

Together Ahead! : Okun's Law Exhibited in the Slovak Republic

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Abstract:

This paper asks whether Okun's Law can be applied to the Slovak Republic and how the Slovaks compare to other economically stable nations in Europe and North America. Slovakia's history is sectioned into three time periods: 1945 to 1990, 1990 to 1993, and 1993 to 2013. The first time period had no unemployment data with which to draw conclusions due to the Communist Party Rule. The second time period displayed Okun's Law, but the data was scarce and difficult to use as a comparison to other countries. The third time period provided copious amounts of data which strongly exhibited Okun's Law. From this data was extruded a coefficient and natural rate of unemployment. The data is similar to many well-developed European nation's data. Despite the Slovak's unsteady beginning, their economy has grown very competitive. This indicates that Slovakia will soon be counted among advanced economies like that of the United States, Germany, and the United Kingdom.

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I. Macroeconomic Mathematical Proposition Statement of Purpose:

“Faithful to ourselves, together ahead!” An old motto of the Slovak Republic, also known as Slovakia, well represents its land and citizens. Slovakia is home to more than five million people. The Slovak Republic is a parliamentary republic, a member of the European Union, and uses the Euro as its currency.¹ Many comparisons between Slovakia and the United States or other countries are made with single statistics. However, it is also good to compare countries using a combination of statistics. A combination of statistics which has a pattern or trend is made into macroeconomic theory or law. One such combination is Okun’s Law.

Okun’s Law was coined by Arthur Okun, who was an advisor to President Kennedy in the 1960’s. Okun’s law compares the change in Unemployment Rate with the change in Output Growth Rate.² The equation for Okun’s Law is the change in unemployment rate (ΔU) equals the change in output growth rate (ΔY) multiplied by the coefficient/slope of the curve (β) plus the y-axis intercept (ϵ). Below is the variable equation.³

$$\Delta U = (\Delta Y)\beta + \epsilon$$

According to the Okun’s Law coefficient, as the United States’ growth rate increases by one percent, their unemployment rate decreases by -0.454 percent. However, the Okun’s Law coefficient may not be consistent between countries. How does Okun’s law vary when applied to other countries with inimitable economic data? This question is difficult to answer. Okun’s Law may change when applied to different time periods as well. To apply Okun’s Law to Slovakia,

¹ Slovakia in History, ed. Mikulas Teich, Dusan Kovac, and Martin D. Brown (New York: Cambridge University Press, 2011), 306.

² Olivier Blanchard and David R. Johnson, *Macroeconomics*, 6th ed. (New Jersey: Pearson Education Inc., 2013), 31.

³ Laurence M. Ball, Daniel Leigh, and Prakash Loungani, “Okun’s Law: Fit at Fifty?,” *NBER Working Paper Series* (2013), http://www.nber.org/papers/w18668.pdf?new_window=1 (accessed November 15, 2013).

the country should be divided up into at least three economic time periods. Using data from these three selections one can decide whether or not Okun's Law is true for that time period. If the law does hold true for Slovakia in that time, one can discover if the natural rate of unemployment is similar to that of other countries, especially the United States.⁴

The first time period selected is from 1945 to 1990. This is a longer time period than the second two. These 45 years of Slovakian history were under communist party rule and Slovakia was called the Slovak Socialist Republic. Their country was combined with the Czech Socialist Republic and commonly called Czechoslovakia. It is very difficult to find data during this time period because of the communist influences in their economy. There are no expectations that the available data from this time period should reflect Okun's law. The citizens of the Slovak Socialist Republic were employed solely by the government and there was no need for an unemployment rate statistic. Also, the reported output growth data during the socialist rule is not reliable due to the Czechoslovakian government's desire to present themselves as a flourishing country despite post-war economic hardships.⁵

The second time period selected is from 1990 to 1993. It is the shortest time period researched, but it stands alone in Slovakian History. In late December of 1989 the Berlin Wall was broken and eleven days later in Czechoslovakia the Velvet Revolution took place. Slovakia and the Czech Republic were no longer under communist dictatorship and the countries formed their own parliamentary republic. It seems unlikely the data from 1990 to 1992 will reflect

⁴ Ibid.

