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THE IMPACT OF THE MAIN MACROECONOMIC INDICATORS ON THE FINAL CONSUMPTION OF THE POPULATION

Case studies

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Abstract

In the last few years, and especially after the beginning of the economic and financial crisis in Romania, significant changes occurred in the macroeconomic indicators conditioning the final consumption of the population. Consequently, in this article, we aimed at analysing the evolution of the main macroeconomic indicators (the Gross Domestic Product-GDP, the inflation rate, the unemployment rate) influencing the final consumption of the population, as well as the correlation among these variables. For the analysis of these correlations I proposed using the linear regression model. The analysis of the trend and of the causal links among the studied variables uses annual series from the 2000 – 2012 period. For the statistical processing and the econometric modelling we used software Excel and Eviews software packages.

1. INTRODUCTION

The final consumption of the population represents the value of the goods and services used for the direct satisfaction of the human individual or collective – family needs. (P rean et al., 2010)

The importance of the statistical analysis of the consumption of the population emerges primarily from the fact that it underlies the substantiation of the economic and social policies concerning the economic development and the increase in the living standard of the population, and secondly it is the informational support both for the business entities and for the population. (B bucea and Balacescu, 2011)

The analysis of the evolution of the national economy of a country is performed by means of a *synthetic statistical indicator system*, calculated at macroeconomic level that includes the indicators of the population's living standard.

In the present paper we chose a limited set of macroeconomic indicators, composed of: the Gross Domestic Product, the unemployment rate, the inflation rate, which indicators influence the final consumption of the population.

I grouped microeconomic indicators studied in the paper according to the impact of the positive evolution on the national economy, in two categories. The first category includes the positive indicators Gross Domestic Product and final consumption whose annual growth leads to the development of the national economy. The second category includes the negative indicators unemployment rate and inflation rate whose positive evolution has a negative influence on the national economy.

The annual evolution of the four macroeconomic indicators is studied by means of chronograms and chronological indicators: the average rate of change, the average level and the dynamics.

The analysis of the correlation among the main macroeconomic indicators that influence the consumption of the population is performed by means of econometric monofactorial and multifactorial linear regression models: $y = a+b*x_1+c*x_2+d*x_3$
where: y is the final consumption of the population and represents the dependent variable of the econometric model, x_1 is GDP, x_2 is the inflation rate, x_3 is the unemployment rate and represent the independent variables of the model.

A fundamental condition that must be met before making the assessment of a simple regression equation is to verify the stationary nature of the time series. (erb nescu and Necsulescu, 2013) The verification of the stationary nature of the series is made by means of the Augmented Dickey-Fuller test. The time series are stationary if $t\_Statistic$ $t\_Critical$ and the probability p is lower than the significance threshold $\alpha = 0.05$ (erb nescu and Necsulescu, 2013)

An econometric regression model is valid if the following assumptions are met simultaneously: the parameters are significant and the model is adequate for the data (S voiu and Necsulescu, 2009).

2. THE STATISTICAL ANALYSIS OF THE MACROECONOMIC INDICATORS THAT INFLUENCE THE FINAL CONSUMPTION OF THE POPULATION

For the statistical processing and the econometric modelling I used the annual data concerning the GDP, the final consumption of the population, the inflation rate and the unemployment rate for a period of 13 years (2000 - 2012).

The analysis of the descriptive statistics of the variables concerning the Gross Domestic Product, the final consumption of the population, the inflation rate and the unemployment rate, shown in table no. 1, led to the conclusion that all the value series are normally distributed (the critical value of the Jarque-

Bera test$< {}^2 = 5.99$ and the probability is $> = 0.05$), within the normal asymmetry and vaulting limits, non-homogenous (the homogeneity coefficient has values higher than 50%).

The evolution and the forecast of the four indicators in the 2000-2012 period are studied below (see figure no. 1).

In the studied period, 2000-2012, the GDP and the final consumption of the population had an increasing trend, e.g., the GDP annually increased on average by 17.96% (from 80984.6 RON to 587499.4 RON) and the final consumption of the population by 17.03% (from 63459 RON to 420300.7 RON). Until 2008, before the onset of the economic crisis, the annual increase by 26%, of the Gross Domestic Product is significantly higher (according to the statistical test t the probability is $0.0001423 <$ the significant threshold 0.05) compared to the annual increase by 5.44% of the GDP in the 2009-2012 period (which period coincides with the onset of the economic and financial crisis in our country). The annual average increase by 25.12% of the final consumption of the population, before the onset of the economic crisis in Romania, is significantly higher (according to the statistical test t the probability is $0.000248 <$ the significant. threshold 0.05) compared to the annual increase by 5.26% in the 2009-2012 period.

In 2009 compared to 2008 decreases are noticed both in the Gross Internal Product and in the final consumption of the population (by 2.63% - from 514700 mil. RON to 501139.4 mil. RON and by 5.43% respectively – from 381108.1 mil. RON to 360402.1 mil. RON).

Thus, it is noted that the evolution of the two macroeconomic indicators is a very similar one, with sharp increases for the 2000-2008 period, with a decrease by approximately 3% and 5% respectively in 2009 compared to the previous year with insignificant increases for the 2009-2012 period.

