ECONOMETRIC MODEL FOR ANALYZING THE INFLUENCE OF FACTORS ON FINAL CONSUMPTION

Assoc. prof. Mădălina-Gabriela ANGHEL PhD (madalinagabriela_anghel@yahoo.com)
„Artifex” University of Bucharest

Lecturer Ana CARP PhD (karp_ana@yahoo.com)
„Artifex” University of Bucharest

Lecturer Marian SFETCU PhD (sfetcum@yahoo.com)
„Artifex” University of Bucharest

ec. Ștefan Gabriel DUMBRAVĂ (stefan.dumbrava@gmail.com)

Abstract

Statistic and econometric models can be used, to great effect, in macroeconomic forecasting studies. Thus, we can perform forecasts by using the regression model, either simple, multiple, linear or non-linear. In fact, we resort to a extrapolation of results for a future period, by taking into account the regression parameters. Having in mind the importance of consumption for standard of living, we will analyse the connection between final consumption as explained variable and the private consumption, public consumption and gross available income of population. The multiple linear regression analysis can be used in final consumption recorded at the level of the Romanian economy. To build a linear multiple regression model, we defined the private consumption, public consumption and gross available income as independent variables, while final consumption value was considered a dependent variable, that is the main variable of the model.

Keywords: final consumption, private consumption, public consumption, available gross income, econometric model

JEL Classification: C53, E21

Introduction

Based on the data permanently available, provided by the National Institute of Statistics, we can use the regression function to build other linear regression models, having 2, 3, 4 or more factors. Methodologically, the models can be processed and, by using the instruments of Eviews, we achieve the regression parameters that help make a concluding analysis. forecast models can be used as such:

- Forecasts based on the average increase computed on the basis of the relation:
\[ Y_{t+n+i} = y_t + (n+i-1) \bar{A}; \]

- Forecasts made by using the average calculated index, the expansion relationship being:

\[ Y_{t+n+i} = y_t \times (n+i-1) \]

- Making forecasts based on an analytical function of the following shape: \( y_t = a + bt \), where \( a \) and \( b \) denote the regression parameters, while “\( t \)” is the time factor.

**Literature review**

Anghelache and Anghel (2017) consider that macroeconomic management can only be achieved by knowing macroeconomic indicators by knowing their influence on GDP growth but, in particular, on the influence of causes. Anghelache and Anghel (2017) analyze the factorial variables, i.e., those that can determine the evolution of gross domestic product, the most complex indicator of macroeconomic results, using statistically-mathematical-econometric methods. Anghelache and Popovici (2015) believe that consumption analysis in the Gross Domestic Product may help to provide basic clarifications on the important aspects of the efficiency of economic decisions and social needs. Anghelache, Anghel et al. (2015) discuss the use of econometric regression models in macroeconomic analyzes. Anghelache, Anghel, and Popovici (2015) study the contribution of two factors, namely, private consumption and public consumption, to the calculation and hence to the evolution of gross domestic product. Anghelache and Anghel (2014) investigate the need to apply statistical, mathematical, cybernetic and computer-based methods and models in risk and financial-banking and monetary analysis, both microeconomic and macroeconomic. Bastagli and Hills (2013) use aggregate national account data to compare household consumption in different countries with higher and lower levels of public consumption. Censolo and Colombo (2008) analyze the role of the public consumption structure in a growth model of R & D in three sectors. Michelis and Monfort (2008) present a series of issues concerning Gross Domestic Product, Regional Convergence and European Cohesion Policy. Foerster and Choi (2016) believe that low average growth patterns reflect the influence of persistent factors such as a slow recovery in the labor market, restrictive financial conditions, or poor productivity growth. Gali et al (2007) present the results of the latest research in the field, according to which consumption increases in response to an increase in government spending. Guner et al (2008) study a simple growth model with an endogenous distribution of production unit sizes. Jorgenson and Slesnick (2008) estimates a model based on micro-data from consumer spending studies, supplemented with price information.
from the consumer price index. Lucas and Moll (2014) propose a model of
the economy with many agents, each with a different level of productivity.
Nalewaik (2012) believes that a greater focus on gross domestic income
may be useful for assessing the current state of the economy. Reis (2009)
follows two approaches to modeling consumption dynamics and measuring
the frequency of fluctuations of society, namely statistical and economic ones.