⁵ OECD (1991), "OECD Economic Surveys: Czech and Slovak Federal Republic 1991," *OECD Publishing*. (2001). http://www.oecd-ilibrary.org/economics/oecd-economic-surveys-czech-republic-1991_eco_surveys-cze-1991-en (accessed 15 November 2013).

Okun's Law due to the instability the country faced after the fall of the communist party leadership.⁶

The third and final time period selected is from 1993 to present day. It begins in 1993 because on January 1st, 1993 Slovakia left the federation with the Czech Republic and was officially recognized as the Slovak Republic. This time period should mildly reflect Okun's law, but with a few outliers due to the potential dip in output growth from forming a new country.⁷ Despite the expectations of the reflection of Okun's Law in this time period, Slovakia is too new a parliamentary republic to match the trends in other countries. The natural rate of unemployment in Slovakia is not anticipated to mimic other country's natural rate of unemployment, especially the United States. Also it is not expected for the Okun's Law coefficient to be similar to more developed and older countries like the United States.

II. Literature Search:

To support the research on Okun's Law, other studies were examined where Okun's Law is applied to many countries and critiqued. It is important to understand the fallbacks in Okun's Law in order to create an accurate representation of the data found in the three Slovakian time periods. The two publications scrutinized are "Post-Recession US Employment Through the Lens of a Non-linear Okun's Law" and "Okun's Law: Fit at Fifty?".

The first publication focuses explicitly on the United States from 2009 to 2013. Okun's Law is applied in multiple forms to assist economists' in understanding the effects of the Great Recession. It appears that Okun's Law does not provide a "good enough" estimate for the

⁶ Slovakia in History, ed. Mikulas Teich, Dusan Kovac, and Martin D. Brown (New York: Cambridge University Press, 2011), 322.

⁷ Ibid.

unemployment rate given the growth rates which the United States witnessed post-recession. Chinn, Ferrara, and Mignon provide a few reasons they think Okun's Law needs modification during this time.⁸

The second publication examines Okun's Law across several countries over longer periods of time. This publication is similar to the first in that it agrees modifications should be made when applying Okun's Law to a shorter period of time. However, it argues that Okun's Law does in fact hold true in the United States throughout several past recessions including the most recent, Great Recession, and that other advanced countries potentially affected by the recessions also display Okun's Law.⁹

Each of these publications agree on the rationale for modifications of Okun's Law. One modification is a result of applications in the business cycle. It was observed that Okun's Law does not accurately depict the level of unemployment on the lower end of the business cycle. On average, it predicted one or two percent above the actual rate. This can be explained, according to the second publication, by the fact that Okun's Law is best observed over longer periods of time. Ball, Leigh, and Loungani also argue that when it is applied to the Business Cycle, Okun's Law's predictions are nearer to the natural rate of unemployment which explains the shortcomings in the business-cycle-length predictions.¹⁰

Another problem which is addressed in each of the publications is structural unemployment. Okun's Law does not account for different types of unemployment nor does it have official modifications referring to peculiarities in unemployment. It was observed after the

⁸ Menzie D. Chinn, Laurent Ferrara, and Valérie Mignon, "POST-RECESSION US EMPLOYMENT THROUGH THE LENS OF A NON-LINEAR OKUN'S LAW" *NBER Working Paper Series* (2013), http://www.nber.org/papers/w19047.pdf?new_window=1 (accessed 15 November 2013).

⁹ Laurence M. Ball, Daniel Leigh, and Prakash Loungani, "Okun's Law: Fit at Fifty?," *NBER Working Paper Series* (2013), http://www.nber.org/papers/w18668.pdf?new_window=1 (accessed November 15, 2013).

¹⁰ Ibid.

