SEASONAL FLUCTUATIONS IN THE RATE OF UNEMPLOYMENT IN BULGARIA

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ABSTRACT
The main purpose of the present study is to estimate the influence of the seasonality factor on the rate of unemployment in Bulgaria by comparing it with the European Union including its current 28 members. The dynamics and seasonal fluctuations in the rate of unemployment in Bulgaria have been studied by means of statistical models. The conclusion reached is that the seasonality factor exerts a greater influence on the rate and dynamics of unemployment in Bulgaria in comparison with the EU economy as a whole.

Introduction. The problems related to the rate and dynamics of unemployment, the influence of different factors, including the factor of seasonality, are crucially important from both theoretical and practical points of view. A great number of factors influence the rate and dynamics of unemployment in Bulgaria, with the factor of seasonality occupying an important place among them. The influence of the factor of seasonality on the rate of unemployment in Bulgaria is comparatively highly pronounced [4]. The estimation of the exact quantitative effect of the influence of the seasonality factor on the rate of unemployment would contribute to the development and implementation of a range of measures to keep down and reduce the rate of unemployment in Bulgaria.

Materials and Methods. The main purpose of the present study is to estimate the influence of the seasonality factor on the rate of unemployment in Bulgaria by comparing it with the European Union including its current 28 members (EU-28) (members of the EU for the period after 01.07.2013).

The present paper has the following main tasks:

1. To define the terms 'unemployment' and 'unemployment rate' by applying them to both the national economy and the European Union (EU-28);
2. To study the seasonal fluctuations in the rate of unemployment in Bulgaria;
3. To make a comparative analysis between Bulgaria and the European Union (EU-28).
4. To present the main conclusions and results obtained in examining the economic indicators in the course of time.

Modern market economy, and the labour market in particular, can be represented as a complex and self-regulating system which functions under the influence of the counterbalancing forces of demand and supply [1]. From this point of view, unemployment characterizes the imbalance of the labour market in which labour supply exceeds demand. According to the definition of the International Labour Organization [3], the unemployed comprise all persons above a specified age who during the reference period were:

– without work, that is, were not in paid employment or self employment during the reference period;

– currently available for work, that is, were available for paid employment or self-employment during the reference period; and

– seeking work, that is, had taken specific steps in a specified recent period to seek paid employment or self-employment.

– Different institutions define and establish the main criteria according to which a person is classified as unemployed. For example, according to the methodology of Eurostat [2], an unemployed person is defined as:

– someone aged 15 to 74 (in Italy, Spain, the United Kingdom, Iceland, Norway: 16 to 74 years);

– without work during the reference week;

– available to start work within the next two weeks (or has already found a job to start within the next three months);

– actively having sought employment at some time during the last four weeks.

The unemployment rate is calculated as follows:

$$U = \frac{\text{Persons unemployed}}{\text{Labour force}} . 100 \quad (1)$$

The labour force includes both employed (employees and self-employed) and unemployed people, but not the economically inactive, such as pre-school children, school children, students and pensioners.

Due to putting greater focus on the purpose of the present study, it has the following limitations:

1. The period on which information is presented is 2000Q1- 2017Q3;
2. Quarterly data are used at the level of both Bulgarian and EU (EU-28) economies;
3. The study is based on official and publically available information.

Eurostat's latest information has been used to conduct the study. The main methods applied are: comparative method, factor analysis, visual fit approach, the expert judgment method.

Seasonal dynamics of unemployment in Bulgaria and in the EU-27. The study continues with examining the rate of unemployment in Bulgaria on the basis of quarterly data on the Bulgarian economy for the period 2000Q1- 2017Q3.

