Relevance of Okun's Law in Montenegro

VESNA KARADZIC[1], TAMARA BACKOVIC[2] and JUSTAS STREIMIKIS[3]

[1] Professor, Faculty of Economics, University of Montenegro, Podgorica, Montenegro, e-mail: vesnaka@ucg.ac.me
[2] Associate Professor, Faculty of Economics, University of Montenegro, Podgorica, Montenegro, e-mail: tassabacc@ucg.ac.me
[3] Lithuanian Institute of Agrarian Economics, Vilnius, Lithuania; University of Economics and Human Science in Warsaw, Warsaw, Poland, e-mail: justas.streimikis@gmail.com

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ABSTRACT

The purpose of this paper is to examine whether the Okun's law is valid in case of Montenegro. This paper investigates short-term and long-term relationships between uneployment rate and economic growth in Montenegro with the goal to estimate the Okun's coefficient. In this reserach Okun's law was tested by implementing the first difference model.The analysis has been carried out according to standard econometric methodology considering static and dynamic regression model specifications. In the first part of the analysis, the two analyzed series are tested for stationary and co-integration and then the classical linear regression model was estimated. In the second part of the analysis the Error Correction Method (ECM) was applied, which in addition to quantifying the relationship between the unemployment rate and the economic growth rate, also enables the unemployment rate forecasting. The key finding of this paper is that the value of unemployment rate will decrease by 0.275534% in short term and by 1.46794% in long term for every 1% increase in economic growth rate. This implies that the Okun's low is valid in Montenegro.

INTRODUCTION

The goal of every economy is to achieve the highest possible economic growth and the lowest possible unemployment rate, without creating inflationary pressures. The variables related to these two phenomena are of great importance for any economy.The 2008 global economic and financial crisis and the current Covid-19 pandemic, both have strongly affected the labor market of the world's leading as well as developing and underdeveloped economies, causing large fluctuations in it. Unemployment has become one of the biggest economic and social problems in the world. Therefore, it is a true challenge for academics and policymakers to provide an adequate and thorough attention to labor market dynamics and research of unemployment - growth correlations.

The question regarding the linkage between economic growth and unemployment gained prominence after Okun (1962) depicted the extent to which the unemployment rate is negatively correlated with output growth. In his work, Okun demonstrated the relation between the goods market and the labor market by connecting short-term trends in output, i.e. the real GDP, and the changes in unemployment, known as Okun's law. Okun's law linearly links the potential and the real gross domestic product and the unemployment rate. When the growth rate of a real product exceeds the growth rate of a potential product, the unemployment rate falls. Conversely, when the growth rate of the real product is lower than the growth rate of the potential product, the unemployment rate rises. According to Okun's law, for every 2% fall in the gross domestic product in relation to the potential gross national product, the unemployment rate increases by 1%.

Assessment of Okun's law in the form of estimated Okun's coefficient is a measure of the responsibility of unemployment in the growth of gross domestic product and is therefore an important indicator of the cost of unemployment in terms of output. Considering the relations between the variables, the Okun's coefficient, as a parameter, can give an answer to how strong the connection is between the variables, but also to the question which annual output rate will not create unemployment. The empirically determined Okun's coefficient is one of the most consistent relations in macroeconomic theory and practice, and is considered a universal truth valid for all countries and all economic systems. Although roughly based on Keynesian truth, Okun's law has been accepted as part of orthodox economics and neo-classical synthesis and, carried away by the mainstream background, has become one of the most interesting scientific topics of the 20th century. This has been confirmed by numerous empirical studies over the past fifty years. (Sharma, Tomić, 2012; Kabat et al. 2020).

The appeal of Okun's law is attributed to its simplicity and its extensive empirical support qualifies it to belong at the core of modern macroeconomics (Jardin and Gaetan, 2011; Mazzanti et al., 2020).

1. LITERATURE REVIEW

There is a vast literature examining the validity of Okun's law. Current developments in the global and national labor markets have further encouraged numerous emirical studies related to the verification of the validity of the Okun's law as one of the basic macroeconomic laws. Here we will briefly look at just some of the research conducted in the American, Asian and European labor markets in the last decade. After Okun (1962) documented that unemployment in the United States tends to fall by a one percentage point for every three percentage point rise in output growth over the period 1947 - 1960 a greate number of researchers have tried to estimate Okun's coefficient by either adopting a single-country approach (Caraiani, 2010; Ahmed, Khali,and Saeed, 2011), panel-data approach (Dixon and Shepard, 2002, Moosa, 1997; Lal et al., 2010) or a multi-regional approach (Freeman, 2000; , 2005; Villaverde and Maza, 2009).