Great Recession that unemployment did not diminish even while output grew. These observations were coined “jobless recoveries”. Many economists use the “jobless recoveries” as an example of the shortcomings of Okun’s Law. Chinn, Ferrara, and Mignon use a non-linear modification of Okun’s Law in order to make sense of the slow growth and high unemployment levels of the recovery. Ball, Leigh, and Loungani claim that the “jobless recoveries” are simply periods of sluggish growth which are merely bumps in the long run and do not interfere with Okun’s Law’s application as a whole.¹¹

These limitations of Okun’s Law should be taken into account during analysis of Slovakia’s unemployment and output growth data. The business cycle limitation may be notably important for one of the selected time periods, 1990-1993. This period is very short and may display the irregularities which are caused by the business cycle. The structural unemployment and/or “jobless recovery” limitation is important for the most recent time period, 1993-2013. This is because the complications Slovakia has faced since it’s independence could mirror the lethargic movements observed in the United States after the Great Recession.

III. Application of Macroeconomic Mathematical Proposition and Results:

For the first time period it is very difficult to uncover data. This is due to the nature of the communist party influence in what was then the Slovak Socialist Republic. It is a consequence of the socialist economy that a key element of data for the research is impossible to find. There was no record of unemployment in the Slovak Socialist Republic. Unemployment did not exist because every person was either employed by the government or not in the labor force. One can still speculate on what the unemployment could/should have been during that time, but there are

¹¹ Ibid.

no hard facts or statistics on unemployment from 1945 to 1990. In the 1991 edition of the Organization for Economic Co-operation and Development (OECD) survey it is suggested that an estimate could be made for “overemployment” during this time period. Overemployment can be synonymous with unemployment in this discussion because it is assumed that in a typical capitalist economy the “overemployed” would be unemployed. OECD 1991 suggests that the “overemployed” rate was about fifteen percent of total employment. This statement is not conclusive or proven and it is excluded it from the charts and references.¹²

Below is a chart providing some background data for this time period as a point of reference for the next two time periods researched.¹³

Year	1985	1986	1987	1988	1989
Output (\$)	5,827,020,000	7,874,149,000	9,480,149,000	10,073,850,000	9,769,582,000
Growth (%)	3.50	4.17	2.46	1.94	1.21

The second time period begins in January of 1990 and ends at the start of 1993. During this time Slovakia was united with the Czech Republic in what was called the Czech and Slovak Federal Republic. It is a little easier to find data during this time period because the nation was no longer under communist party rule. Because of the tumultuous time period, unemployment data for 1990 was not found. It is understandable that under the duress of forming a new government the data from 1990 would be skewed. Having had no measure of unemployment in years past, it takes time to organize an accurate surveying force.

¹² OECD (1991), “OECD Economic Surveys: Czech and Slovak Federal Republic 1991,” *OECD Publishing*. (2001). http://www.oecd-ilibrary.org/economics/oecd-economic-surveys-czech-republic-1991_eco_surveys-cze-1991-en (accessed 15 November 2013).

¹³ IndexMundi, “Slovak Republic – GDP Growth,” IndexMundi, <http://www.indexmundi.com/facts/slovak-republic/gdp-growth> (accessed 15 November 2013).

