unemployment rate decreases at 5.6 %, vacancies and direct foreign investments are the same as in 2013 year.

$$5.6 = 15.9338 - 0.3133 x_{1t} - 0.0182 * 35.18 - 0.0013 * 97.67$$

$$x_{1t} = 30.5346$$

In the second scenario to decrease average wage to 5.6 %, average wage should increase to 30.53 thousand CZK if vacancies and direct foreign investments are the same as in 2013 year.

3^d scenario

What happened with vacancies if unemployment rate decreases at 5.6 %, average gross wage and direct foreign investments are the same as in 2013 year.

$$5.6 = 15.9338 - 0.3133 * 25.08 - 0.0182 x_{2t} - 0.0013 * 97.67$$

$$x_{2t} = 129.0769$$

In the third scenario to decrease average wage to 5.6 %, vacancies should increase to 129.08 thousand units if vacancies and average wage are the same as in 2013 year.

3.5 Discussion of Results

The first and second hypotheses were confirmed. Accordingly to t-test, the influence of average gross wage and vacancies is significant, because t-value higher than t-critical value. As for direct foreign investments it's insignificant, because t-value lower than t-critical value. That is mean that the hypothesis 3 is confirmed. Hypothesis 6, about negative relationships between unemployment rate and average gross wage was also confirmed. Model justified that an increase in average gross wage leads to decrease of unemployment rate. Hypothesis 7, about negative relationships between unemployment rate and vacancies was verified and confirmed. An increase in vacancies leads to decrease of unemployment rate. Hypothesis 8, about negative relationships between unemployment rate and foreign direct investments was confirmed. Model justified that an increase in foreign direct investments leads to decrease of unemployment rate.

The model can be used for simulations to see what will happened if the explanatory variables are changed. According to estimated model government should raise wage and create more vacancies.

4 Conclusion

Unemployment is a major issue for any state, and all governments seek to minimize the level of unemployment for the purpose of improving the population's living standards, and for maximizing the economic output reached by the national economy. Unemployed persons require particular care on the state's part, as they are the most vulnerable category of people with the lowest purchasing power.

However, unemployment is not always a bad sign for the national economy, and everything depends on its actual rate. Thus, in the economic literature, natural unemployment is considered to be an objectively predefined level of unemployment which always exists in the country, and is due to the economic activity of people who tend to seek better jobs, raising their level of wages, or simply changing their environment. However, the rate of cyclical unemployment above the natural one testifies that there are problems in the national economy which are connected with its inability to provide the entire labor force with the jobs they require.

The consequences of unemployment may be both positive and negative. The negative consequences of unemployment include the decreased purchasing power of the population, and thus the overall decreased standards of people's living. They also means that the economic activity of companies is dropping, and many entities are forced to withdraw from the market, thus narrowing the choice of products offered on the market and decreasing the level of market competition. For the state, the higher rate of unemployment means that it is forced to spend more funds on the payment of unemployment benefits and other similar social payments, and at the same time get lower budget revenues as a result of the decreased payments of the personal income tax.

The positive consequences of unemployment include the fact that it allows effectively re-organizing the market without the state's intervention, and therefore allows balancing the supply and demand on the market using natural methods. At the same time, for companies, a positive aspect is that they get an opportunity to pay lower wages due to the increased number of candidates for vacancies offered, and the power of labor unions is decreased as well.

When regulating the level of unemployment, the state needs to take into account a wide variety of factors predefining its actual rate. Particular attention needs to be paid to

the ratio between the level of unemployment benefits paid to unemployed persons and the level of income they can get when finally finding a job. This is a key prerequisite for ensuring the high standards of the unemployed persons' living, at the same time encouraging them to seek a job for getting higher profits.

The analysis of unemployment in Czech Republic allows drawing the following conclusions. As can be seen from the subchapter "Statistical Verification of the Model", the model of unemployment was elaborated with one dependent and three independent variables, and it was well estimated, because the coefficient of determination makes up 79.7%.