Karfakis, Katrakilidis and Tsanana (2014) confirm that real production has a strong impact on unemployment in Greece from 2000 to 2012 concluding that Okun's ratio is 3: 1, i.e. that a 1% increase in unemployment is associated with a 3% decrease in real production. Quade (2003) by a simple regression link between unemployment and production also gets a strong negative relation for the US sample with quarterly data from 1977 to 2001 concluding that the Okun's coefficient of the observed sample is equal to -0.10. Ball, Leigh, & Loungani (2013) investigate the relationship between the unemployment rate and the growth rate of US production for the period 1948–2011 on a quarterly and annual basis, and in twenty developed economies from 1980 to 2011 with annual dana. They use two approaches to estimating Okun's law, the regression equation in levels including the production gap and the unemployment gap variables, and regression equation in the differences of the production and unemployment variables. Preferring the gap method they conclude that for the US the Okun's coefficient is -0.45, while in other observed countries the Okun's coefficient is also negative, taking values from -0.14 in Austria to -0.85 in Spain.

Olusegun (2015) examined the validity of Okun's law in the UK. He used quarterly data on the unemployment rate and GDP growth rate for the 1971 - 2013 period and concluded that Okun's law was valid in Great Britain for the observed period, while the value of Okun's coefficient was   -0.074. Javeid (2010) and Misbah et al. (2014) tested the validity of Okun's law, as well as the existence of a long-term

and short-term relationship between the unemployment rate and GDP growth rate in Pakistan, based on annual data for 1981 – 2005 period. Applying the differences version of Okun's law, Javeid estimated Okun's coefficient to be -0.028 conferming a negative relationship between the unemployment rate and GDP growth rate in Pakistan. A similar analysis covering several Asian markets (Pakistan, India, China, Sri Lanka, and Bangladesh) for period 1980 to 2006 indicated mixed results regarding the value of the Okun's coefficient (Lal et al., 2010). Edienat (2017) confirmed the validity of this law in Jordan for the period 1982-2016.

The survey of the Central Bank of Malta conducted on the basis of annual data for the period 2000-2012 has shown that the percentage increase in GDP has lead to a decrease in the unemployment rate by 0.2%. Vesna Prorok (2015) examined the validity of Okun's law in the Macedonian market for the period from 1991 to 2009. This empirical analysis indicated the existence of both long-term and short-term positive relation between these two variables, so the author concluded that Okun's law did not apply to the Macedonian market for the analysed period. Fouquan (2012), using panel data for 20 OECD countries over the past three decades, sought to prove that Okun's law does not represent a linear relationship between the unemployment rate and the GDP growth rate. The results of the research has indicated the existence of an asymmetry in the relationship between cyclical unemployment and the output gap. On the other hand, this study provided an original approach to grouping data of the same dynamics which solved the problem of heterogenity, and confirmed that Okun's law vary over time.

A similar analysis was conducted by Kargi (2013) who investigated the validity of the Okun's law in 34 OECD countries. The analysis showed that the relationship between the GDP growth rate and the unemployment rate was inverse, and that cointegration existed, observed in the long run. In this study, countries are categorized according to GDP growth rates into those with low, normal, and high growth rates. Consistency in terms of unemployment rates for countries with high growth rates was not observed, while in the case of countries with low growth rates a general conclusion was reached that unemployment rates were extremely high (Snieska et al., 2020; Chen et al, 2019).

The development of a pure theoretical foundation for Okun's relationship has been largely neglected in the academic literature, such that empirically, no functional form has been dominantly preferred to any other on the basis of theory (Weber and West, 1996). As a consequence, the empirical examination of Okun's law is typically subject to revisions with the comovement between output growth and unemployment frequently being analyzed under different settings. So while there is no contention on the importance of Okun's law, debates have evolved on the econometric techniques used to establish this relationship; how the cyclical components are extracted; and whether a dynamic or static specification is adopted (Turturean, 2007). Recently, the possibility of asymmetric behaviour between economic growth and the unemployment rate has added a new dimension in the development of the academic literature. (Phiri, 2014; Beknazarov et al., 2020; Vigliarolo, F. 2020; Bilan et al., 2020; Mishchuk et al., 2020; Soylu et al., 2018). The value of the Okun's coefficient differs from country to country because, in addition to labor, it is defined by other production factors and working conditions in the country. The general formula of the causal relation between unemployment and GDP is given by Okun's law, but in order to draw practical conclusions, it is necessary to monitor the long-term development of macroeconomic indicators and to model the observed values for a given country, which has not been done in Montenegro yet. That is why in this paper we address the significance of Okun's relationship for the Montenegrin data.

