## ANALYSIS OF THE EVOLUTION OF GROSS DOMESTIC PRODUCT IN REAL TERMS

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#### Abstract

In this paper, the authors have assumed to analyze the evolution of the Gross Domestic Product in real terms, during the period 2000-2016. The accent is placed on a more detailed study for the lase three years (2014-2016), to forecast the evolution for the following period. The authors have used structural analysis, by resources and uses, of the Gross Domestic Product, to emphasize, based on value indices, the contribution of each branch (resource) or use. There are used absolute and relative data, and a chronological study is made, based on corresponding indices. Conclusions were expressed, on the basis of datasets, gross or seasonally adjusted series. Of course, data for the year 2016 are presented as provisional series, they are to be corrected in the subsequent periods, according to the methodology used in the calculation and value expression of this synthetic indicator of results of Romania. Within the study, there were used data provided by the National Institute of Statistics, and also, some aspects included in analyses made by other specialized institutions.

**Key words:** Gross Domestic Product, production method, expenses method, estimation, deflating, data source

JEL Classification: E60, E69

#### Introduction. Literature review

The gross domestic product at market prices (QGDP) expresses the final result of the production activity of resident producer units, over a period, quarter, or a year. In the official statistics of Romania the gross domestic product at market prices is estimated by using several approaches, namely the production approach, expenditure approach and income approach.

The data sources used to calculate (estimate) the Gross Domestic Product are the following:

- statistical sources of infra-annual reports on industrial production, construction, services and trade; production account of agriculture calculated based on data from the Ministry of Agriculture; infraannual reports on earnings and number of employees;
- financial-accounting sources (i.e. balance sheets of financial institutions);
- administrative sources consisting in the execution of the state budget, local budgets, state social insurance budget and external balance of payments.

Newbold, Karlson, Thorne (2010), Anghelache (2008), Anghelache, Mitrut and Voineagu (2013), Anghelache and Anghel (2016) describe, in detail, the instruments of micro- and macroeconomic statistics. Anghelache, Anghel and Manole (2015), Anghelache and Anghel (2014) are preoccupied with the role of modeling in economic analyses. Anghelache and Anghel (2015) present the utility of statistic-econometric models in the analysis of the Gross Domestic Product. Anghelache, Anghel and Popovici (2016), Anghelache, Anghel and Sacală (2014), Anghelache et.al. (2013) have realized an analysis of the GDP evolution. Balan, Ozekicioglu and Kilic (2016) evaluate, on the example of some OECD member states, the impact of entrepreneurship and education on the GDP. De Michelis and Monfort (2008) develop on the connection between GDP, regional convergence and the policy dedicated to the European cohesion. Dornbusch, Fischer and Startz (2007) is a reference work in macroeconomics. Dumitrescu, Anghel, Anghelache (2015) have realized a structural analysis of the Gross Domestic Product of Romania. Eeckhoudt, Gollier and Schlesinger (2005) are preoccupied with the risk characteristic associated to the decisionmaking process. Garín, Lester and Sims (2016) evaluate a series of aspects regarding the targeting for the nominal GDP indicator. Hubbard and Sharma (2016) develop on the long-term GDP forecasting. Sokolovska and Sokolovskyi (2015) present a macroeconomic study for the OECD countries.

#### 1. Some methodological aspects concerning the calculation of quarterly Gross Domestic Product

In studying the evolution of the GDP the starting point used was the calculated value of this indicator. According to the National System of Accounts and EUROSTAT there are three methods of calculating the indicators of results at the macroeconomic level. In the study that we undertook we used two approaches of calculating the GDP, calculation by production approach and expenditure approach. The gross domestic product at market prices (QGDP) expresses the final result of the production activity of resident producer units, over a period, quarter, or a year. In the official statistics of Romania the gross domestic product at market prices is estimated by using several approaches, namely the production approach, expenditure approach and income approach.

Calculated using the production approach, the relationship used is QGDP = GVA+TP-SP

where:

GVA = gross value added at basic prices;

TP = taxes on products;

SP = subsidies on products.

By using the expenditure approach, the relationship used is QGDP = FC+GCF+E-I,

where:

FC = actual final consumption;

GCF = gross capital formation;

E = exports of goods and services;

I = import of goods and services.

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- statistical sources of infra-annual reports on industrial production, construction, services and trade; production account of agriculture calculated based on data from the Ministry of Agriculture; infraannual reports on earnings and number of employees;
- financial-accounting sources (i.e. balance sheets of financial institutions);
- administrative sources consisting in the execution of the state budget, local budgets, state social insurance budget and external balance of payments.

