ASYMMETRY IN THE OKUN COEFFICIENT IN ROMANIAN ECONOMY

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Introduction

Any recession is characterized by social costs. The loss of jobs, the specter of unemployment, and the decrease of earnings are all negative phenomena that produce during the recessions. During the ongoing financial crisis, unemployment rose quickly in Romanian economy. From a very low unemployment rate, at about 3.5 % before the trigger of the recession, in less than a year, the unemployment more than doubled. Coupled with the loss of budgetary revenues and the increasing public debt, this put further constraints on the optimal decisions of policy makers.

The dynamics on unemployment in the near future, as well as the future development of the unemployment as the economy starts to grow, led to reignite of the interest in the output-unemployment relationship, also known as the Okun coefficient. While there are a number of studies on the estimation of the Okun coefficient, see [1] and [3], less attention was paid to the possibility of asymmetries in the Okun relationship. The recent experience showed that while during the expansion between 2000 and 2008 the unemployment decreased constantly but slowly, the unemployment rose rapidly in less than one year. There is also a major interest on the possible dynamics of unemployment during the post-crisis recovery.

The main purpose of this study is to analyze whether the Okun's Law is asymmetric or not in Romanian economy. I also investigate whether the shifts in the Okun relationship are correlated with the business cycles. The econometric framework is a nonlinear one, supported by recent research, see [18], that points to the possibility of modeling the Romanian business cycles using nonlinear econometric models.

This paper is organized as follows. The first section reviews the main results in the literature on the Okun coefficient. The next section introduces the model and explains its approach. I estimate the Okun coefficient using the Markov Switching approach and compare the result of the estimations with previous results for Romania. I draw an assessment of the results and some possible policy implications in the last section.

1. Literature Review

The Okun's Law is a key relationship in macroeconomics and it was proposed by the American economist Okun, see [15]. In its original form, the relationship implies that a GDP growth by 3 % leads to a 1% decrease in unemployment. Following studies confirmed this finding, although they found slight variations from the proposed value of -0.3 in the original paper.

A series of researches were undertaken in order to test in various form the existence of this relation, mostly for United States, as well as other developed economies. We can include here the studies by [7], [8], [6], [17] or [21]. A few studies which compare this relationship for several developed or OECD countries were also realized by [14] and [12].

Interestingly, [14], and also [12], proposed an interpretation of the difference between the Okun coefficients in the studied economies by the difference in the institutions of the labor market in these economies. Thus, [14] found values for the Okun coefficients ranging from -0.08 for Japan to -0.41 for the United States. According to him, a bigger absolute value for a country implied that the labor market in that economy was more flexible. His findings did confirm the conventional wisdom that the labor

markets in the Anglo-Saxons economies were more flexible.

Recently, there is a growing interest in the possible asymmetry of the Okun coefficient. A theoretical background for the asymmetric Okun coefficient was provided by [10]. According to them, finding whether there are asymmetries or not in the output-unemployment relationship helps at:

- Discriminating between alternative labor and goods market theories;
- Establishing or not the existence of an asymmetric Phillips curve;
- Better designing stabilization policies;
- Improvement of the forecasts for unemployment.

They also suggested that the first contributions to the possible nonlinearities or shifts of the Okun relationship can be traced back to [4] or [16]. For example, [4] used a production function and suggested that the symmetric Okun coefficient would wrongly lead to an overestimation of the unemployment during booms as well as to an underestimation of unemployment during recessions.

Following studies deepened the initial findings. [20] estimated a model which relates the changes in unemployment with changes in the output. The model was estimated for positive and, respectively, negative values of the output. The model was estimated for 20 OECD countries. He found evidence for asymmetric effects. [13] also found also nonlinearities and asymmetries in the Okun coefficient, with the relation stronger during rapid downturns.

Using an approach derived from the paper in [20], [10] studied the existence of the asymmetry for seven OECD economies. They showed that failure to take into account the asymmetries would lead to a rejection of the hypothesis of a long-run relationship of unemployment and output in United States and New Zealand. Moreover, the symmetric approach (except for Canada) showed different magnitudes for the short-run relationship depending whether the economy was in a boom or a downturn.

[19] also studied the existence of asymmetries in the Okun coefficient for United States. They showed that short-run effects of the output gap have a stronger effect on the unemployment cycle during a downturn, confirming previous findings for US or other developed economies.

A different approach was proposed by [5]. He proposed the use of the Markov Switching approach in the analysis of Okun coefficient shifts. By applying this approach on data for the US economy he proved that there are changes in the Okun coefficient depending on the business cycle phases.

An extension of this approach was done by [11] who used the regime-dependent Markov Switching approach to estimate the Okun coefficient in US economy. They pointed that by using this approach, further evidence on the "jobless recovery" can be offered.

2. The Model and Its Estimation

As we have seen from the previous section, there is continuing great interest in the modeling of the Okun coefficient as well as the detection of possible asymmetries. While the initial approaches were based on classical approaches, with the estimation on positive and negative ranges for the value of the output gap, the last approaches suggested the use of the Markov Switching Approach (MS, hereafter), see [9] for a detailed presentation. Such of model allows for nonlinearities, by introducing the possibility of shifts in the time series process.

