Abstract

This paper describes a use case for macro economical models, the objective being the structural analysis of the Gross Domestic Product. The authors first introduce the theoretical foundation of the model, then offer a snapshot on GDP evolution. The econometric models proposed for analysis are designed with the help of EViews software and their performance and reliability are described through the optics of the statistical tests.

Key words: estimation, regression, gross domestic product, logarithm, evolution

1. Model based on linear regression function

Linear regression model involves the identification of variables for defining specification for variable and model residuals; the context in which the regression model is used. Analysis of chronological (time) using a temporal function which, in essence, is also a regression, with a variable time (t).

The purpose of using the regression model is to obtain the parameters that correspond to the set of variable dependency analysis, formulated between variables, where the series of data are recorded in the statistical units of the population for a period or a moment, and for highlighting the dependence between the variables within a specified time-frame.

In the theoretical analysis, dependency of variables is stochastic. Consideration of the residual variable within such a model is needed. Other factors that influence the score variable are grouped in the residual.
Unifactoriale nonlinear models are linearized transformations that are applied to the variables, the regression model. So, for example, a model of the form turns into a linear model by logarithmation the two terms of the above equality, resulting in linear function.

This model is recommended when the points are located, that the cloud of points around a line.

Sometimes, for estimating parameters using other techniques of estimation, which cannot be incremental transformations, linear estimation of parameters is made by numerical methods. Linear regression model is based on the series of data for the two features. They are represented by vectors x (the variable factor) and y (variable score).

This requires completion of the methods used for the estimation of the two parameters; specify the methods to be used for testing the properties of the estimators of regression model and setting the framework for the use of the regression model in making predictions.

In defining the function of linear regression are considered, most commonly, four hypotheses:

- data series are not affected by the errors.
- for each fixed value of the characteristic factoriale, residual variable is zero, i.e. on average:
  \[ E[\varepsilon_i | X = x_i] = 0 \]
  for all i,
- the lack of correlation between residues expressed that the terms do not exhibit the phenomenon of covariance, which means the variable correlation hypothesis
- residuals with the independent, which means that
  \[ \text{cov}(X, \varepsilon_j) = 0 \]
  for any j, showing an increase in the value of the variable factoriale does not automatically lead to an increase of the values of the variable.

On the basis of the four assumptions define the linear regression model through the function:

\[ y_i = b + a \cdot x_i + \varepsilon_i \]

for i = 1,...,n

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2. The evolution of Gross Domestic Product

GDP in 2010 an amount of 522561,1 million lei, in 2011 at 578551,9 million lei, i.e. 587466,2 million lei at sfâșitul 2012.

The evolution of GDP in 2012, in the first half, was slightly increased in the context of the domestic and international crisis has continued to affect growth. Afterwards the evolution was labile, without a guarantee that it will follow a steady upward course.

In the period 2001-2008, GDP evolution was made in leaps and bounds, with positive developments. As of 2009, under the effect of economic and financial crisis, has triggered economic growth decline
Factors of change in Gross Domestic Product by type of resource

In 2011, as in 2012, GDP was achieved on account of work done in the main industries of the national economy.

Also in 2011, agriculture, forestry and fisheries had a positive contribution of 11.3.

- In 2012 have remained the same trends indicating that agriculture has marked a rebound from the final components of disturbing the year with results materialized in the evolution of GDP.
- Activities in industry, construction, services and net taxes on products together, had a decisive contribution to the fall in GDP, which means a negative fact for Romanian economy failed to cope with the effects of the crisis on destroyers.

Evolution of Gross Domestic Product by type of use

From the point of view of 'uses', the GDP in 2012 and have brought the contribution: variation of stocks, net exports, gross fixed capital formation, final consumption of General Government final consumption of households.

- The GDP in terms of uses, contributed gross fixed capital formation and consumption of individual households.
- Individual consumption of households and collective consumption of General Government, together, were reduced. A sharper decline registered net exports.
- The evolution of GDP in 2012 follows up this 'process' of the recession. In the first six months of 2011 have taken over all the negative 'uncounted' in 2011 and then continued with a slight comeback continued and in 2012.
• Thus, GDP fell slightly compared to 2009; most of the branches had a negative implying contributions entering the degringoladă macroeconomic management; the structure of branches and uses has been negative.

**Evolution of GDP-seasonally adjusted series**

• Analyzing the evolution of GDP seasonally adjusted quarterly in 2010 compared to the corresponding quarter of the previous year may find that the largest decrease was recorded in the second quarter and the lowest in the fourth quarter. He continued in the same positive rhythm in 2011. In the fourth quarter of 2011 and the first quarter of 2012, there were declines of GDP again. Then, he followed the evolution of a oscillating without a solid and foreshadow continues.