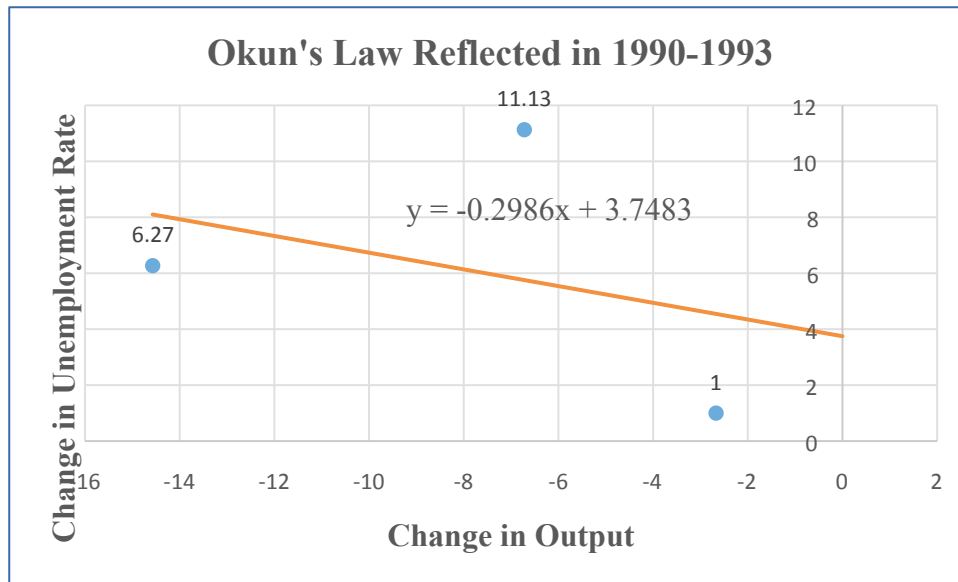
Below is a chart comparing the change in unemployment rate and the change in output growth in percentages.¹⁴

Year	1989	1991	1992
Change in Unemployment	1	6.27	11.13
Change in Output Growth	-2.67	-14.57	-6.72

The change in unemployment was calculated based off of quarterly data then averaged for ease of display and calculation. A baseline estimation of a one percent change in unemployment paired with the percent output change for the year 1989 was used in order to provide a third data point and a reference for the latter data. It is acceptable because unemployment under communism is near zero. The graphics for this period are measly and do not give a detailed account for what is happening. The reason the data does not give much indication of the economics of the period is because there is very little time for data to reveal key indicators. The Velvet Revolution had just taken place and the Slovakian economy was in turmoil. However, even with the slight amount of data, Okun's Law does show itself in the Czechoslovakian economy.

The following graph is a representation of the table shown above.

¹⁴ Kamil Janáček, "Eastern European Economics," *Journal Storage* Vol. 32, No. 4 (Jul. - Aug., 1994), pp. 55-70, <http://www.jstor.org/stable/4379967> (accessed 15 November 2013).

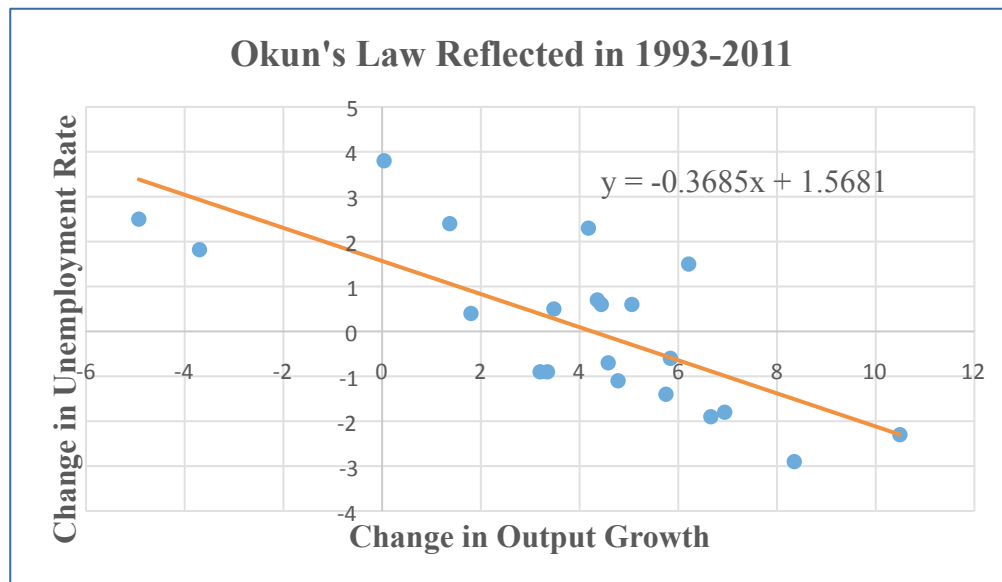


The graph is obviously very limited, but the slope is negative and therefore the bulk of Okun's Law is upheld. It is not practical to attempt finding the natural rate of unemployment for this time period because the time period is not long enough to warrant the calculation. The natural rate of unemployment would be skewed. The business cycle does not intervene with this data due to the disorder of Slovakia at this time.