As we can see from figure no. 2, in the analysed time interval, the inflation rate in our country had a constant decrease from one year to the next by an annual average of 18.25% - from 45.7% to 3.33%), except 2008. Thus, it is noted that, on the background of the economic and financial crisis that affected the whole world, the inflation rate of Romania for 2008 had an increase by approximately 62% compared to the previous year. In the 2000-2007 period, the annual increase of the inflation rate is 27.144% significantly higher than 19.3% from the 2008-2012 period (according to the statistical test t the probability is $0.02015 <$ the significant threshold 0.05 0.05).

Throughout the entire period analysed, the unemployment rate has a fluctuating evolution. The most significant unemployment rates are in 2002 (31.25% compared to the previous year), in 2004 (14.29%) in 2009 (18.97%). Significant decreases of the unemployment rate appear in 2003 by 16.67%, in 2005 by 10% and in 2007 we have a decrease by 12.33% compared to the previous year.

3. THE IMPACT OF THE MACROECONOMIC INDICATORS ON THE FINAL CONSUMPTION OF THE POPULATION

The stationary nature of the four data series: the GDP, the final consumption of the population, the inflation rate and the unemployment rate is studied by means of the ***Augmented Dickey-Fuller*** test (Codirla u,2007).

Analysing the data in table 2, we can say that all the series are stationary if we accept a 1% significance threshold for the GDP, a 5% significance threshold for the final consumption of the population, a 5% significance threshold for the inflation rate, and a 1% significance threshold for the unemployment rate.

The link between the GDP, which is assumed to be the independent variable of the model and the final consumption of the population, i.e. the dependent variable, is

described, by the regression function in the following form:

$$FCP = 12666,24 + 0,71*GDP$$

The two parameters of the econometric model are significantly different from zero (see table no. 3) because the probabilities (0.01 and 0 respectively) that parameters a and b are correctly estimated are low compared to the significance threshold ($= 0.05$). The Gross Internal Product is an import ant influence factor of the final consumption of the population ($F_c = 3995.91$ $F_{0,05;1;11} = 4.84$).

The impact of the Gross Domestic Product on the final consumption has a high intensity and describes a direct relationship between the two variables (Multiple R = 0.9986). The increase in the DGP by one mil. RON determines the annual increase of the final consumption of the population by 0.71 mil RON. The variation of the final consumption of the population is explained in a percentage of 99.7% by the variation in the GDP.

Another important factor that influences the final consumption of the population is the inflation rate. The regression function that describes the correlation between the two variables is:

$$FCP = 372888,2 – 8275,67*IR$$

Both the parameter a and the parameter b are significantly different from zero because the values calculated of the t test are higher compared to the table value ($t_{0,05;12} = 2.18$) and the probabilities are low(see table no. 4). The inflation rate is an important variable influencing the final consumption of the population because the calculated value of the F test ($F_c = 27.40$) is higher than the theoretical one ($F_{0,05;1;11} = 4.84$).

Between the inflation rate and the final consumption of the population there is a high-intensity and reverse link (Multiple R = -0.8447). The decrease in the inflation rate by one percentage determines the increase in the consumption of the population, from one year to the next, on average by 8275.67 mil RON.

Approximately 71% of the variation of the consumption of the population is justified by the variation of the inflation rate, the remaining 29% by the variation of the disturbing factors.

The final consumption of the population can also be influenced by the macroeconomic indicator unemployment rate. The regression between the two variables is described by the mathematical function: $FCP = 578418,9 – 45139,5*UR$

Analysing the results of the processing shown in table no. 5, we can see that both the parameter a and the parameter b are significantly different from zero because the values calculated of the t test (t Stat = 4.47 and 3.82 respectively are higher compared to the table value ($t_{0,05;12} = 2,18$). The calculated value of the test F (F = 9.67) is higher than the table value ($F_{0,05;1;11} = 4.84$) so we can say that the unemployment rate is a factor that influences the consumption of the population.

The impact of the unemployment rate on the final consumption of the population has an average intensity and describes a reverse link between the two variables (Multiple R = -0.5392). The increase in the unemployment rate by one percentage determines the decrease in the final consumption of the population, from one year to the next, on average by 45139.5 mil RON. Only 29% of the variation of the consumption of the population is justified by the variation of the unemployment rate and 71% by the variation of the disturbing factors.

Based on the econometric monofactorial regression models, we can build the econometric monofactorial regression model that describes the link between the consumption of the population, the GDP, the inflation rate and the unemployment rate.

$$FCP = 62842,55 + 0,66*GDP – 704,85*IR – 3493,35*U$$

Except the parameter d, the other parameters of the econometric model are significantly different from zero because,

according to table no. 6, the calculated values of the t test are higher that the theoretical value of the test ($t_{0,05;12} = 2.18$). The GDP, the inflation rate, and the unemployment rate are important factors influencing the consumption of the population (F = 2268.91 $F_{0,05;3;9}$ = 3.86).