Taking into account the results of the tests, the average gross wage has the level of statistical significance of only 1%, while the same figure for vacancies makes up 5%. As a result, it can definitely be stated that those variables have their effects on the population, but they do not contribute to any major changes in the level of unemployment.

When considering the results of the final estimated equation, the next points should be highlighted: first of all, the unemployment rate will be 15.9338 % per year, if average gross income, vacancies and foreign direct investments are equal to zero; second, the unemployment rate will decrease by 0.3133 % point per year, if the average gross wage increases by 1,000 CZK per person per month; third, the unemployment rate will decrease by 0.0182 % point per year, if vacancies increase by 1,000 units; and finally, the unemployment rate will decrease by 0.0013 % per year, if direct foreign investments increase by 1 billion CZK per year. However, it should be noted here that foreign direct investments rather seem to be an insignificant value, and therefore their effect shouldn't be generalized on the scale of the whole populations, and should only be analyzed in the context of the analyzed sample.

It should also be said that the average gross wage, vacancies and direct foreign investments have indirect relationship with unemployment. It means that, if they increase, the unemployment rate will decrease.

The information obtained in the course of this research can be successfully used for planning. Thus, for instance, if companies increase the vacations, this may have a slight positive effect on the unemployment, leading to its partial decrease. However, it should also be understood here that the increased vacations may provoke additional costs for

companies, and there would definitely be a risk of decreased profits. Therefore, when making any such decisions, the corporate management should evaluate the possible outcome. If the expected decrease in the level of unemployment is greater than the possible loss of profits as a result of the increased vacations, such measure will definitely be profitable for the respective company. However, if the risk is greater than the expected decrease in unemployment, the corporate management should rather refrain from implementing such measures.

Bibliography

- (1) Krugman, P., Wells, R., Graddy, K. *Essentials of Economics*. 3d USA: Worth Publishers, 2007. 1158 p. ISBN-13: 978-1-4292-7850-8.
- (2) Walters, W. *Unemployment and Government: Genealogies of the Social*. Cambridge University Press, 2000. 195 p.
- (3) Symes, V. *Unemployment in Europe: Problems and Policies*. Routledge, 2006. 232 p.
- (4) Wagner, H. *Globalization and Unemployment*. Springer Science & Business Media, 2000. 401 p.
- (5) Aamaas, A., Keenan, J. F. W., Sedmak, C., Van Der Zijden, L. *Resilience and Unemployment*. LIT Verlag Münster, 2012. 224 p.
- (6) Mclaughlin, E. *Understanding Unemployment: New Perspectives on Active Labour Market Policies*. Routledge, 2013. 307 p.
- (7) Maitah, M. *Macroeconomics*; Praha: Reprografické studio PEF ČZU v Praze, 2009. 210 p. ISBN 978-80-213-1904-2.
- (8) Maitah, M. *Macroeconomics Issues and Exercises*. Praha: Reprografické studio PEF ČZU v Praze, 2013. 209 p. ISBN 978-80-213-2051-2.
- (9) Mankiw, N.G. *Principles of Economics*. 6E USA: Cengage Learning, 2008. 890 p. ISBN 13: 978-0-538-45305-9.
- (10) Bagusat, C., Keenan, J.F.W., Sedmak, C. *Decent Work and Unemployment*. LIT Verlag Münster, 2011. 255 p.
- (11) Vedder, K.R. *Out of Work: Unemployment and Government in Twentieth-century America*. NYU Press, 1997. 306 p.
- (12) Shimer, R. *Reassessing the ins and outs of unemployment*. 2012
- (13) Ang, S.H., Loganathan, N. *Interactions between Economic Growth and Unemployment Condition in Asian Region*. 2013
- (14) Christiano, J.L., Trabandt, M., Walentin, K. *Introducing financial frictions and unemployment into a small open economy model*. 2013
- (15) Clasen, J., Clegg, D. *Regulating the Risk of Unemployment: National Adaptations to Post-Industrial Labour Market in Europe*. 2011