**Research methodology, data, results and discussions**

In this paper we analyze the correlation between final consumption
and private consumption, public consumption and the available gross incomes
of the population. To analyze the correlation between selected variables
we used data on a yearly basis, starting in 1990 until 2014, regarding the
Romanian economy. These data were drawn from the official printed and
electronic publications issued by the National Statistics Institute of Romania.
To ensure the full comparability of figures, the values of the indicators were
deflated using the consumer price index, the basis for the official calculation
of inflation rate. The base reference year was considered the first year of the
interval, which is 1990.
Evolution of final consumption, private consumption, public consumption and gross available income in Romania during the period 1990-2014

<table>
<thead>
<tr>
<th>Year</th>
<th>Final consumption</th>
<th>Private consumption</th>
<th>Public consumption</th>
<th>Gross available income</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990</td>
<td>68,0</td>
<td>55,8</td>
<td>12,2</td>
<td>58.8</td>
</tr>
<tr>
<td>1991</td>
<td>61,9</td>
<td>49,0</td>
<td>12,9</td>
<td>49.8</td>
</tr>
<tr>
<td>1992</td>
<td>55,3</td>
<td>44,7</td>
<td>10,6</td>
<td>46.3</td>
</tr>
<tr>
<td>1993</td>
<td>51,0</td>
<td>42,4</td>
<td>8,6</td>
<td>44.2</td>
</tr>
<tr>
<td>1994</td>
<td>54,4</td>
<td>44,5</td>
<td>9,9</td>
<td>47.9</td>
</tr>
<tr>
<td>1995</td>
<td>62,7</td>
<td>51,9</td>
<td>10,8</td>
<td>56.2</td>
</tr>
<tr>
<td>1996</td>
<td>69,3</td>
<td>58,0</td>
<td>11,3</td>
<td>61.3</td>
</tr>
<tr>
<td>1997</td>
<td>66,1</td>
<td>56,3</td>
<td>9,8</td>
<td>57.0</td>
</tr>
<tr>
<td>1998</td>
<td>64,1</td>
<td>59,1</td>
<td>5,0</td>
<td>49.6</td>
</tr>
<tr>
<td>1999</td>
<td>63,1</td>
<td>59,1</td>
<td>4,0</td>
<td>52.1</td>
</tr>
<tr>
<td>2000</td>
<td>62,0</td>
<td>56,8</td>
<td>5,2</td>
<td>51.1</td>
</tr>
<tr>
<td>2001</td>
<td>66,2</td>
<td>61,0</td>
<td>5,2</td>
<td>53.5</td>
</tr>
<tr>
<td>2002</td>
<td>69,0</td>
<td>63,5</td>
<td>5,6</td>
<td>55.8</td>
</tr>
<tr>
<td>2003</td>
<td>79,5</td>
<td>70,4</td>
<td>9,1</td>
<td>56.2</td>
</tr>
<tr>
<td>2004</td>
<td>88,9</td>
<td>80,6</td>
<td>8,2</td>
<td>67.5</td>
</tr>
<tr>
<td>2005</td>
<td>97,0</td>
<td>87,6</td>
<td>9,3</td>
<td>69.2</td>
</tr>
<tr>
<td>2006</td>
<td>106,9</td>
<td>97,3</td>
<td>9,6</td>
<td>75.5</td>
</tr>
<tr>
<td>2007</td>
<td>118,3</td>
<td>107,4</td>
<td>10,9</td>
<td>86.3</td>
</tr>
<tr>
<td>2008</td>
<td>134,2</td>
<td>121,7</td>
<td>12,5</td>
<td>101.8</td>
</tr>
<tr>
<td>2009</td>
<td>122,9</td>
<td>109,8</td>
<td>13,1</td>
<td>94.1</td>
</tr>
<tr>
<td>2010</td>
<td>121,2</td>
<td>110,5</td>
<td>10,7</td>
<td>92.1</td>
</tr>
<tr>
<td>2011</td>
<td>118,8</td>
<td>109,3</td>
<td>9,5</td>
<td>87.9</td>
</tr>
<tr>
<td>2012</td>
<td>121,8</td>
<td>112,0</td>
<td>9,8</td>
<td>86.0</td>
</tr>
<tr>
<td>2013</td>
<td>122,2</td>
<td>110,9</td>
<td>11,4</td>
<td>90.6</td>
</tr>
<tr>
<td>2014</td>
<td>128,3</td>
<td>115,0</td>
<td>13,2</td>
<td>89.4</td>
</tr>
</tbody>
</table>

* Romanian currency, at the level of 1 $ = 4,00 RON on August 5th, 2015

To analyze the correlation between the four macroeconomic indicators presented in the table above, considered relevant for the purpose of this research, it is necessary in a first step to identify the characteristics of evolution for each separate measure within the timeframe analyzed. In this respect, using the software Eviews 7.2, we have studied in a first stage, the evolutions of four indicators:
As can be observed from the dataset and above figure, during the timeframe studied, the evolutions of the three indicators present similar trends. There is a steady growth from year to year, with small fluctuations of increases and decreases from 1990 until 2008, when it is found that, amid the economic – financial crisis that affected the global economy, especially since the second half of 2008, the values of the four indicators for 2009 showed a decrease compared to the immediately preceding interval. From 2011 and until 2014, the values of the four indicators recorded a minor increase.

