ESTIMATING THE OUTPUT GAP FOR ROMANIA'S ECONOMY

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Abstract: *In this research paper the authors try to estimate Romania's Output Gap and how the country managed to evolve, from the given chronological perspective, in parallel with the estimated potential Output Gap. Romania started to feel the heat of the economic crisis at almost three quarters after the American economy started its decline, but when it comes to the economy's Output Gap, the country macro-behaved with a pace somehow differentiated in parallel with the global economy. Where was Romania and where it is heading that is the question that this research paper tries to answer from macroeconomic perspective.*

Key words: output gap, GDP, TFP, Cobb-Douglas function.

1. Introduction

After the crisis that started at global level almost 8 years ago there are voices that still highlight the fact that we are still in unstable global economic and the perspective is not clear. Romania, who entered about 3 quarters later the global crisis was one of the countries that is still in the middle of nowhere regarding the economic policies implemented for stabilizing the outcome of each year under the crisis tremendous and volatile social and economic pressure.

Furthermore, the government took measures in 2010 to cut government spending (the 25% cut for the salaries for state employed) and the increase with 5 percentage points in the VAT for collecting more money to the national budget. These measures created a stall in the Romanian economy, protected the government from going South with its deficit, but also postponed recovery.

The paper will try to underline through quantitative analysis what was Romania's potential and what it succeeded to establish in these times of economic distress.

2. Methodology
Primary used data:
  a) Quarterly GDP for average price for the year 2000, for the period Q1 2001 – Q3 2003. The frequency was quarterly and the source for the data was the National Institute for Statistics of Romania, the Measuring Unit was millions lei.
  b) The number of employees in the 2001 – 2013 timeframe. The basic frequency of the data monthly, but it was converted in quarterly data with the help of monthly' averages. Source: Labor Ministry.
  c) Fixed Capital Gross Formation in average prices for the year 2000, starting from Q1 2000 till Q4 2013. The frequency was monthly, source: the National Institute for Statistics of Romania, the Measuring Unit was millions lei.

Secondary data (obtained through own estimations):
a) K (capital stock) was obtained through the Perpetual Inventory Method (PIM). To obtain the capital stock there are three conditions to fulfill: (1) there is needed a basic value with the role of a benchmark; (2) the statistics regarding the gross formation of fixed capital and (3) information on the life span of assets.
b) Total Factors Productivity (TFP), is estimated after the initial process.

To estimate the Output Gap for the Romanian economy there was used the methodology proposed by Denis et al. (2006) regarding estimating the Output Gap for the European Union through the production factors' method. Furthermore there was also studied the revised version of the methodology proposed by D'auria et al. (2009), but the authors reacted by using for estimating the potential output through the Hodrick-Prescott filter (1997). The same methodology is used by Socol and Măntescu (2011), but the two authors use annual data. Denis et al. (2006) explains the path for estimating potential output: it is determined by using a Cobb-Douglas type function, by correcting or adjusting the excess (U_L & U_K) and adjusted for its efficiency level (E_L & E_K). The potential GDP is develop through the following relation (Denis et al., 2006):

$$Y = (U_L L E_L)^\alpha (U_K K E_K)^{1-\alpha} = PTF * L^\alpha * K^{1-\alpha} \tag{1}$$

After that, the Cobb-Douglas production function for the Romanian economy has the following design (Socol and Măntescu, 2011):

$$Y = PTF * L^{0.65} * K^{0.35} \tag{2}$$

, where TFP is total factor' productivity.

There where chosen the yielded values of 0.65 and 0.35 according to Socol and Măntescu (2011), the authors underlining the fact that these yields for the Romanian economy where chosen because there are small differences if other approached values would have been selected.

The first stage consisted of estimating the time series for the capital stock. According with Altăr et al. (2010), the initial capital stock (K_0) was estimated in tune with the ratio $\frac{K_t}{Y_t} = 2$. In Albu's paper (2014), at European Union's level, for the 2000 – 2012 timeframe, there was estimated an annual depreciation rate for capital of $\rho = 2.785$ and an average life span for the assets of 35.9 years. Konuki (2008) uses the estimation for the Output Gap for Slovakia's economy in a working paper for the IMF a depreciation rate for capital of $\rho = 4$.