- (16) EUROSTAT. *Unemployment rate by sex and age groups - monthly average, %* [online]. 2014. [Accessed: 11th November 2014]. Available from: <<http://epp.eurostat.ec.europa.eu-European commission>>.
- (17) CZECH NATIONAL BANK. *Foreign Direct Investment to the CR Inward Flows* [online]. 2014. [Accessed: 11th November 2014]. Available from: <<http://www.cnb.cz-Czech national Bank>>.
- (18) CZECH STATISTICAL OFFICE. *Average gross monthly wage* [online]. 2014. [Accessed: 11th November 2014]. Available from: <<http://www.czso.cz/-Czech Statistical office>>.
- (19) CZECH STATISTICAL OFFICE. *Vacancies* [online]. 2014. [Accessed: 11th November 2014]. Available from: <<http://www.czso.cz/-Czech Statistical office>>.

Appendix

Figure 15: Description of histograms

Frequency distribution for Unemployment_rate , obs 1-14 number of bins = 5, mean = 8.45, sd = 1.50474					
interval	midpt	frequency	rel.	cum.	
< 6.2250	5.6000	1	7.14%	7.14%	**
6.2250 - 7.4750	6.8500	3	21.43%	28.57%	*****
7.4750 - 8.7250	8.1000	3	21.43%	50.00%	*****
8.7250 - 9.9750	9.3500	6	42.86%	92.86%	*****
>= 9.9750	10.600	1	7.14%	100.00%	**
Frequency distribution for Average_gross_wage , obs 1-14 number of bins = 5, mean = 20.0184, sd = 4.15763					
interval	midpt	frequency	rel.	cum.	
< 14.701	13.219	2	14.29%	14.29%	****
14.701 - 17.665	16.183	3	21.43%	35.71%	*****
17.665 - 20.629	19.147	2	14.29%	50.00%	****
20.629 - 23.593	22.111	3	21.43%	71.43%	*****
>= 23.593	25.075	4	28.57%	100.00%	*****
Frequency distribution for Vacancies , obs 1-14 number of bins = 5, mean = 55.8296, sd = 31.5987					
interval	midpt	frequency	rel.	cum.	
< 42.486	29.753	7	50.00%	50.00%	*****
42.486 - 67.952	55.219	4	28.57%	78.57%	*****
67.952 - 93.418	80.685	1	7.14%	85.71%	**
93.418 - 118.88	106.15	1	7.14%	92.86%	**
>= 118.88	131.62	1	7.14%	100.00%	**
Frequency distribution for Direct_foreign_investments , obs 1-14 number of bins = 5, mean = 147.471, sd = 77.6203					
interval	midpt	frequency	rel.	cum.	
< 70.783	41.011	3	21.43%	21.43%	*****
70.783 - 130.33	100.55	5	35.71%	57.14%	*****
130.33 - 189.87	160.10	1	7.14%	64.29%	**
189.87 - 249.41	219.64	3	21.43%	85.71%	*****
>= 249.41	279.18	2	14.29%	100.00%	****

Table of figures

Figure 1: Description of calculation of statistical significance of parameters.....	10
Figure 2: Unemployment from a Wage above the Equilibrium Level	22
Figure 3: Unemployment rate, percentages, period 2000 – 2013, Czech Republic	34
Figure 4: Histogram of unemployment rate.....	35
Figure 5: Box-plot of unemployment rate	36
Figure 6: Average gross monthly wage, thous. CZK, in period 2000 – 2013, in Czech Republic	36
Figure 7: Histogram of average gross wage	37
Figure 8: Box-plot of average gross wage	38
Figure 9: Vacancies, thousand units, in period 2000 – 2013, in Czech Republic	38
Figure 10: Histogram of vacancies	39
Figure 11: Box-plot of vacancies.....	40
Figure 12: Direct foreign investments to Czech Republic, bill. CZK, in period 2000 - 2013	40
Figure 13: Histogram of direct investments	42
Figure 14: Box-plot of direct investments	42
Table 1: Annual time series during 2000 – 2013 years in Czech Republic.....	33
Table 2: Estimation output from GRETL	44
Table 3: Estimation output from GRETL – statistical verification and R-squared	45
Table 4: Comparison of t-value and t-critical	46