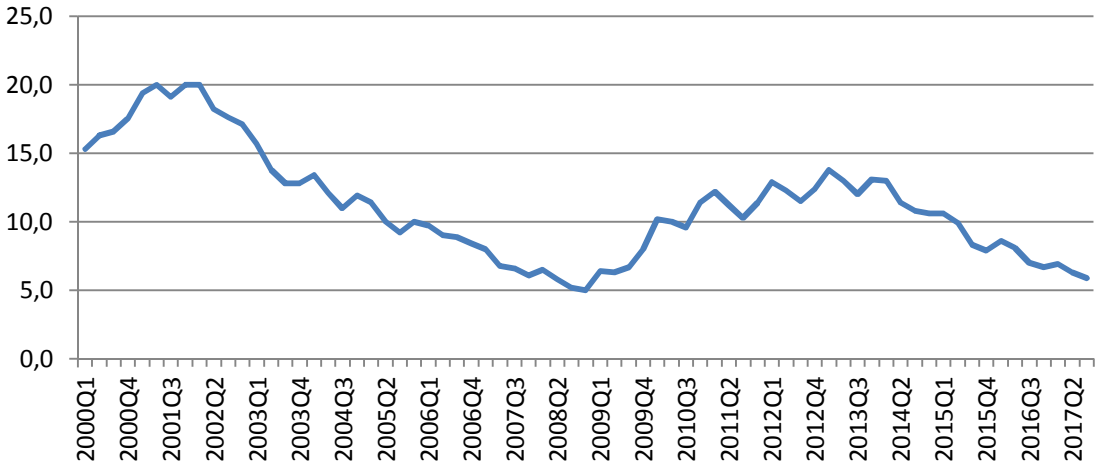

Fig. 1. Dynamics of the rate of unemployment in Bulgaria for the period 2000Q1- 2017Q3
Source: Eurostat

As can be seen in fig. 1, the period studied can be notionally divided into four sub-periods. During the first sub-period 2000Q1-2000Q4, the rate of unemployment decreased by 2.1 percentage point (pp) (from 18.7% in 2000Q1 to 16.6% in 2000Q4). During the second sub-period 2001Q1-2008Q4 considerable dynamics of the unemployment values in Bulgaria were observed. Its rate decreased more than four times - from its highest value during the period studied (22.5% in 2001Q1) to its lowest value (5.1% in 2008Q4). During the third sub-period (2009Q1- 2013Q1), as a result of the impact of the global financial and economic crisis, unemployment in Bulgaria rose more than twice (from 6.4% in 2009Q1 to 13.8% in 2013Q1). During the fourth sub-period (2013Q2-2017Q3), when the Bulgarian economy was recovering from the economic crisis slowly and with difficulty, a decreasing trend in the rate of unemployment was observed. It decreased by 7.1 pp (from 13% on 2013Q2 to 5, 9% in 2017Q3). This trend will most likely continue and unemployment will regain its pre-crisis level or reach an even lower level.

The results from the seasonal decomposition of the rate of unemployment in Bulgaria are presented in fig. 2.

As can be seen in fig. 2, the seasonal indices reached their highest value during the first quarter (106, 1%), and their lowest value - in the third quarter (94.7%). The deviation about the mean during the individual quarters is 11.4 pp.

For the adjusted time series (i.e. a time series with removed seasonal or random fluctuations) the most suitable model for modeling the trend has been estimated by means of the procedure Curve

Estimation of the software package IBM SPSS Statistics. The different models have been compared according to the value of the coefficient of determination (explanatory part).