Expression output in current prices is done differently. Thus, for nonfinancial corporations (enterprises), households and non-profit institutions serving households, the estimation is done, by industry, by extrapolation in volume and price, or value of production in the corresponding period of the previous year, using indices as volume, price and value available from statistical sources.

In the case of financial corporations and public administration gross domestic product is determined directly on the sources of data (balance sheets and budgetary executions).

Intermediate consumption is determined for non-financial corporations (enterprises), households and non-profit institutions serving households, by

industry, by applying the share of intermediate consumption in production calculated for the corresponding period of the previous year, and for financial corporations and public administration is determined directly on the sources of data (balance sheets and budgetary executions).

Another important element used in estimation of the GDP by production method is the gross value added that is estimated as the balance between production and intermediate consumption.

Taxes and subsidies on products are determined based on data from budgetary executions.

The GDP is estimated in the current prices, prices corresponding to the period of the previous year and the average prices of the year 2000.

In actuality the GDP is calculated by using rough estimates and seasonally adjusted estimations when using the regressive method (recommended by European regulations).

By using seasonal adjustment it was intended to remove seasonal effects from the data series to point out real economic evolution from successive periods.

Quarterly and annual national accounts in Romania are affected by seasonality. Also, the accounts are adjusted and based on the number of working days.

Seasonally adjusted series are obtained by eliminating the seasonal effect of the gross series, by means of correction coefficients, set up according to the regression model used (additive or multiplicative).

Obtaining the seasonally adjusted GDP is accomplished through the direct method. This method leads to a statistical discrepancy between GDP and the sum of its seasonal independent adjusted parts.

Seasonally adjusted series for the last five years and the quarters available in the reference year are recalculated on a quarterly basis as data becomes available. In this context, in the last series of data available observations, it is corrected with the modifications resulted from the adopted models and the regression parameters.

Beginning with the first quarter of 2012, policy assessment and dissemination of GDP was modified by introducing a third estimates, known as "provisional data (2)", which is published at about T+95 days after the end of the reference period. The objectives of this review is limited to the integration of statistical, financial and administrative information that become available or have been corrected after publication of the first provisional estimate at about T+70 days after the end of the reference period. It also ensures consistency between aggregates underlying the estimate of Gross Domestic Product and accounts aggregates of institutional sectors, particularly the sector "General government"

with dissemination term of T+90 days of the end of the reference period.

Additional information used in estimating GDP by the "provisional data (2)" are usually statistical data corrected for the last month of the quarter, on: indices of industrial production; indices of industrial production prices; indices of construction works; indices in construction costs; volume indices of turnover in retail trade except motor vehicles and motorcycles; volume indices of turnover in wholesale and retail trade and repair of motor vehicles and motorcycles; value indices of turnover in wholesale; turnover volume indices of market services rendered to the population; indices of turnover for market services business services. Also additional statistical data is used regarding passenger and freight transport, detailed data on executions administrative budget and revised data on the balance of payments.

#### 2. Analysis of Gross Domestic Product evolution in real terms

Gross domestic product, the most important results indicator in analyzing economic trends, showed a positive trend in 2016. From a quarter (semester) to another it recorded increases in both the previous period (quarter or semester) as well as against the corresponding period of the previous year.

Thus, compared to the same quarter of 2015, GDP grew by 4.3% on the gross series and by 4.8%, both as gross or seasonally adjusted series. In 2016, the Gross Domestic Product increased by 4.8% compared to 2015 as gross series and seasonally adjusted series.

Seasonally adjusted series of quarterly GDP was recalculated as a result of revised estimates for the fourth quarter of 2016 no significant differences were noted at the end of 2016.

The quarterly evolution of the GDP during 2014 - 2016, calculated as gross series and seasonally adjusted series is presented in the following table:

						Table I		
		Trim. I	Trim. II	Trim. III	Trim. IV	Year		
- in % as against the corresponding period of the previous year -								
Gross series	2014	104.3	101.9	103.4	102.9	103.1		
	2015	104.4	103.5	103.8	104.0	103.9		
	2016	104.3	106.0	104.3	104.7	104.8		
Seasonally adjusted series	2014	103.9	102.7	103.4	102.8	-		
	2015	104.0	103.7	104.0	104.2	-		
	2016	104.1	105.8	104.4	104.8	-		
- in % as against the previous quarter -								
Seasonally adjusted series	2014	100.2	100.3	101.6	100.7	-		
	2015	101.4	100.0	101.8	100.9	-		
	2016	101.3	101.5	100.5	101.3	-		

**Evolution of the quarterly Gross Domestic Product during 2014-2016** *Table 1* 

Data source: National Institute of Statistics: Press release number 53/07.03.2017

The data presented in the table above shows that in the years 2014-2016 the GDP increased both compared to the corresponding period of the previous year and the previous quarter. Seasonally adjusted series, expresses a lower trend GDP growth from quarter to quarter. Thus, in the second quarter of 2015 a decrease of 0.1% is observed compared to the first quarter of the same year. Data recorded in the third quarter of 2016 show a similar trend.