I combine the gap approach as proposed by [21], with the MS approach that allows for the detection of shifts in the Okun coefficient. The gap approach in the estimation of the Okun coefficient can be expressed though the following equations:

$$y_t^c = y_t - y_t^n \quad (1)$$

$$u_t^c = u_t - u_t^n \quad (2)$$

$$u_t^c = \beta * y_t^c \quad (3)$$

Where: β is the Okun coefficient with a negative value, as the theory predicts; y_t^c represents the production cycle, y_t represents the production, y_t^n represents the potential production, u_t^c is the unemployment cycle, u_t represents the unemployment rate and u_t^n stands for the natural rate of unemployment.

The MS model proposed in described below:

$$u_t = \alpha + \beta_{S_t} y_t + \sigma_{S_t} \varepsilon_t \quad (4)$$

Where: S_t stands for the state at time t – there are a finite number of states;

α is the constant which is constant over the states;

u_t is the dependent variable;

y_t is the explanative variable;

σ_{S_t} is the standard deviation, which differs along with the states;

β_{S_t} shows the regression coefficients for each state and corresponds to the regime switching Okun coefficients;

ε_t are the residuals characterized by a normal distribution with a zero mean and a variance equal to 1.

The independent variable y_t is given by the monthly industrial production, taken as a fixed base index series with the base in December 1990. The dependent variable u_t I use is given by the unemployment rate. Afterwards both series were seasonally adjusted, logged and filtered using the Hodrick-Prescott filter. For both series the sample used was between January 1991 and December 2009.

The model used was a two state MS model, as in equation (4). The model was estimated using the maximum likelihood approach. The estimation indicated that the convergence was achieved. In Table 1, I present the results of the estimation. The estimated values for the coefficients and standard deviations are all statistically significant.

Tab. 1: Maximum Likelihood Estimates for the Model

State parameters	Estimates
Constant	
α	-0.0024 (0.0008)
State 1	
β_1	-0.3182 (0.0670)
σ_1	0.0243 (0.0027)
State 2	
β_2	-0.0963 (0.0097)
σ_2	0.0091 (0.0006)

Note: Standard errors in brackets. Source: own computations

The estimated model features a non-switching constant which appears as statistically significant. The negative value of the constant may suggest that at zero economic growth, the unemployment tends to decrease.

The results indicate that the Okun coefficient differs along two states and that there is a strong Okun coefficient and a weak Okun coefficient. Practically, there is a state in which the unemployment reacts quite strong to output changes, and a state in which the reaction of the unemployment is rather a weak one. The results here can be compared with those from previous studies, see Table 2.

Tab. 2: A Comparison of the Estimations of the Okun Coefficient

Estimation	Posterior mean	Confidence interval		Data Sample
New Keynesian model**	-0.49	-0.44	-0.53	2000-2008 (quarterly)
Bayesian linear regression***	-0.55	-0.03	-0.99	2000-2008 (quarterly)
Classical linear regression*	-0.17	-	-	1991-2004 (monthly)

Source: own

Notes: * Classical linear regression applied on monthly data, see [1].

** Okun coefficient derived from an estimated New Keynesian model, see [3].

*** Bayesian linear regression, see [3].

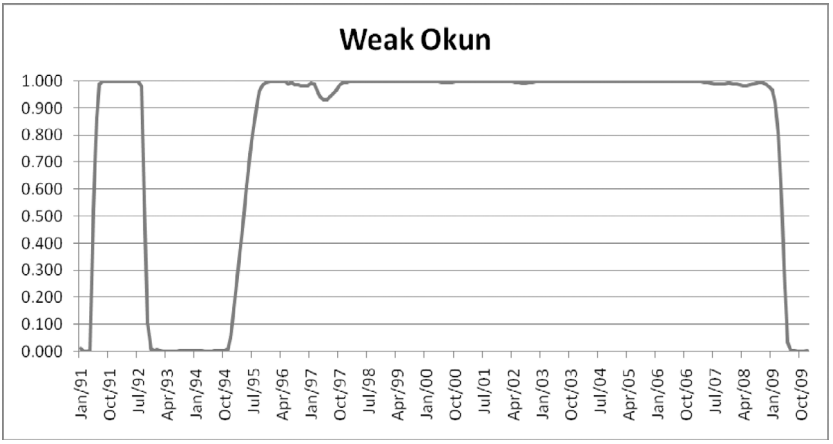
The results in this paper reconcile the findings up to now. According to the findings here, there is a phase characterized by a strong Okun coefficient, around -0.38, and phase with a weak Okun coefficient. Thus, the value in [1], who used a symmetric approach, appears as an average of the two values derived from an asymmetric approach. The higher values registered in [3] may have been biased upwards by sample and frequency used, as the quarterly GDP and unemployment rate were used.