2. METHODOLOGY AND DATA

Okun's law can be tested empirically using two methods; namely, the first differences model and the gap model. The first-difference method, used in Okun's original 1962 paper, looks at the relationship between changes in gross national product (GDP) and changes in the unemployment rate. On the other hand, the gap version observes the relationship between the unemployment rate gap and the output gap, with the unemployment gap representing the difference between the actual and natural unemployment rates, while the output gap representing the difference between actual and potential GDP. In this version of Okun's law, there is a problem of determining the value of potential GDP (Central Bank Malta, 2013).

Regarding the problem with potential GDP value determination, in this reserach Okun's law was tested by implementing the first difference model. In the first part of the analysis, the classical linear regression model was estimated. This model aimed to quantify the relationship between the change in the unemployment rate and the economic growth rate of Montenegro. The next step was the estimation of the dynamic model, which assumes the relationship between the change in the unemployment rate and the change in the economic growth at time t, the unemployment rate lagged by one period, and the growth rate lagged by one period. In the second part of the analysis we apply the error correction method (ECM), which, in addition to quantifying the relationship between the unemployment rate and the economic growth rate, also enables the forecast of the unemployment rate.

Data base for this research consist of time series of the number of unemployed persons and the value of the growth rate of the gross domestic product of Montenegro. The data are presented on an annual basis, for the period from 2007 to 2019. The data are taken from the World Bank website. Eviews 10 software package was used for analysis purposes.

3. EMPIRICAL RESULTS AND DISCUSSION

Although at the beginning of the analyzed period the economic growth of Montenegro was on an upward trajectory, due to the growth of economic activity in the field of services, especially in tourism, trade and financial intermediation, the consequences of the global financial crisis were felt at the end of 2008. The crisis has affected a significant decline in economic activities, and thus a decline in the value of all macroeconomic indicators, especially gross domestic product. The decrease of gross domestic product was a result of a large decline in both domestic and foreign demand. The first signs of Montenegro's exit from the recession were noticed in 2010. Mild economic growth continued to be recorded in this year. The key drivers of economic recovery were industrial production, tourism and forestry. Stable and mild economic growth was also recorded in 2011. However, the last quarter of this year led to a significant increase in risk and a slowdown in economic activity. In addition to domestic imbalances, the growth of risks was affected by the crisis in the euro area, as well as the slowdown in growth in the region.

As expected, in 2012 there was a decline in economic activity, growing illiquidity of the economy and the transfer of negative shocks from the region and the European Union to the Montenegrin market. There was a decline in the value of industrial production, a decrease in the volume of activities in construction and forestry, as well as in transport. The only driver of development is still tourism, which is achieving an increase in tourist arrivals and overnight stays. The recovery of the economy, as a result of the sharp growth of economic activity in all economic sectors, was recorded in 2013. After that, until the end of the analyzed period, yearly shifting in increase and decrease of economic activities were recorded, but on the long run, those activities moved upwards and resulted in increased economic growth of Montenegro.
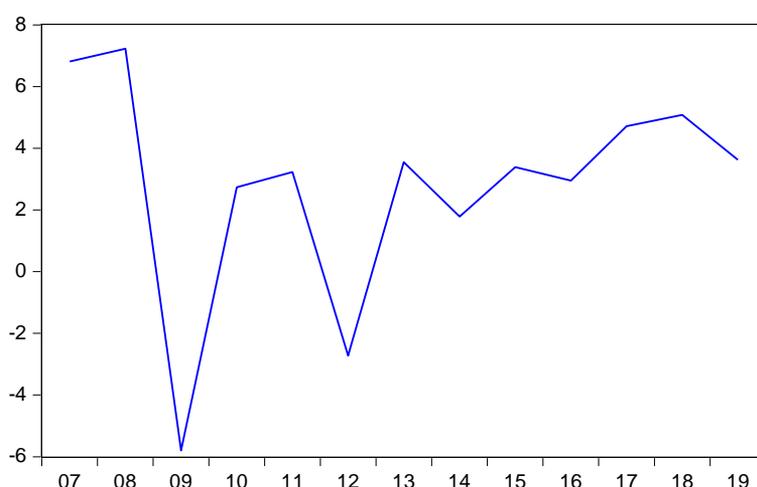
What characterized the labor market in the first year of the analysis is a decrease in the unemployment rate, but this trend did not continue in the following year. At the end of 2008, there was a decline in economic activity, a decline in aggregate supply and demand, and thus a decrease in demand for labor, which resulted in an increase in the unemployment rate. This trend was recorded until the beginning of 2012. In 2013 the number of unemployed grew significantly faster than the number of employed. The reasons for the increase in the number of unemployed persons in Montenegro are primarily uneven economic trends in the recovery of the global economy and the long recession, especially in some EU member states. By the end of the analyzed period, alternating increases and decreases in the number of unemployed persons in Montenegro were measured, with a long-term tendency to decrease the unemployment rate. What is characteristic for Montenegro and its labor market is the pronounced mismatch between labor supply and labor market needs, and at the same time there is a high level of long-term unemployment, as well as a high unemployment rate among young people. One of the ways to solve the problem of long-term unemployment was the program of the Ministry of Labor and Social Welfare and the Employment Service of Montenegro, which in April 2019 began implementing the public campaign "Let's hire locals", aiming to employ unemployed people from Montenegro during summer season.