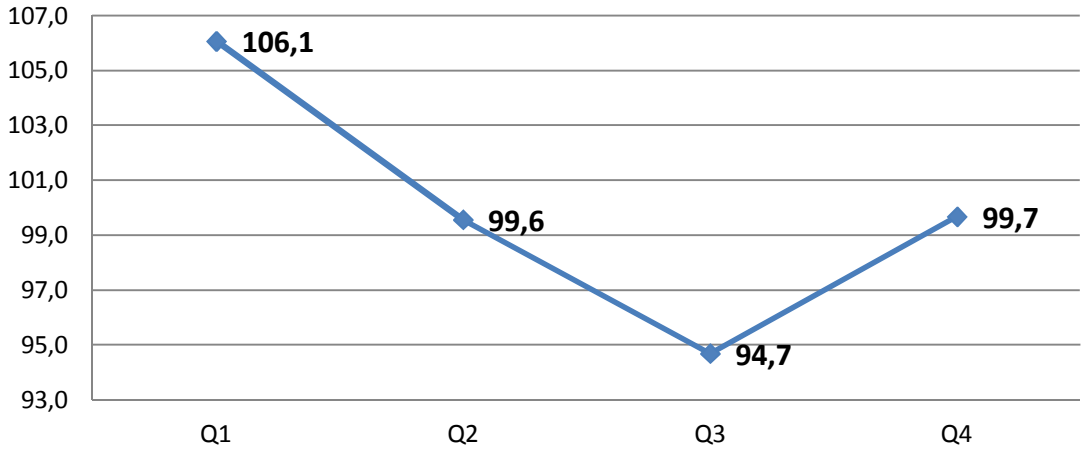

Fig. 2. Seasonal decomposition of the rate of unemployment in Bulgaria, quarterly data
Source: Eurostat, the author's own calculations

Table 1. Estimation of the different models describing the variation in the rate of unemployment in Bulgaria, made by means of the statistical software SPSS

Model Summary and Parameter Estimates

Dependent Variable:Trend-cycle for U from SEASON, MOD_1, MUL CEN 4

	Model Summary					Parameter Estimates			
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	,371	40,620	1	69	,000	15,340	-,116		
Logarithmic	,489	66,117	1	69	,000	21,128	-3,009		
Inverse	,203	17,573	1	69	,000	10,298	12,948		
Quadratic	,541	40,140	2	68	,000	19,090	-,424	,004	
Cubic	,686	48,891	3	67	,000	23,354	-1,110	,028	,000
Compound	,304	30,122	1	69	,000	14,753	,991		
Power	,401	46,186	1	69	,000	23,581	-,244		
S	,172	14,381	1	69	,000	2,281	1,069		
Growth	,304	30,122	1	69	,000	2,691	-,009		
Exponential	,304	30,122	1	69	,000	14,753	-,009		
Logistic	,304	30,122	1	69	,000	,068	1,009		

According to the results obtained, the coefficient of determination has the greatest value with the cubic (0.686) and quadratic (0.541) models. For the linear model this coefficient is 0.371. The F-statistic shows that the total variations explained by these models are significant (the significance levels are with values Sig. =0,00<0,05). As the difference between the values of the coefficient of determination for the cubic and quadratic models is equal to 0.315, i.e. it is larger than 0.1, the cubic model has been chosen as the most adequate one- fig. 3. The cubic model is described by means of the following equation:

$$U=23.3542–1.1105t+0.0280t^2–0.0002t^3+\varepsilon, \quad (2)$$

where U is the rate of unemployment in Bulgaria, t=1,2,3,…,71 (the number of quarters), ε-the error term (fig. 3).

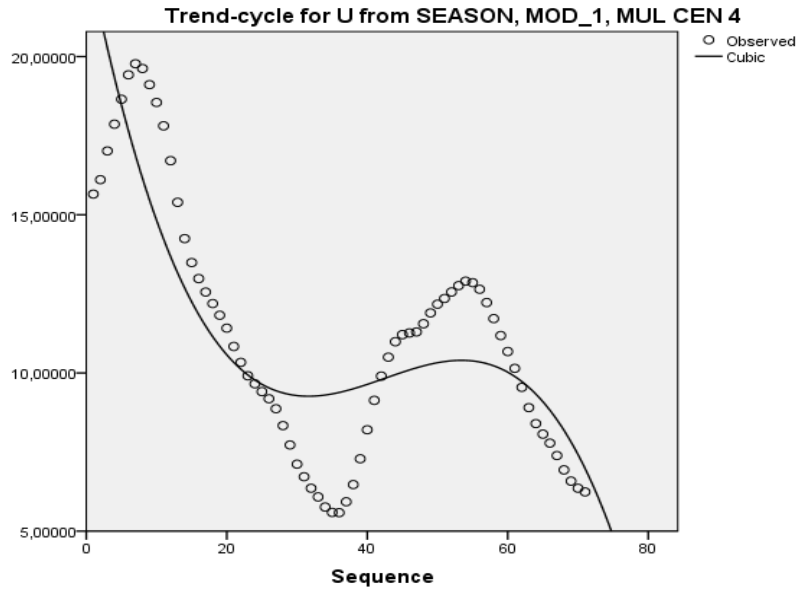

Fig. 3. Dynamics of the rate of unemployment in Bulgaria with removed seasonality and random fluctuations (cubic regression model)