Even if Altăr et al. (2010) decide to set a value of 5 for this coefficient (a yearly depreciation rate for capital of 5%), according to Denis et al. (2006) and to almost all existant theoretical models, in our paper we used for estimating the capital stock a depreciation rate of 4% per year. To validate the choice we could state that there is a small deviation from the European Union's average, estimated by Academician Albu (2014) by the fact that the Slovakian economy had a similar trend and tendency compared with Romania's economy from last years, after is seen in the graphic below created using Eurostat data:

Fig.1: Descriptive statistics for annual GDP evolution. The parallel between Slovakia and Romania (2002 – 2013)
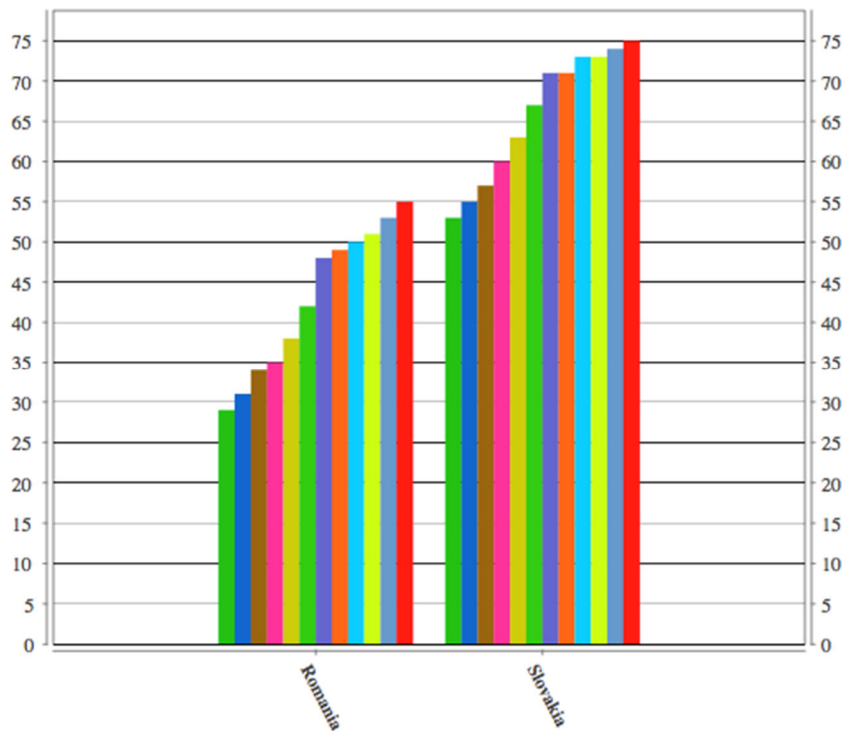

Source: the authors, by using Eurostat data.

As follows, the absence of an official statistics from European entities, to estimate the capital stock, according to PIM, there was used the following equation (Altăr et al., 2010):

$$K_t = K_{t-1} * (1 - \rho) + I_t = K_0 * (1 - \rho)^t + \sum_{j=1}^{t} I_j * (1 - \rho)^{t-j} \qquad (3)$$

, where K_t = *capital stock,*
    ρ = *the annual depreciation rate,*
    I_j = *the gross formation of fixed capital.*

Official statistics for gross formation of fixed capital (I_j) are available starting with the year 1995 and where created according to ESA 2010. According to the PIM methodology, the initial capital stock is less important if the initial moment is far away.

The evolution of capital stock starting with the first quarter of the year 2001, till the thrid quarter of the year 2014, is described in the following graphic:

Fig.2: The quarterly evolution of capital stock (K) in Romania (2001q1 – 2014q3)
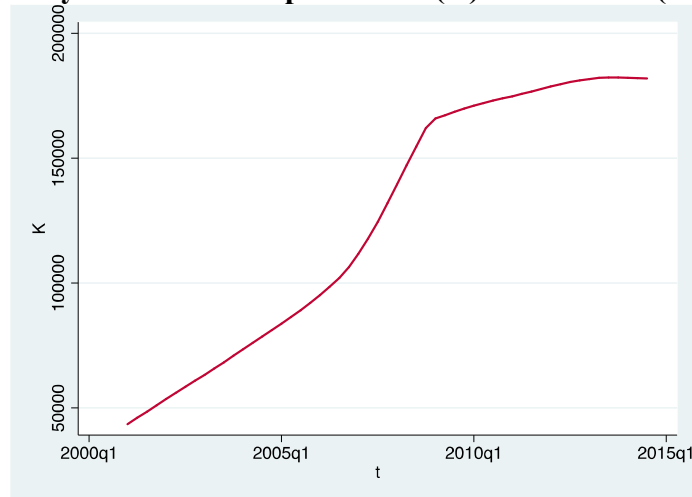
The second stage consisted of estimating total factors productivity (variable found from now on as **TFP**). This was calculated by using the following equality:

$$\ln \text{TPF} = \ln Y - (\alpha * \ln L + (1 - \alpha) \ln K) \qquad (4)$$

Figure 3 highlights the evolution of the total factors productivity in the analysed period (2001q1 – 2014q3). This was situated between 1.9 and 2.18 interval, and the average was about 2.07, most of the values being concentrated in the superior frame of the interval, according to the histogram (fig. 4).

