GDP Correlation Analysis - HICP Inflation Rate in Romania, Hungary and Bulgaria

Iuga Iulia
"1 Decembrie 1918" University of Alba Iulia
iuga_iulia@yahoo.com

Abstract

The purpose of the present study is to make a comparative account between gross domestic product (GDP) and inflation rate based on the harmonized index of consumer prices (HICP). These indicators represent the main factors for measuring and comparing inflation in the Member States of the European Union, thus reflecting the way to handle the costs of households in the gross domestic product. The survey was conducted over a period of eight years, namely, 2007-2014, and the data were collected from Eurostat and processed using the Eviwes program.

Key words: correlation analysis, GDP, inflation rate, comparative analyses.
J.E.L. Classification: P51; E31; E60.

1. Introduction

The Gross Domestic Product is the most important instrument for measuring the results of a national economy. Its determination is only one of the important aspects that national economies are facing, other important issues being those related to the international comparability of data by expressing in convertible currencies, the determination of annual growth rates of GDP per inhabitant. In Romania, there are several methods of calculation of the Gross Domestic Product: production method, expense flow method, revenue method, value added method.

When public authorities are promoting expansionary fiscal policies to support the economy and money are borrowed, to finance resulting budget deficits, from central banks (generally forbidden by law) or commercial banks and other credit institutions, the broad money supply could grow, thus leading to a possible increase in inflation rate (Bilan & Roman, 2014). Some authors (Anghelache, Sacală, 2016) analyze the interconnection between Romania's Gross Domestic Product and Gross income. Anghelache and Anghel (2015) analyze the Gross Domestic Product through statistical-econometric methods. Anghelache, Anghel and Sacală (2013) describe the evolution of the principal macroeconomic indicator. Hubbard and Sharma (2016) project gross domestic product (GDP) for 140 world economies from 2020 to 2050 based on United Nation's demographic projections, the International Monetary Fund's GDP statistics.GDP may be influence by another factors such as: investments, legislation, purchasing power of population, infrastructure (Cioca, 2015).

Inflation affects each of us. At the moment of occurrence, an imbalance is created as prices rise and the purchasing power of the national currency decreases. Inflation can be quantified through several indicators. Inflation cannot be explained by a reason-effect argument. It is a process, namely a chain of phenomena that influence each other. The phenomenon that plays the role of triggering inflation can vary both over time and in space, causing prices to rise. The most important are: - consumer goods price index (CPI); - Producer Price Index (IPP); - the general price index (PGI); - GDP deflator.

Consumer price indices (CPIs) are among the key macroeconomic indicators, having a very important role in the implementation of monetary policy and economic analysis. The Consumer Price Index (CPI) is used to substantiate monetary policies at national level (hence the inflation targeting by the NBR), social policies (minimum wage, pensions, social assistance, etc.) and

economic, budgetary and fiscal policies. In this context, each country has developed national methodologies to ensure a clear reflection of price developments from one period to the next one. These methodologies referred to the subject of an internationally focused action aimed at reconciling and harmonizing the methods and techniques used so to guarantee the quality of the entire process of producing consumer price indices. In view of the need for comparability regarding the evolution of consumer price data at European level under the aegis of Eurostat, steps have been taken to create common methodological bases common to all EU Member States, thus harmonizing consumer price indices. The Harmonized Index of Consumer Prices (HICP) serves to internationally compare the inflation rate between the Member States of the European Union and to establish monetary policy at EU level.

Another paper sheds new light on the role of inflation regimes in explaining the extent of exchange rate pass-through (ERPT) into import prices (Nidhaleddine Ben Cheikh, Waël Louhichi, 2016). One of this paper investigates long-run effects of inflation and deflation in a monetary life-cycle model that incorporates both capital stock and elastic labor supply as production factors (Takemasa Oda, 2016).