A further problem is whether the phases of the two switching Okun relationships are correlated with the business cycles in Romanian economy. The usual findings were that the unemployment reacted stronger in a downturn compared to the upturns. Figure 1 and Figure 2 in the Annex show the two phases based on the smoothed probabilities derived from the estimated MS model. The graphs consist in two figures each with two axes, with probability of a certain state (strong or weak Okun) on the vertical, and the time period on the vertical. Each point on the figure is associated with a certain probability (namely that unemployment is either in the strong relationship with

Fig. 1: **Smoothed Probabilities for the Two States of the Markov Switching Model. State 1 (Strong Okun Coefficient)**

Source: own

Fig. 2: **Smoothed Probabilities for the Two States of the Markov Switching Model. State 2 (Weak Okun Coefficient)**



Source: own

output or in the weak relationship with the output) which shows us which kind of state predominates at a certain point. For each figure, each time the probability is higher than 50 %, we can say that the state pictured in that figure is predominating. Thus, the figures mirror each other, in other words, the probabilities at a certain point for both states add to one.

In Table 3 we can see the derived dating of business cycles in Romanian economy as derived from [2].

Tab. 3: Dating Business Cycles in Romania Using the MS Approach

Smoothed probabilities		Duration of recessions in months
Peak	Through	
January '91	September '92	21
February'97	January '99	24
August '08	-	-

Source: [2] – computations for 1991-2008 period.

Quite significantly, the results here confirm the other findings in the literature, at least for the last cycle, the growth from 1999 to 2008, and the recession that started from 2008. Thus, during the ongoing recession, the Okun relationship switched to the stronger behavior, and thus explaining the rapid expansion of unemployment that doubled in less than one year. At the same time, the long growth period started in 1999 showed a constant but slow decline in unemployment, which can be explained by a Okun coefficient of -0.09. We can also see that the first downturn, the so called "transformational recession" that was common to all transition economies, was characterized by a rapid expansion of unemployment. For this first recession, the Okun coefficient is shown to be in the stronger state, at least for the first part of this recession.

The two periods in which the Okun coefficient behaves, let's say, unexpectedly, are the expansion between October 1992 and January 1996, and the recession that followed between February 1997 and December 1998. I would explain this behavior through the fact that the state intervention continued to be high during those times. During the first expansion period, the state tried to keep the unemployment low and not only postponed the restructuring of the state owned firms, but also encouraged their activity through governmental credit. This is why the Okun coefficient switched to the stronger behavior. Once the economy entered again in recession, the policy makers tried to lower the social costs by different policies, one of which was the early retirement. This would explain the weak state of the Okun coefficient.

After 1999, we can talk about a normal behavior of the unemployment-output, in concordance with the main findings in the literature, which is another sign that the Romanian economy became a full market economy.

Conclusion

There is an acute interest in how much the unemployment will rise until the crisis will be finished. Once the crisis is over, and the recovery starts, clearly a question to be asked will be how rapid will the unemployment decrease. Recent experiences showed that even developed economies can pass through the so-called "jobless recovery" phenomenon.

In this paper I address both questions by using the asymmetric approach is the estimation of the unemployment-output relationship, also known as the Okun coefficient. While there are several studies in the estimation of the Okun coefficient for Romanian economy using different approach, from the classical regression to the Bayesian approach, they could not explain the asymmetry which is obvious from the behavior of real data.

The estimation based on a MS shows evidence for the existence of an asymmetric behavior of the Okun coefficient, with a state characterized by a weak Okun coefficient, and a strong Okun coefficient state. Moreover, the last long expansion is associated with a weak Okun relationship, while the ongoing crisis with a strong one.

The results here imply that there is a real danger for a jobless recovery once the economy starts to grow. A weak coefficient of -0.09 is general thought as an evidence of a rather rigid labor market. Such a characteristic of labor market in Romanian economy should be addressed by specific labor market policies and measure that would help the economy generate more jobs once it starts to grow.

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Abstract

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The current financial and economic crisis reignited the interest in the output-unemployment relationship. The unemployment rate in Romanian economy reacted strongly to the fall in economic activity, by more than doubling in less than a year raising, and thus raising questions on the validity of a symmetric relationship between unemployment and output. In this paper I investigate the existence of asymmetries in the Okun coefficient in Romanian economy. The asymmetric approach is justified based on both practical reasons, given the last results in the literature, as well as from a theoretic point of view. The econometric framework used is the Markov Switching approach. The data used is at monthly frequency and consists in the monthly industrial production index and in the unemployment rate between January 1991 and December 2009. The Regime switching approach allows for the testing whether the Okun relation switches between different phases. I find that there are asymmetries in the Okun coefficient. A state characterized by a weaker Okun coefficient of -0.09 was found, and a state with a stronger Okun coefficient of -0.32. After 1999, the switches are associated with the two phases of the business cycles, with a weaker Okun coefficient during the expansion and a stronger Okun relationship during the recession, as in the literature, underlining that the Romanian economy became a full market economy. The findings here reconcile the previous findings based on symmetric approaches. Some policy implications as well as the peril of a jobless recovery are discussed. This paper thus contributes to the ongoing refinement and understanding of the output - unemployment relationship.

Key Words: *business cycles, Markov Switching, nonlinear methods, Okun coefficient, mathematical methods.*

JEL Classification: *C22, C50, E32.*