• In relation to the other Member States of the European Union, Romania has had a drop in 2011, while a significant number of countries have risen (Belgium, Denmark, France, Lithuania, Austria, Poland, Slovenia, United Kingdom), while others have had declines below 0.5.

• In comparison with 2008, in 2009, 2010 and 2011, EU member countries have experienced reductions in the volume of GDP, the highest in Latvia (-17.9) and Lithuania (-13.2), followed by Romania (-6.9), Slovenia (-5.8) and Hungary (-5.3). Decrease at EU level was 2.3. In 2009 remained an accelerated decrease. In 2010, the fourth quarter of 2011 and then began a recovery, but uncertain, due to the crisis in the eurozone. In 2012 has continued the evolution of nonconvingătoar of GDP.

• The negative evolution of GDP in 2010, 2011 and 2012 compared to year 2009 significantly contributed to building who declined and trade section; repairing cars and household items; Hotels and restaurants; transport and telecommunications. Other branches have been smaller reductions in the volume of activity.

**Realization of Gross Domestic Product by forms of ownership**

In the period 2009-2012, the private sector contributed 4.5-75.7 to GDP formation. Still, low share of the private sector was vital, in particular through the gross value added in agriculture.

• In the period 2010-2012, for which we perform a complete analysis of the Fund, was found to increase the private sector's share in gross value added in construction.
• It is Important that the share of the private sector to the achievement of gross value added by branches of the national economy and, finally, the GDP has remained at a high level.
• It is evident that privatization of the Kings, or expanding privatization in already privatised branches will have the desired effect.

![Graph showing percentage values from 2001 to 2012](chart.png)

3. The regression model used in the analysis of the correlation between GDP and consumption

Simple regression aim is to highlight the relationship between a dependent variable explained (endogeneous, score) and an independent variable (explanatory note, exogenous factor predictors).

To be able to build a linear regression model we defined final consumption as the independent variable, while the gross domestic product was considered to be a dependent variable.

To determine the parameters of the linear regression model we have considered a variety of data on the evolution of the macroeconomic indicators of outcomes in the period 1998-2012.

<table>
<thead>
<tr>
<th>Year</th>
<th>GDP</th>
<th>Final Consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>373798,2</td>
<td>337468,6</td>
</tr>
<tr>
<td>1999</td>
<td>545730,2</td>
<td>484361,5</td>
</tr>
<tr>
<td>2000</td>
<td>80377,2</td>
<td>69253,3</td>
</tr>
<tr>
<td>2001</td>
<td>116768,7</td>
<td>99473,7</td>
</tr>
<tr>
<td>2002</td>
<td>152017,0</td>
<td>127118,8</td>
</tr>
<tr>
<td>2003</td>
<td>197427,6</td>
<td>168818,7</td>
</tr>
</tbody>
</table>
### GDP evolution depending on final consumption can be related as:

**Evoluția PIB în funcție de variația consumului final**

\[
y = 1,2202x - 7616,9 \\
R^2 = 0,9886
\]

### Between gross domestic product and final consumption, there is a direct and linear in shape.

- On the basis of the data submitted by using the Excel program/Data Analysis, the following results were obtained:
- The validity of the regression model is confirmed by the F-test statistic values (1036,1114-value far superior tabelat what level is considered to be a landmark in tests of validity of econometric models) and the degree of risk is zero (reflected by the value of Significance).
• Figure leads to the conclusion, after the shape of the cloud of points, that there is no correlation between the independent variable and residues, i.e., the pattern is well chosen.
• Also, the correlation between the two indicators can be analyzed using computer software Eviews.
• Starting from the same set of data, the processing in Eviews has led to the following results:

![Regression Function](image)

Regression Function becomes:
\[ \bar{Y}_X = -7616.882095 + 1.220180278 X \]

Multiple R is the coefficient of multiple correlation, in this case the simple correlation between x and y. It is noted that between the value of gross domestic product and that of final consumption registered in our
country between 1998-2012 there is a direct and very strong conclusion expressed based on the value of Multiple R (0.9942).

- Simple linear regression Model that reflects the values of the correlation between gross domestic product and those of final consumption are presented as follows:

\[ \text{GDP} = -7616.8 + 1.22 \text{ FC}. \]

- As can be seen, the final consumption is an extremely important factor for the evolution of GDP. Thus, for an increase of the monetary unit of the end-consumer will get an increase of 1.22 monetary units of GDP.

- In addition, it is noted that the value of the term free C is very high, which allows us to affirm that the factors which were not considered in the construction of the model exhibits a high enough influence on the evolution of gross domestic product of negative value free indicates that the variables that were not included in the econometric model have a negative effect on the evolution of GDP.

Bibliography

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