2. Research methodology

The research methodology we employed for this article consisted of analyzing and systemizing the specialized literature in this field. The data regarding the real GDP and inflation rate are obtained from the Eurostat, The National Institute of Statistics and the National Bank of Romania. The paper concludes with analysis of the correlation between GDP as dependent variables and inflation rate as independent variable. We want to study the relation between the two indicators that represents the most important macroeconomic indicators. We will calculate the correlation between GDP and inflation rate for all analyzed year (2007-2014) and we will also analyze the intensity of the relation between these indicators.

3. Evolution of GDP and inflation rate in Romania, Hungary and Bulgaria over 2007-2014

GDP being the most widely used unit of measure for the overall size of an economy is adjusted according to Euro currency to take account of differences in price levels compared to other EU Member States.

In order to be able to analyse the correlation between the two GDP macroeconomic indicators and the HICP inflation rate, it is necessary to identify a series of particularities that reflect the evolution of each magnitude considered in the timeframe under econometric analysis. In the first step, using Eviwes, we studied the individual evolution of the two indicators.

Thus, the study of the evolution of the Gross Domestic Product in the three countries of Romania, namely Hungary and Bulgaria during the period 2007-2014 allowed the obtaining of the following information and graphic representations.

Figure no.1. PIB evolution in Romania, Hungary and Bulgaria
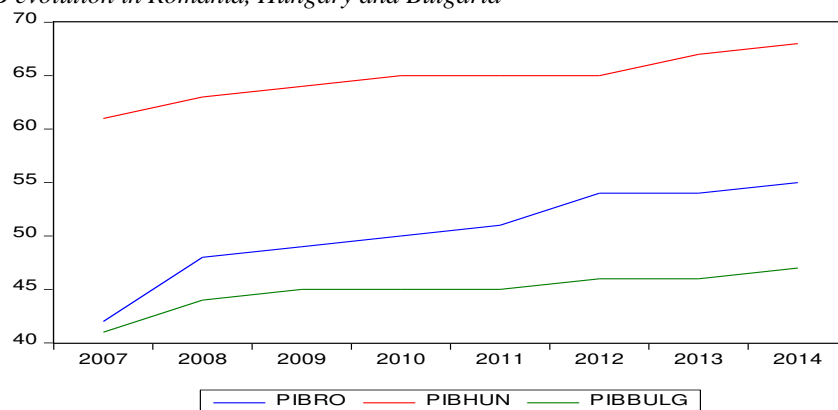
As can be seen in Figure 1, our country's gross domestic product is at a higher level than that of Bulgaria and much lower than Hungary, but Romania is on a steady growth while other countries in 2010- 2012 have remained at the same level.

Below, we performed a more concrete illustration for each country in the case of the inflation rate, which shows that the inflation rate in Romania is the highest due to high prices, very low salaries and other economic factors that negatively influence Romania's economy.