**Gross Domestic Product - seasonally adjusted data -** estimated for 2016 was 759,227.6 million lei in current prices, increasing - in real terms - with 1.5% compared to the third quarter of 2016 and with 4.8% compared to the fourth quarter in 2015.

Seasonally adjusted estimates of Gross Domestic Product following provisional calculations (1) and (2), and the differences between the two determined values are shown in the following table:

					10010 2
		Trim. I	Trim. II	Trim. III	1.I-30.IX
Million lei current prices	Provisional (1)	184756.9	189804.3	188895.2	563456.4
	Provisional (2)	184761.4	189810.2	189008.6	563580.2
	Differences	4.5	5.9	113.4	123.8
In % as against the previous quarter	Provisional (1)	101.5	101.5	100.6	-
	Provisional (2)	101.5	101.5	100.6	-
	Differences	0.0	0.0	0.0	-
In % as against the corresponding period of the previous year	Provisional (1)	104.1	105.8	104.6	104.8
	Provisional (2)	104.1	105.8	104.5	104.8
	Differences	0.0	0.0	-0.1	0.0

Quarterly Gross Domestic Product – seasonally adjusted series Table 2

Data source: National Institute of Statistics: Press release number 19/13.01.2017

Comparative analysis of data from the above table shows a steady trend. Recalculated data express zero differences in both versions - compared to the previous quarter or against the corresponding period of the previous year.

Gross domestic product estimated for the period 1.I-30.IX 2016 was 563580.2 million lei in current prices, increasing - in real terms – with 4.8% compared to the same period of previous year. Below is the graphical representation of the evolution of GDP, total value and the sector value show the real recorded trend.



Data source: National Institute of Statistics: Press release number 19/13.01.2017

Analysis of trend data on GDP estimate for the third quarter of 2016, when it was 207488.9 million lei in current prices, expresses a growth – in real terms – with 4.3% against the corresponding period of 2015. The Gross Domestic Product estimated for the entire year increased by 4.8%, compared to 2015, reaching 759,227.6 million lei.

Gross series estimates of Gross Domestic Product provisional variants (1) and (2), and the differences between the two versions are presented in the following table:

					Table 3
		Trim. I	Trim. II	Trim. III	1.I-30.IX
Million lei current prices	Provisional (1)	146716.3	178856.6	207348.4	532921.3
	Provisional (2)	146716.3	178856.6	207488.9	533061.8
	Differences	0.0	0.0	140.5	140.5
In % as against the corresponding period of the previous year	Provisional (1)	104.3	106.0	104.4	104.9
	Provisional (2)	104.3	106.0	104.3	104.8
	Differences	0.0	0.0	-0.1	-0.1

**Quarterly Gross Domestic Product, gross series** 

Data source: National Institute of Statistics: Press release number 19/13.01.2017

We observed that the GDP estimate for period 1.I-30.IX 2016 was 533061.8 million lei in current prices, showing a growth – in real terms – with 4.8% against the corresponding period of 2015.

Following are presented data on gross domestic product at current prices, volume indices and deflator indices – gross series and seasonally adjusted series - for the third quarter and during 1.I-30.IX 2016. It is noted a consistency of the GDP evolution in all variants analyzed.

### 3. Resource and utilities contribution to the evolution of the Gross Domestic Product

In the third quarter of 2016 the dynamic of the GDP growth suffered a modification in provisional version (2) compared with the provisional version (1) of -0.1 percentage points.

The volume of the gross added value was reduced with 0.2 percentage points, significant changes were registered in the following industries: wholesale and retail trade; repair of motor vehicles and motorcycles; transport and storage; hotels and restaurants (-1.8 percentage points), from 111.0% to 109.2%; Information and communications (+0.3 percentage points), from 115.1% to 115.4%; Professional, scientific and technical activities; administrative services activities and support services activities (-0.3 percentage points), from 107.8% to 107.5%.

The volume of the net taxes on products and contribution to GDP growth rose by 1.3 and respectively 0.2 percentage points.