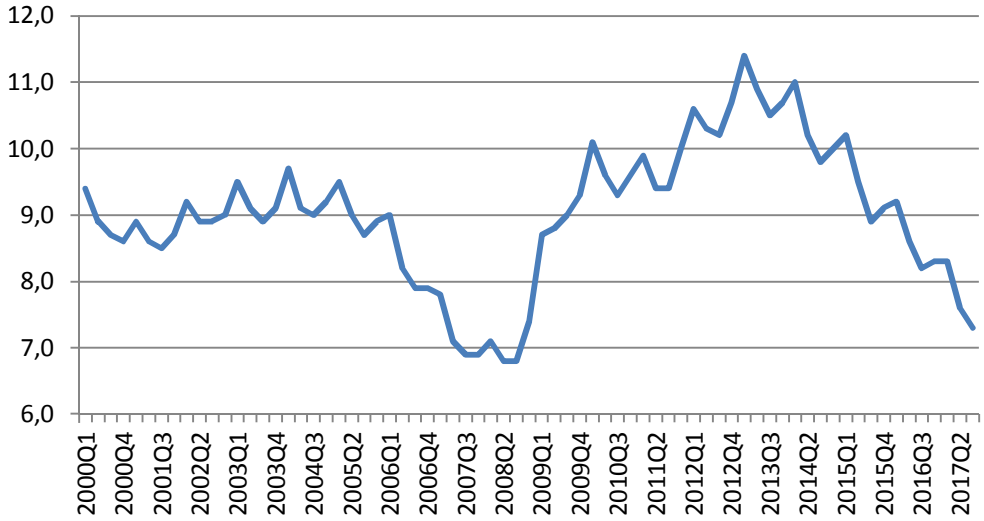

Fig. 4. Dynamics of the rate of unemployment in the EU-28 for the period 2000Q1- 2017Q3 Source: Eurostat

As can be seen in fig. 4, the rate of unemployment in the EU-28 was at its lowest in 2008Q2-Q3 (6.8%) immediately before the global economic crisis affected the European economies. The rate of unemployment reached its highest value in 2013Q1 (11.4%). Over recent quarters a steady decreasing trend in the rate of unemployment has been observed and the expectations are that it will reach values equal to the pre-crisis ones or lower than them.

The results from the seasonal decomposition of the rate of unemployment in the EU-28 are presented in fig. 5.

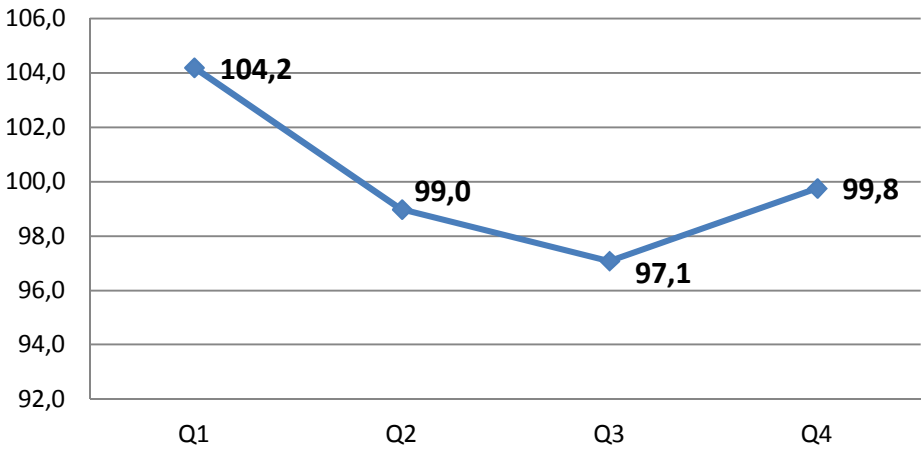

Fig. 5. Seasonal decomposition of the rate of unemployment in the EU-28, quarterly data
Source: Eurostat, the author's own calculations