Figure no.2. Inflation rate in Romania, Hungary and Bulgaria

INFLATIARO

INFLATIAUNG

INFLATIABULG
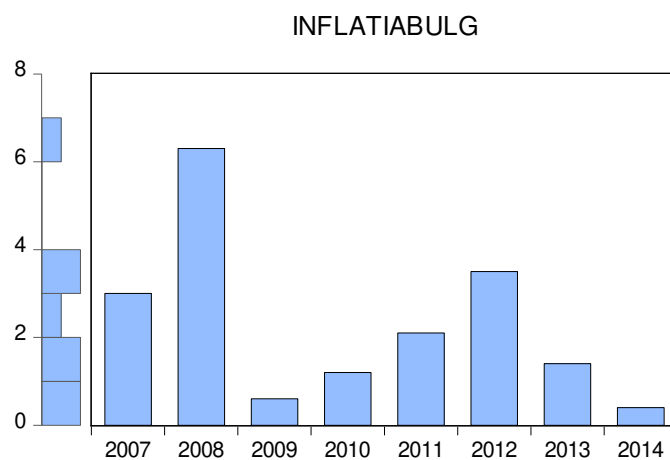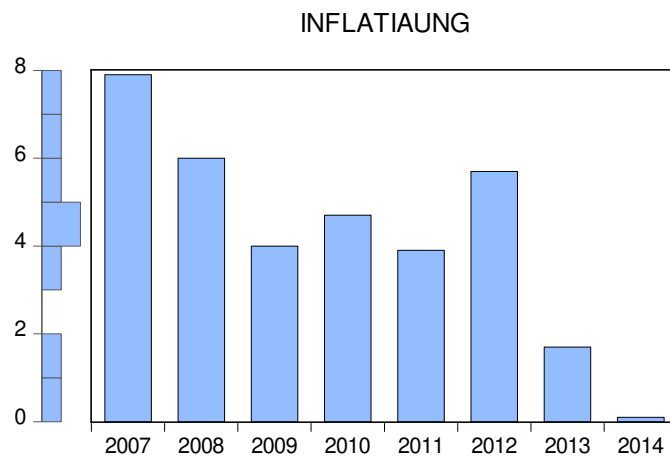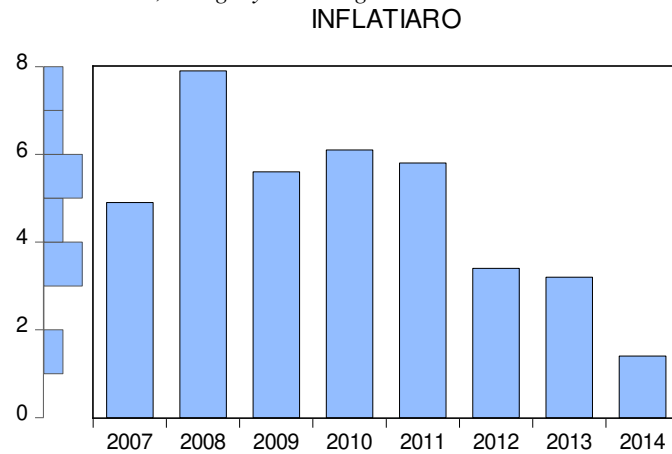
Hungary has the most favourable inflation. Bulgaria, even if it has a lower population than that of Romania, the inflation rate is much lower than our country, due to the fact that the standard of living is more developed and more acceptable. Compared to our neighbours, our country has the highest level of inflation due to high market prices.

We see from the graph that the inflation rate in 2014 is the lowest (below 1%) for both Bulgaria and Hungary, due to the fact that there were decreases in consumer prices.

4. Testing the correlation between GDP and inflation rate

For our country, factorial analysis took place in 99 cases out of 100, we are talking about a probability of about 99% (100-0,122376). The average of variables is 50.375, Schwarz criterion has a value of 5.682778, Sum squared resid is 81.81673. Based on the results in the table, it results that the indicators analysed in the econometric model are representative for the data and show us a clear and accurate picture of the evolutions over time.

Table no. 1 Statistical variables - Romania

Dependent Variable: PIBROM
Method: Least Squares
Date: 06/28/16   Time: 18:18
Sample: 2007 2015
Included observations: 9

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLATIAROM	-1.318243	0.463002	-2.847166	0.0248
C	56.74419	2.251107	25.20724	0.0000

R-squared	0.536619	Mean dependent var	51.22222
Adjusted R-squared	0.470421	S.D. dependent var	4.711098
S.E. of regression	3.428367	Akaike info criterion	5.495175
Sum squared resid	82.27591	Schwarz criterion	5.539003
Log likelihood	-22.72829	Hannan-Quinn criter.	5.400595
F-statistic	8.106353	Durbin-Watson stat	1.318208
Prob(F-statistic)	0.024789		

Table no.2 Statistical variables – Hungary

Dependent Variable: PIBUNG
Method: Least Squares
Sample: 2007 2014
Included observations: 8

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLATIAUNG	-0.867709	0.103423	-8.389867	0.0002
C	68.36184	0.490049	139.5000	0.0000