Fig.3: The evolution of TFP (2001q1 – 2014q3)Fig
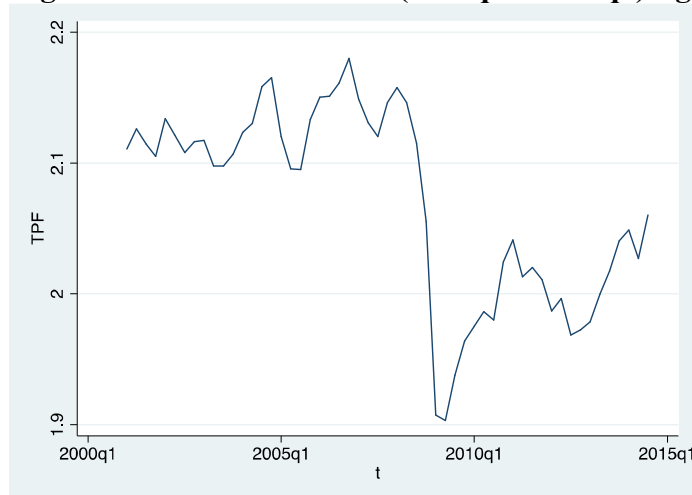
Fig.4: TFP histogram
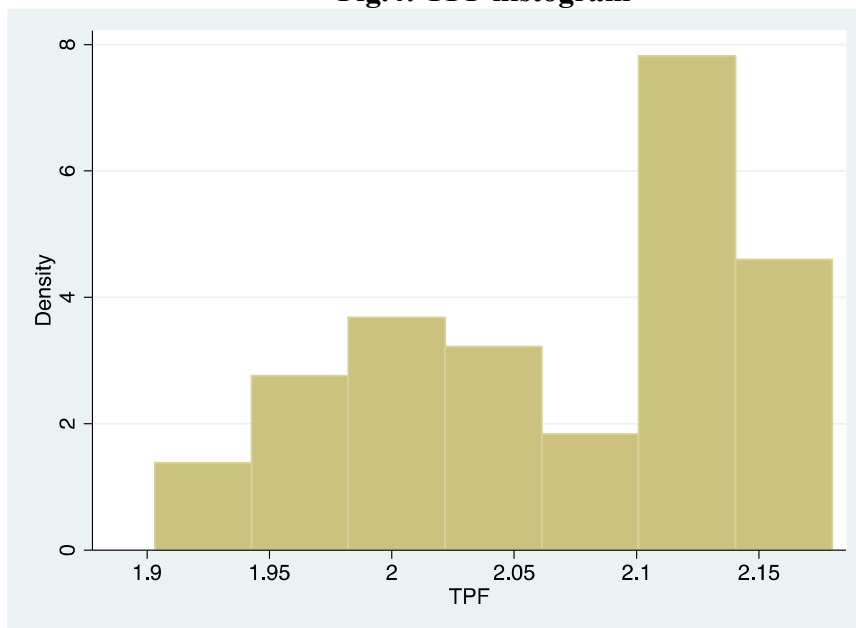
Therefore, according to the methodology presented by Denis et al. (2006) and adapted for the Romanian economy by Socol and Măntescu (2011), we used a relation for estimating the potential GDP through the following equation:

$$Y_{pot} = TPF_{pot} * L_{pot}^{\alpha} * K_{pot}^{1-\alpha} \tag{5}$$

The potential values of TFP and those for L and K where obtained with the help of the Hodrick-Prescott filter. This filter was used to analyze the cyclicity and the volatility for the time series. The idea that represents the foundation of this filter is to decompose the time series in a sum that results into an evolutive trend and with a transitionary deviation, that could be classified as a cycle, like follows:

$$x_t = \tau_t + \xi_t \tag{6}$$
$$observed\ series = the\ permanent\ trend + cycle$$

According to the literature, for data that are quarterly available, the most used adjustment parameter for extracting the permanent trend is λ=1600. We also used this parameter in this research paper.

The third stage consited of the actual estimation for the Output Gap of the Romanian economy. The results of the equation no.5 could be described as follows in the figure 5. It is stressed the fact that there is a recession gap starting with the first quarter of the year 2002, that finalised in the thrid quarter of the year 2007. Afterwards, in the economic boom period, the output gap was positive, reaching a maximum value of 6.73 percentage point, in the second quarter of the year 2008.