Table 2. Estimation of the different models describing the variation in the rate of unemployment in the EU-28, made by means of the statistical software SPSS

Model Summary and Parameter Estimates

Dependent Variable:Trend-cycle for U from SEASON, MOD_1, MUL CEN 4

	Model Summary					Parameter Estimates			
Equation	R Square	F	df1	df2	Sig.	Constant	b1	b2	b3
Linear	,054	3,970	1	69	,050	8,614	,011		
Logarithmic	,027	1,894	1	69	,173	8,429	,179		
Inverse	,002	,145	1	69	,704	9,042	-,335		
Quadratic	,054	1,958	2	68	,149	8,598	,013	-1,929E-5	
Cubic	,366	12,876	3	67	,000	10,184	-,243	,009	-8,160E-5
Compound	,043	3,067	1	69	,084	8,606	1,001		
Power	,018	1,255	1	69	,266	8,484	,017		
S	,001	,052	1	69	,820	2,195	-,023		
Growth	,043	3,067	1	69	,084	2,152	,001		
Exponential	,043	3,067	1	69	,084	8,606	,001		
Logistic	,043	3,067	1	69	,084	,116	,999		

The cubic model is the most adequate one (0.366), followed by the quadratic and linear models (0.054). The cubic model is statistically significant unlike the rest of the models. In this case, the cubic model has been chosen as the most adequate one:

$$U=10.1844–0.2430t+0.0088t^2–0,0001t^3+\varepsilon, \quad (3)$$

where U is the rate of unemployment in the EU-28, t=1,2,3,…,71 (number of quarters), ε-the error term, (fig.6).

On the basis of the models thus obtained, a forecast could be made for the quarterly values of the rate of unemployment in Bulgaria and the EU-28 for the next period. The time horizon of the forecast is 5 quarters, i.e. about 7% of the length of the time series.

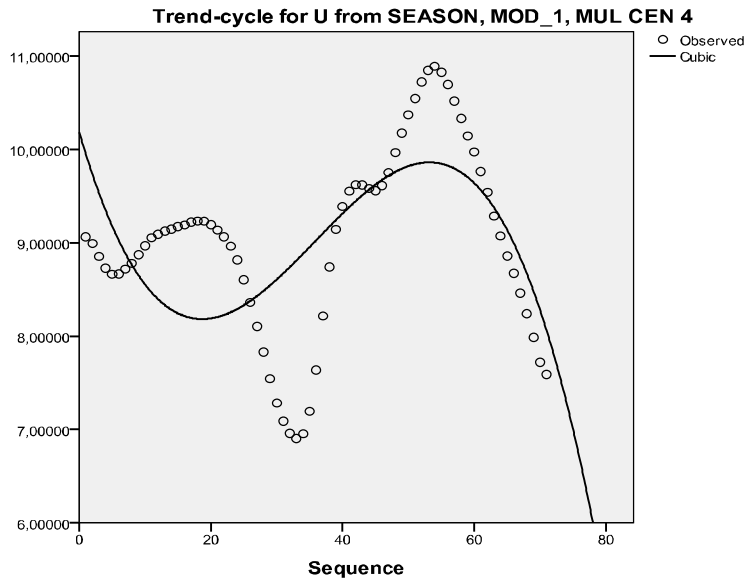

Fig. 6. Dynamics of the rate of unemployment in the EU-28 with removed seasonality and random fluctuations (cubic regression model)

Table 3. Quarterly forecast values of the rates of unemployment in Bulgaria and the EU-28

Quarter	Bulgaria	EU-28
Q4 2017	6.5	7.8
Q1 2018	6.5	7.8
Q2 2018	6.4	7.9
Q3 2018	5.4	7.2
Q4 2018	4.6	6.8

Therefore, if we assume that the patterns found will hold steady during the forecast period too, then the rate of unemployment in Bulgaria will fall and in the fourth quarter of 2018 it will reach 4.6%. The rate of unemployment in the EU-28 will also go down and in the fourth quarter of 2018 it will reach 6.8%. The quarterly forecast values of the unemployment rate in Bulgaria are lower than the forecast value of the rate of unemployment in the EU.