The third time period studied is from 1993 to present day. The time period begins with what many people nicknamed the Velvet Divorce. Czechoslovakia peacefully split into the Czech Republic and the Slovak Republic. Slovakia then became the country which is recognized today. The data from this time period is much more abundant and easily uncovered. Slovakia has been thriving under its new government.¹⁵

¹⁵ Slovakia in History, ed. Mikulas Teich, Dusan Kovac, and Martin D. Brown (New York: Cambridge University Press, 2011), 340.

The following graph displays changes in unemployment and changes in output during this time period.¹⁶



This graph is an excellent depiction of Okun's Law. There are twenty years' worth of data points which is ideal because Okun's Law is best observed over long periods of time. This graph does more than reveal the proof of Okun's Law, it also gives a hint at the natural unemployment rate of the Slovak Republic. Where the regression line crosses the x-axis that data point is the natural rate of unemployment. Using the equation of the regression line, $Y = -0.3685x + 1.5681$, and solving for X when Y equals zero the natural rate of unemployment is found to be 4.26 percent. The slope of the line, or the Okun's Law coefficient, reveals that an increase of one percent in the growth rate decreases the unemployment rate by 0.3685 percent (slope equals -0.3685).

¹⁶ IndexMundi, "Slovak Republic – GDP Growth," IndexMundi, <http://www.indexmundi.com/facts/slovak-republic/gdp-growth> (accessed 15 November 2013).

IV. Sources and Uses of Data

The data collection stage of the research was perhaps the most time consuming portion. It was very difficult to find the data because of the limited research and knowledge about Slovakia. Print is used as much as possible in the research. However, most historians are interested in only the politics of the revolutions in Slovakia and very few economists are intrigued by the economic progress; or at least the library was not keen on revealing those that are. Fortunately, internet resources are able to provide documents which would normally not be accessible.

For the first time period, data from 1985 to 1990 was found on the internet resource, IndexMundi.com. It is a very reliable database, however the data did not cover the entirety of the first period. Print sources from the United States Naval Academy Nimitz Library were used to provide an adequate picture for the economic happenings between 1945 and 1985. The only data discovered for this time period was in relation to gross domestic product.

The second time period was a little more fruitful. An online edition of the 1991 OECD: Czech and Slovak Federal Republic and an academic journal titled "Eastern European Economics" found on the online database, Journal Storage or jstor.org was utilized. The unemployment percentages from Journal Storage were very useful, but the data was quartered while the output growth data was yearly. The unemployment data was averaged by year in order to better match the output growth data. This also made it much easier to graph the data and compare it to the expected results and Okun's Law.

The third time period was the least demanding of the data collections. IndexMundi was used to find the data needed for output growth and unemployment percent. The only calculation

required was to find the difference between years of unemployment rates, i.e. the change in unemployment rate per year. This was because IndexMundi did not provide an option for the change in unemployment rate and so it was necessary to perform the calculations. Excepting these few minor calculations, the data was unaltered in any way to reflect the desired results.

All of the data was entered into an excel spreadsheet and utilized in the scatterplot functions on excel in order to graph the data series. It was very simple to draw the trend line and display the line equation which describes Okun's Law.