Data on the realization of the GDP divided by resource are presented in full in the following table:

				Table 4
	Contribution to GDP formation - %		Contribution to GD growth- %	
	Provisional	Provisional	Provisional	Provisional
	(1)	(2)	(1)	(2)
Agriculture, forestry and fishing	8.0	7.9	0.2	0.2
Industry	23.2	23.2	0.4	0.4
Constructions	6.3	6.2	0.2	0.2
Retail and en-gross trade; repairs of auto vehicles and motorcycles; transport and storage; hotels and restaurants	15.6	15.5	1.6	1.3
Information and communication	5.6	5.6	0.8	0.8
Financial and insurance intermediaries	3.1	3.1	0.0	0.0
Real estate transactions	7.4	7.4	0.0	0.1
Professional, scientific and technical activities; administrative services activities, and support service activities	7.8	7.8	0.6	0.5
Public administration and defense; social insurance in the public system; education; health and social assistance	10.8	10.5	0.3	0.3
Show-business, cultural and recreational activities; repairs of home-use products and other services	2.5	2.5	0.0	0.0
Gross Value Added – total	90.3	89.7	4.1	3.8
Net taxation on product	9.7	10.3	0.3	0.5
Gross Domestic Product	100.0	100.0	4.4	4.3

## Contribution of the categories of resources to the formation and increase of the Gross Domestic Product

Data source: National Institute of Statistics: Press release number 19/13.01.2017

GDP uses are outlined below. From the viewpoint of GDP use, significant changes in the contribution to GDP growth in the third quarter of 2016 between the two estimates, were recorded in the following industries: final consumption expenditure of general government from 0.0% to +0.3%, resulted by an increase in volume from 100.3% to 102.1%; gross formation of fixed capital from +0.8% to 0.1%, resulted by a decrees in volume from 102.8% to 100.5%; import of goods and services from +2.5% to +2.9%, resulted by an increase in volume from 106.7% to 107.7%; export of goods and service from +2.3% to +2.6%, resulted by an increase in volume from 106.3% to 106.9%.

Complete data are summarized in the following table:

				Tuble .	
	Contribut	ion to GDP	Contribution to GDP		
	formation - %		growth- %		
	Provisional (1)	Provisional (2)	Provisional (1)	Provisional (2)	
Effective total final consumption	72.5	72.4	4.0	4.4	
Effective final individual consumption of households	65.9	65.6	4.0	4.0	
Expenses for the final consumption of households	59.9	60.0	4.0	4.1	
Expenses for the final consumption of non - lucrative institutions in the service of households	0.2	0.2	0.0	0.0	
Expenses for the individual final consumption of public administrations	5.8	5.4	0.0	-0.1	
Collective final effective consumption of public administrations	6.6	6.8	0.0	0.4	
Gross formation of fixed capitals	27.9	27.0	0.8	0.1	
Variation of inventories	0.4	1.5	-0.2	0.1	
Net export of goods and services	-0.8	-0.9	-0.2	-0.3	
Export of goods and services	38.1	38.3	2.3	2.6	
Import of goods and services	38.9	39.2	2.5	2.9	
Gross Domestic Product	100.0	100.0	4.4	4.3	

# Contribution of uses categories to the formation and increase of the Gross Domestic Product

Table 5

Data source: National Institute of Statistics: Press release number 19/13.01.2017

Seasonally adjusted series are quarterly recalculated due to changes of the adopted models, number of regressors used, alteration of gross series and number of available observations.

#### Conclusions

The study realized reveals a constant trend of growth of the Gross Domestic Product, both in absolute figures and relative ones, compared to 2015, or considered on quarters, by taking into considerations the results from each corresponding period from 2015. Thus, the annual GDP was 759,227.6 million lei, representing an increase by 4.8% compared to the year 2015. Quarterly, in 2016, against the same quarters in 2015, increases were recorded, by 4.3% during the first trimester, 6.0% in the second, 4.3% in the third quarter and 4.7% in the fourth. Within the study, we have

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performed the structural analysis on resources and uses. From the resources' viewpoint, we can observe that industry contributed to the formation of the Gross Domestic Product by 23.1%, the engross and retail trade by 18.1%. A lower contribution was posed by agriculture, forestry and fisheries, 3.9% and the financial transactions, by 3.7%. Synthesizing the structure of the Gross Domestic Product by uses, we ascertain that, in 2016 too, the final effective consumption had a contribution of 75.5%, the gross formation of fixed capital 24%, and the variation of inventories contributed by 6.8%. The net export of goods and services has influenced by a percent (-1%) the achievement of the Gross Domestic Product. From the data presented in this paper, subsequent analyses can be made, but they will most likely emphasize the same aspect, that is the growth trend of the GDP for the following period.

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