Based on this information, we have analyzed the existence of a possible correlation between the value of final consumption (the resultant variable), on the one hand and private consumption, public consumption and the gross available income.

The econometric description of such correlation between the four variables can be realized by using a multifactor model to explain the variation in final consumption based on the simultaneous influence of the two indicators mentioned above.

To estimate the multiple regression model, we used the instruments of Eviews 7.2, where we defined the proper variables: the resultant variable is the final consumption (CF), while private consumption (CP), public consumption (CPL) and gross disposable income are the factorial variables. Using the least squares method for parameter estimation, we also envisioned
the introduction of the free term (c), as it is a good econometric scientific principle in considering other factors, not included specifically in the model we propose in this paper.

The model is the following:
\[ y = a_0 + a_1 x_1 + a_2 x_2 + a_3 x_3 + \varepsilon, \]
where:
- \( y \) shows the final consumption
- \( x_1 \) shows private consumption;
- \( x_2 \) shows public consumption;
- \( x_3 \) shows gross available income;
- \( \varepsilon \) shows residual variable;
- \( a_0 \) parameter free term;
- \( a_1, a_2 \) and \( a_3 \) are the regression parameters.

The estimation instrument of the software provided us the following results:

**The results of the regression model parameter estimates**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>0.029351</td>
<td>0.047647</td>
<td>0.616005</td>
<td>0.5445</td>
</tr>
<tr>
<td>CP</td>
<td>1.003351</td>
<td>0.001933</td>
<td>519.1954</td>
<td>0.0000</td>
</tr>
<tr>
<td>CPL</td>
<td>1.07767</td>
<td>0.005005</td>
<td>201.3351</td>
<td>0.0000</td>
</tr>
<tr>
<td>VDBGP</td>
<td>-0.005338</td>
<td>0.003113</td>
<td>-1.714548</td>
<td>0.1012</td>
</tr>
</tbody>
</table>

\[ CF = 0.029351 + 1.003351 \cdot CP + 1.07767 \cdot CPL - 0.005338 \cdot VDBGP \]

The results from Eviews processing allow us to describe the econometric model through the following equation:

\[ CF = 0.029351 + 1.003351 \cdot CP + 1.007767 \cdot CPL - 0.005338 \cdot VDBGP \]

\( a_0 \) coefficient is 0.029351. C is the constant term and describes the average level of the dependent variable all the factor variables are zero.
Therefore, the final consumption will increase by 0.029351 million RON if the private consumption, public consumption and gross available income are zero. Since statistical t-test probability attached is far superior to 5% significance mark, it means that this quotient is insignificant;

\( a_1 \) coefficient is 1.003351, which means that the private consumption increases by one million RON, while maintaining unchanged the other explanatory variables in the model, final consumption will grow by an average of 1.003351 million RON. Working at the level of relevance 5%, probability attached to the statistical t-test, this level is lower for the final consumption variable it means that this quotient is insignificant;

\( a_2 \) coefficient is 1.007767, which means that the public consumption increases by one million RON, while maintaining unchanged the other explanatory variables in the model, final consumption will grow by an average of 1.007767 million RON. This is a significant quotient because the probability attached to the statistical t-test is lower than level of relevance 5%.

\( a_3 \) coefficient is -0.005338, which means that the gross available income of the population increases by one million RON, while maintaining unchanged the other explanatory variables in the model, final consumption will decrease by an average of 0.005338 million RON. This is an insignificant quotient because the probability attached to the statistical t-test is higher level of relevance 5%.

We have further evaluated the accuracy of the econometric model drawn. From figure 2, we observe that the values of tests that \( R^2 \) and adjusted \( R^2 \) are close to unit, which allows us to say that the model is correctly estimated. Further, the model can be used for economic forecasts, for these indicators, at least at the level of the Romanian economy, for which the starting dataset is drawn.

The determination report is 99.99%, leading to the idea that the variation of the dependent variable is explained by the simultaneous variation the three factors, as a strong link which exists between endogenous variable and three exogenous variables.

**Conclusion**

The model allows us to conclude that there is a direct relationship between final consumption, private consumption, public consumption and gross available income in Romania, for the analyzed timeframe.

In prognosis studies, there are successfully used the models based on chronological studies. That is, based on the analysis data drawn from the application of simple and multiple regression models, to establish the values of possible future evolutions outside the analysis horizon at the moment “t”.
Also, depending on the analysis needs, the regression function can be used to build simple linear correlation models, that is the interpretation depending on the considered coefficient. Furthermore, for more complex analyses, we have the non-linear regression models, which, in their use, lead to linearity.

References