Fig.5: The evolution of the Output Gap for Romania, percentage points (2001q1 – 2014q3)
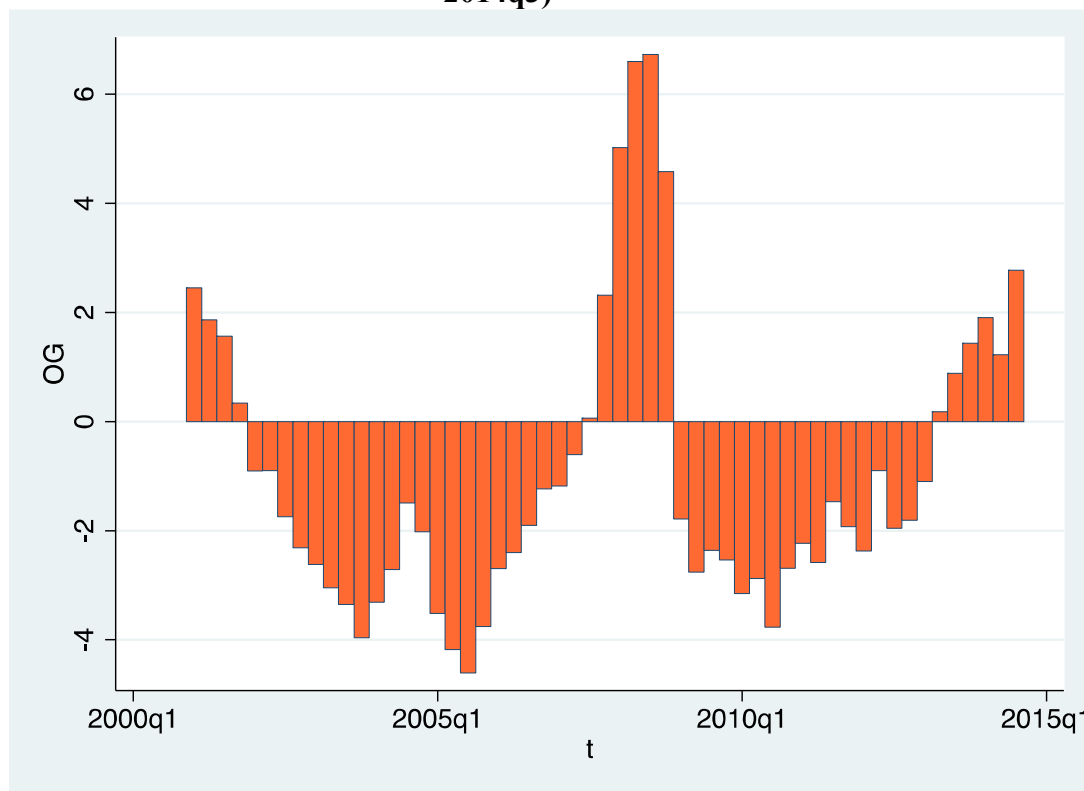
It is highlighted the fact that the way through which the economic crisis influenced economic activity through the existant recession gap seen in the entire economy in the 2009q1 and 2013q1 interval. After this period there was a period of stability, that was seen to have also small positive values.

3. Conclusion

This paper was developed to highlight the evolution of the Romanian economy in tune with its potential, and the best way to show that was by describing the evolution of the Output Gap for Romania's economy, starting from the first quarter in the year 2000 till the third quarter of the year 2014. We should state that Romania evolved under its potential starting with the year 2002 and it is seen as a question mark becasue that is the same period when Romania signed the agreement that helped it to enter the European Union in 2007.

Badly adjusted economic and public policies corroborated with sinuous access to pre-entering European funds led to a delay bigger than 4% in the third quarter of 2005, when the economy was accelerating but not to overheat just to catch up to its potential. The economic crisis was delayed for a while in Romania, because the economy caught on momentum and it accelerated to its positive peak of 6.73% in q2 2008, fact that gave policy makers a „false positive" in the fact that Romania was protected against the economic crisis. The situation was seen desperate when just after another positive Output Gap, the economy decelerated and entered into recession with al economic measures set for an overheating economy. The respone did not come fast and the handbrake was activated only at the starting point of the third quarter of 2010. From that moment on, the economy was again on a positive trend, but with the need to catch up or limit the negative Output Gap. Starting from the first quarter 2009 the Romanian economy is again in a positive Output Gap situation, but according to

Schumpeter (2011) only if reach an average above 2 percentage points per year the government could state that it is improving the economy, because 2% it is the level at which any given economy grows by its own, without any policies.

4. Acknowledgement

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