Fig. 7 presents the difference between the rates of unemployment in Bulgaria and the EU-28 for the period 2000Q1- 2017Q3.

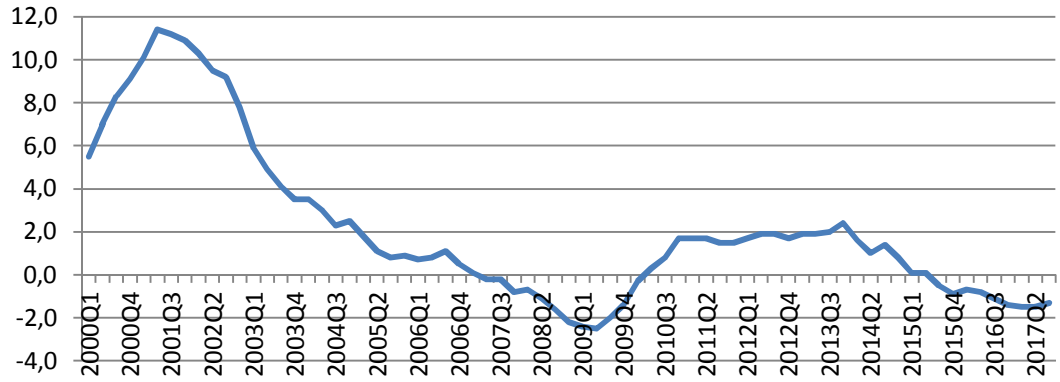

Fig. 7. Difference between the rates of unemployment in Bulgaria and the EU-28 for the period 2000Q1- 2017Q3. Source: Eurostat, the author's own calculations
Note: The time series are seasonally adjusted

As can be seen in fig. 7, at the beginning of the period studied the rate of unemployment in Bulgaria was considerably higher than the rate of unemployment in the EU-28. The biggest was the

difference in 2001Q2, when the rate of unemployment in Bulgaria was higher than the rate of unemployment in the EU-28 by 11.4 pp. The rate of unemployment in Bulgaria was lower than the average level for the European Union during the periods of revival and economic upswing for the Bulgarian economy: 2007Q2- 2010Q1 and 2015Q3-2017Q3.

Conclusions and closing. The following conclusions can be drawn from the analysis of the data presented:

– According to the data on the rate of unemployment, the global financial and economic crisis had a stronger negative impact on the Bulgarian economy in comparison with the EU economy as a whole.

– The seasonality factor had an extremely strong impact on the dynamics of unemployment. The influence of the seasonality factor was stronger in Bulgaria in comparison with the European Union. The dynamics of employment in the sectors of tourism, agriculture, commerce, etc., can be pointed out among the main reasons for the stronger influence of the seasonality factor on the rate of unemployment in Bulgaria.

– If we assume that the patterns that have been found will hold steady during the forecast period too, then the rate of unemployment in Bulgaria will continue to decrease, and during the fourth quarter of 2018 it will reach 4.6%.

– The rate of unemployment in the EU-28 will also decrease and during the fourth quarter of 2018 it will reach 6.8%.

– The quarterly forecast values of the rate of unemployment in Bulgaria are lower than the forecast values of the rate of unemployment in the EU-28.

In closing, it can be noted that the seasonality factor exerts a greater influence on the rate and dynamics of unemployment in Bulgaria in comparison with the EU economy as a whole. In the short run the positive decreasing trend in unemployment in both Bulgaria and the European Union will most likely remain unchanged and the pre-crisis levels will be reached with lower values of this indicator in Bulgaria compared to the average values for the EU.

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