Figure 2. Graphical representation of unemployment rate in Montenegro from 2007. to 2019.

Source: Author's Calculation

The precondition of estimating a model, which will test the applicability of Okun's low in Montenegro, is investigation of stationarity of the time series Unemployment Rate and Economic Growth Rate of Montenegro. Stationarity was examined using the Augmented Dickey-Fuller Test (ADF) and the Phillips-Perron Test (PP). The results of testing the existence of a unit root in the analyzed series are given in the following table:

Table 1. Unit root tests for economic growth rate and unemployment rate time series

Time series	Test	t-statistics	p-value	t-statistics	p-value
		I(0)		I(1)	
GDP growth rate	ADF	-2.950984	0.1918	-10.03461	0.0001
	PP	-2.484824	0.1921	-10.28081	0.0001
Unemployment rate	ADF	-1.488350	0.7746	-5.945892	0.0037
	PP	-1.305627	0.8336	-7.578786	0.0005

Source: Author's Calculation

The results of testing the stationarity of analyzed time series showed that with a risk of error greater than 10%, the initial hypothesis that these series have a unit root cannot be rejected at 10% level of sig-

nificance. On the other hand, performing a unit root test on the same time series that were transformed by differentiation shows that these series are integrated of the first order. This means that the first difference of these series does not give series of random walk, i.e. it gives stationary series. Since both series are first order integrated, it is possible to conduct a cointegration test. The cointegration test should show whether a linear combination of individually nonstationary time series gives a stationary process. The cointegration test is also important because it allows to examine whether the static and dynamic model that defines Okun's law is applicable in Montenegro. If these two series are not cointegrated, then by estimating the regression model, a spurious regression could be obtained, and the parameter estimates would be biased and inconsistent.The Johansen Cointegration Test was implemented in order to examine the cointegration of the unemployment rate and economic growth rate series.

Table 2. Johansen cointegration test for time series unemployment rate and GDP growth rate in Montenegro

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.966711	49.02012	25.87211	0.0000
At most 1	0.651407	11.59235	12.51798	0.0710

Source: Author's Calculation, EVIEWS

The results of the cointegration test indicate that the hypothesis which claims that there is no cointegration relationship between the unemployment rate and economic growth rate can be rejected at a 0% level of significance. On the other hand, the hypothesis that there is exactly one cointegration relation between the mentioned series could not be rejected at 5% significance level. The conclusion is that these two series are cointegrated and that there is exactly one cointegration relation. The first Okun's law model that is estimated is the first-difference model. The specification of this model is:

$$\Delta Y_t = \alpha + \beta \cdot \Delta X_t + \varepsilon_t \qquad\qquad (1)$$

where:

ΔY_t – represents the changes in unemployment rate between current and previous period

α – is the constant that represents a percentage point change in the unemployment rate given zero growth for the coming time period

ΔX_t – is the GDP growth rate in percent between the current time period and the previous

ß – is the percentage point change in the unemployment rate for a one percentage point change in the output growth, also called Okun's coefficient

Okun's coefficient should take negative value as in a growing economy in the long-run the need for labor is growing, which leads to a decrease in the value of the unemployment rate.