R-squared	0.921456	Mean dependent var	64.75000
Adjusted R-squared	0.908365	S.D. dependent var	2.187628
S.E. of regression	0.662223	Akaike info criterion	2.225890
Sum squared resid	2.631239	Schwarz criterion	2.245751
Log likelihood	-6.903561	Hannan-Quinn criter.	2.091940
F-statistic	70.38988	Durbin-Watson stat	2.104426
Prob(F-statistic)	0.000156		

For Hungary, the correlation between GDP and the inflation rate is more intensively analysed with a probability of almost 100% (Prob F-statistic 0.000156). The average is much higher than in our country (64.75, in Romania is 50.375), because it is a much more economically developed country with a much higher population and moderate inflation. From the model, a fall in inflation (-0.867709) can be illustrated in the future and a very good appearance and population growth (68.36184). These values are projected for 2015.

Table no. 3 Statistical variables - Bulgaria

Dependent Variable: PIBBULG
Method: Least Squares
Sample: 2007 2014
Included observations: 8

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INFLATIABULG	-0.388372	0.344659	-1.126829	0.3029
C	45.77311	1.014187	45.13283	0.0000

R-squared	0.174661	Mean dependent var	44.87500
Adjusted R-squared	0.037105	S.D. dependent var	1.807722
S.E. of regression	1.773867	Akaike info criterion	4.196518
Sum squared resid	18.87962	Schwarz criterion	4.216379
Log likelihood	-14.78607	Hannan-Quinn criter.	4.062568
F-statistic	1.269744	Durbin-Watson stat	1.239659
Prob(F-statistic)	0.302853		

For Bulgaria, the probability of estimation is less than 97% of the cases (Prob F-statistic 0,302853). And the average of variables (44.87500) is lower than in Romania and Hungary. A positive aspect is the rate of inflation much lower than that of Romania, this being due to a good correlation in the economy. The same values as for Romania are the levels of Durbin-Watson 1.239659 test level (and for Romania the registered value is 1,245,778).

This study shows that our country is at a lower level than that of Hungary and higher than Bulgaria.

5. Conclusions

According to the calculations made in all three countries, the inflation rate influences gross domestic product, but not in a sizable proportion, which allows us to assert that it is necessary to analyse the other factors of influence of gross domestic product. The inflation rate remains, however, an important macroeconomic indicator, whose dynamics is important because its effects have an influence both at macroeconomic level, but especially at the microeconomic level. The regression model presented in the article can be improved by using a larger number of factors which influencing gross domestic product.

6. References

- Bilan I., Roman A., 2014, *Interconnections between public indebtedness and inflation in contemporary economies*, Economics & Sociology, Vol. 7, No. 4, pp. 59-70.
- Cioca I. C., 2015, *Analysis of Correlation between Gross Domestic Product and Value Added Tax in the European Union Countries*, Ovidius University Annals Economic Sciences Series, vol. XV, issue 1, p.702-706.
- Anghelache C., Sacală C., 2016, *The analysis of correlation between the GDP and the Gross Income*, Romanian Statistical Review - Supplement nr. 9 / 2016.
- Anghelache, C., Anghel, M.G., 2015, *GDP Analysis Methods through the Use of Statistical – Econometric Models*, „ECONOMICA" Scientific and didactic journal, nr. 1 (91), Chişinău, Republica Moldova, pp. 124-130

- Anghelache, C., Anghel, M.G., Sacală, C., 2013, *The Gross Domestic Product Evolution by the End of June 2013*, Romanian Statistical Review, Supplement no. 4/2013, pp. 7-11
- Hubbard P., Sharma D., 2016, *Understanding and applying long-term GDP projections*, EABER working paper series Paper No. 119
- Ben Cheikh N., Louhichi W., 2016, *Revisiting the role of inflation environment in exchange rate pass-through: A panel threshold approach*, Economic Modelling, Volume 52, Part A, January 2016, Pages 233–238
- Takemasa O., 2016, *Optimal Inflation Rate in a Life-Cycle Economy*, IMES Discussion Paper Series 2016-E-5 April 2016