V. Comparing and Contrasting Results:

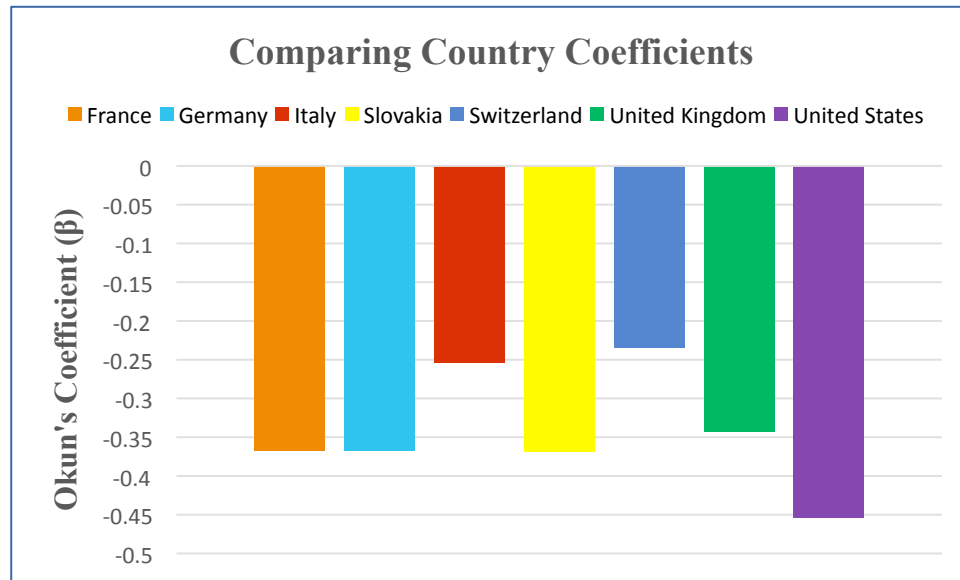
The results of applying Okun's Law to the Slovak Republic over these three time periods are very close to the expectations. The first time period yielded the expected results, failing to find any information regarding unemployment and therefore Okun's Law is inapplicable.

The second time period's outcome was surprising. It was unexpected for the shortest time period to reflect Okun's Law so clearly even with a measly three data points. The tumultuous period does not suggest that there would be a stable relationship throughout the turmoil. The expectations were that this time period would be an exemption from Okun's Law. Instead it is the opposite.

The third time period produced better results than ever imagined. The data presents a literal textbook example of how Okun's Law is displayed over time. The results allow one to calculate the natural rate of unemployment for the time period and use that to compare results from other researchers on Slovakia and additional countries.

The second publication, “Okun’s Law: Fit at Fifty?”, flawlessly couples with the results. Ball, Leigh, and Loungani discover that Okun’s Law is applicable to many countries over time and that the only difference between countries was the coefficient relating unemployment and output growth, that is to say, the slope of the curve. In fact, the results of this publication for the United States are actually rather close to the results of the third time period for Slovakia. In their examination of the United States, Ball, Leigh, and Loungani found that the coefficient of Okun’s Law hovered between -0.4 and -.05. Whereas Slovakia’s coefficient was -0.3685. In the twenty other countries observed in the research they found that the coefficients varied from as low as -0.136 (Austria) and as high as -0.852 (Spain). Noting the large variations in coefficients, one can see that though the economic paths of each country change the numerical values, Okun’s Law is still revealed in each country’s economic data.

The graph below compares Slovakia's coefficient with that of six economically advanced countries.¹⁷



Examining the above graph uncovers new meaning for Slovakia. While the Slovak Republic has been around for only twenty years, their economy is growing and thriving steadily. The Okun's Law coefficient is almost level with several countries considered to be economically advanced and relatively stable. The observations in this paper of Slovakia's growth and progress show that their Okun's Law coefficient and their consistently positive output growth rate indicate many prosperous years in their future. Despite Slovakia's tumultuous beginnings, the Slovaks will soon be counted as near equals among other advanced economies such as the United Kingdom, Germany, and the United States.

¹⁷ Laurence M. Ball, Daniel Leigh, and Prakash Loungani, "Okun's Law: Fit at Fifty?," *NBER Working Paper Series* (2013), http://www.nber.org/papers/w18668.pdf?new_window=1 (accessed November 15, 2013).

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