Table 3. Differential version of the Okun's Law model

Dependent Variable: D(Y)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.379680	0.309241	-1.227781	0.2476
D(X)	-0.087497	0.059089	-1.480780	0.1695

Source: Author's Calculation, EVIEWS

Estimation results of the differential version of the Okun's Law model showed that the relationship between the unemployment rate and the economic growth rate in Montenegro can be confirmed. Estimated Okun's coefficient takes a negative value, which is in accordance with Okun's law. According to

this model, if the economic growth rate in the observed year is increased by 1% compared to the previous year, then the unemployment rate would decrease by 0.087% compared to the previous year.

The second model that is estimated in this research is based on the first-difference model, which for independent variables, in addition to changing the rate of economic growth, includes the rate of unemployment and the rate of economic growth, both lagged by one period. The estimation results of this model are given in the following table:

Table 4. Dynamic differential version of the Okun's Law model

Dependent Variable: D(Y)				
Method: Least Squares				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	5.603105	2.476975	2.262075	0.0535
D(X)	-0.275534	0.053399	-5.159897	0.0009
X(-1)	-0.397978	0.083610	-4.759941	0.0014
Y(-1)	-0.270771	0.130619	-2.072976	0.0719

Source: Author's Calculation, EVIEWS

The estimation of the second model also partially confirmed the validity of Okun's law. According to Okun's law, there is an inverse relationship between the unemployment rate and the rate of economic growth. Therefore, in this model coefficients of economic growth rate and economic growth rate with one period lag should be negative. The value of the first coefficient is -0,275534, and the second one is also negative with the value of -0.297978. Therefore, the inverse relationship between uneployment rate and the growth rate condition is confirmed. On the other hand, the coefficient of uneployment rate with the one period lag should be positive, but in this model this condition is not fulfilled. It indicates that if the value of the unemployment rate in the previous year increase by 1%, in the observed year compared to the previous unemployment rate will decrease by 0.27%.

The next step in our research was the Error Correction Model (ECM) estimation. This model will define the speed of adjustment of the unemployment rate due to the change in the value of the economic growth rate. The results of ECM estimation are given in the following table.

Table 5. Error correction model for the unemployment rate

Dependent Variable: D(Y)				
Method: Least Squares (Gauss-Newton / Marquardt steps)				
$D(Y)=\alpha+\beta_1 \cdot D(X) + \beta_2 \cdot (Y(-1)- \beta_3 \cdot X(-1))$				
	Coefficient	Std. Error	t-Statistic	Prob.
α	5.603105	2.476975	2.262075	0.0535
β_1	-0.275534	0.053399	-5.159897	0.0009
β_2	0.270771	0.130619	2.072976	0.0719
β_3	-1.469794	0.666668	-2.204687	0.0586

Source: Author's Calculation, EVIEWS

According to the results of estimation, all the estimated parameters are statistically significant. Estimated parameter of residual with one-period lag from the cointegration model indicates that unemployment rate will adjust to equilibrium in each subsequent period by 27.0771%. The value of this parameter (β_1) should be negative, because a positive value would indicate a departure from equilibrium. This condition is met and it is concluded that the estimated ECM model is stable. If the economic growth rate increases by 1%, then the short-term unemployment rate would decrease by 0.275534%. In the long run, the unemployment rate will decrease by 1.46794% in the next period with each increase in the economic growth rate of 1% at an annual rate of 27.0771%. The economic growth rate would return to equilibrium

at 1.403317 multiplied by the deviation from that equilibrium. At the same time, due to the negative value of this coefficient, it is concluded that the economic growth rate would return to equilibrium faster than the unemployment rate.

Table 6. Error correction model for economic growth rate

Dependent Variable: D(X)			
Method: Least Squares (Gauss-Newton / Marquardt steps)			
D(X)=C(1)+C(2)*D(Y)-C(3)*(X(-1)-C(4)*Y(-1))			
	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	17.34276	8.018380	2.162876	0.0625
C(2)	-2.790763	0.540856	-5.159897	0.0009
C(3)	1.384111	0.178500	7.754143	0.0001
C(4)	-0.586206	0.282988	-2.071483	0.0721

Source: Author's Calculation, EVIEWS

The inverse relationship between the unemployment rate and the economic growth rate was estimated with first difference of economic growth rate error correction model. This ECM is not stable because the parameter with the error correction is positive which demonstrate that after the initial shock, the rate of economic growth will move away from equilibrium. With an increase in the value of the unemployment rate by 1%, the rate of economic growth will decrease in the short term at a rate of 2.79%.

Based on the model estimation results, it can be concluded that Okun's law is valid in Montenegro, because the parameters that define a short-term relationship between the unemployment rate and economic growth rate in both models have negative values. On the other hand, due to the instability of the last EC model, it is concluded that the economic growth rate always initiates a change in the unemployment rate. At the end of the research, a forecast of the unemployment rate was made using the previously estimated stable version of EC model, by using the Government of Montenegro on the movement of macroeconomic indicators for the period from 2018 to 2022.

$$D(Y_{2021}) = 5.603105 - 0.275534 \cdot D(X_{2021}) + 0.270771 \cdot (Y_{2020} - (-1.469794) \cdot X_{2020}) \qquad (2)$$

According to the projections of the Government of Montenegro for the period from 2018 to 2022 rate of economic growth in 2020 should be 2.4%, while the change in this rate compared to the previous year would be 0.1%. The unemployment rate for the same year would have a value of 13.8%, and the change in this rate compared to the previous year would be -0.2%. What complicates the projections of the unemployment rate movement is the fact that the global economy has been hit by the crisis due to the pandemic of the COVID-19 virus. Current measurements show that the value of the unemployment rate reached 17.5%, while the value of the economic growth rate was -5.6%. In he World Bank projections, the change in the gross domestic product rate for 2021 would reached the value of 10.4%.

Based on the stable version of EC model, the pojection of the change in the unemployment rate for 2021 is:

$$D(Y_{2021}) = 5.603105 - 0.275534 \cdot 10.4\% + 0.270771 \cdot (17.5\% - (-1.469794) \cdot (-5.6\%)) = 5.247369\% \qquad (3)$$

Therefore, the projection of the unemployment rate in Montenegro for 2021 was -0.2%, and the estimated EC model with the current state of the unemployment rate and economic growth rate of Montenegro shows that this change in the unemployment rate next year will be 5.247369%. In the long run, the value of the difference between the realized and equilibrium unemployment rate is $(-1.469794) \cdot (-5.6\%)$ or approximately 8.23%. And this is the value that needs to be corrected until the model returns to equilibrium. Based on the EC model, it can be concluded that the model will return to equilibrium by reducing the value of the difference between the actual and projected change in the unemployment rate by 27.0771% in each subsequent year, starting from 2021.

CONCLUSION

Okun's law is part of the empirical macroeconomics that provides an opportunity to give clear answers to potential problems in every, even the Montenegrin economy. The issue of the relationship between output and unemployment in Montenegro is extremely important knowing that Montenegro's GDP is far below its potential level and that the high unemployment rate is deeply rooted in the Montenegrin labor market.

The purpose of this paper was to examine the empirical relationship between economic growth rate and the unemployment rate in Montenegro. This analysis has been carried out considering static and dynamic regression model specifications. The main results obtained in this study indicate that Okun's law is valid in Montenegro for the analyzed period from 2007 until the 2019. The first estimated model indicates that if the value of the economic growth rate in the previous year is increased by 1%, in the observed year compared to the previous one unemployment rate will decrease by 0.27%. The same results for the short-term unemployment rate are obtained based on the EC model. Under Okun's law a percentage increase in GDP should trigger a 0.5% decrease in unemployment. Okun's coefficient in case of Montenegro is less than the value it should have. However, it should be noted that Okun's coefficient is expected to have different values from country to country, since there are many other factors that affect unemployment in a country and that not all countries are equally developed. This paper is a small contribution to the ongoing debates on the validity of Okun's law.

Our analysis provides projection of unemployment rate for 2021, based on the estimated EC model and the data and projections of the Government of Montenegro for the period from 2018 until the 2022. According to the results of EC model, the change in the unemployment rate for the next year will be 5.247369%. But this projection should be considered with caution because of the global crises due to Covid-19 pandemic.

Given that the global economy has been hit by the COVID-19 pandemic, a suggestion for further research would be for researchers to apply Okun's law in an economic crisis and global recession. According to some research, there is an evidence that Okun's law still applies, however, it faces failures (the Okun coefficient becomes higher) during a recession. This should be interesting starting point for some further investigation on Okun's law and its relevance.

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