The GDP, the inflation rate, and the unemployment rate exercise a high-intensity influence on the final consumption of the population (Multiple R = 0.99934). The variation of the consumption of the population is justified in a percentage of 99.87% by the variation of the GDP, the inflation rate, and the unemployment rate (the determination coefficient is 0.9987).

Analysing the cumulated influence of the three macroeconomic indicators on the consumption of the population we can say that:

- The annual increase by one million RON of the GDP determines the increase in the consumption of the population, from one year to the next, on average by 0.66 million RON.
- The decrease in the inflation rate by one percentage determines the increase in the consumption of the population, from one year to the next, on average by 704.85 million RON.
- The increase in the unemployment rate by one percentage determines decrease in the consumption of the population, from one year to the next, on average by 3493.35 million RON.

4. CONCLUSIONS

Following the study performed we can notice a sharp increase, in the 2000-2008 period, of the positive macroeconomic indicators, the GDP and the final consumption of the population,

and starting from 2009 his increase becomes moderate. The inflation rate, one of the negative indicators of the consumption of the population, has a downtrend from one year to the next. The unemployment rate, in the analysed period, has a fluctuating evolution.

The annual increases in the GDP have a positive effect on the consumption of the population, while the inflation rate and the unemployment rate have a negative influence on the consumption especially after the beginning of the economic and financial crisis that affected the whole world.

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Appendix A

Table no. 1.
Descriptive statistics of the macroeconomic indicators GDP, final consumption of the population (FCP), inflation rate (IR) and unemployment rate (UR)

	Positive indicators mil. RON		Negative indicators mil. RON	
	GDP	FCP	IR	UR
Mean	348441,2	258970,4	13,7654	7,0769
Median	344650,6	268441,3	7,8500	7,0000
Maximum	587499,4	420300,7	45,7000	8,4000
Minimum	80984,6	63459	3,3300	5,8000
Std. Dev.	179547	127091,8	12,9724	0,6735
Skewness	-0,10515	-0,19819	1,5139	0,1266
Kurtosis	1.520.884	1.548.651	4,0337	3,0220
Jarque-Bera	1.209.007	1.226.078	5,5444	0,0350
Probability	0,546346	0,541702	0,0625	0,9827
Sum	4529735	3366615	178,9500	92,0000
Sum Sq, Dev,	3,87E+11	1,94E+11	2.019,4050	5,4431
Observations	13	13	13	13

Source: Processing of the data taken from the statistical publication România în Cifre(Romania in Figures) and the website https://statistici.insse.ro, processing made by means of the software package Data Analysis from Excel

Table no. 2
Test results of the Augmented Dickey-Fuller

	t-Statistic	Prob
GDP		
Augmented Dickey-Fuller test statistic	-4,3438	0,0094
Test critical values:		
1% level	-4,2971	
5% level	-3,2127	
10% level	-2,7477	
final consumption of households		
Augmented Dickey-Fuller test statistic	-3,2318	0,0458
Test critical values:		
1% level	-4,2001	
5% level	-3,1754	
10% level	-2,7290	
the rate of inflation		
Augmented Dickey-Fuller test statistic	-3,9091	0,0177
Test critical values:		
1% level	-4,2971	
5% level	-3,2127	
10% level	-2,7477	
unemployment rate		
Augmented Dickey-Fuller test statistic	-5,7379	0,0011
Test critical values:		
1% level	-4,2001	
5% level	-3,1754	
10% level	-2,7290	

Source: Processing of the data taken from the statistical publication România în Cifre(Romania in Figures) and the website https://statistici.insse.ro, processing made by means of the software package EViews

Table no. 3
Assessment of the parameters of the econometric model describing the relationship between the GDP and the final consumption of the population made by means of the ordinary least squares method (OLS)

Regression Statistics	
Multiple R	0,998626
R Square	0,997255
Observations	13

ANOVA

	df	SS	MS	F	Significance F
Regression	1	1,93E+11	1,93E+11	3995,913	1,92E-15
Residual	11	5,32E+08	48373339		
Total	12	1,94E+11			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	12666,24	4347,754	2,913283	0,014106	3096,896	22235,58
GDP	0,706874	0,011182	63,21324	1,92E-15	0,682262	0,731487

Source: Processing of the data taken from the statistical publication România în Cifre(Romania in Figures) and the website https://statistici.insse.ro, processing made by means of the software package Data Analysis from Excel

Table no. 4
Assessment of the parameters of the econometric model describing the relationship between the inflation rate and the final consumption of the population made by means of the ordinary least squares method (OLS)

Regression Statistics	
Multiple R	0,844709
R Square	0,713533
Observations	13

ANOVA

	df	SS	MS	F	Significance F
Regression	1	1,38E+11	1,38E+11	27,39883	0,000279
Residual	11	5,55E+10	5,05E+09		
Total	12	1,94E+11			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	372888,2	29358,67	12,70112	6,48E-08	308270,2	437506,2
the rate of inflation	-8275,67	1581,02	-5,23439	0,000279	-11755,5	-4795,87

Source: Processing of the data taken from the statistical publication România în Cifre(Romania in Figures) and the website https://statistici.insse.ro, processing made by means of the software package Data Analysis from Excel

Table no. 5
Assessment of the parameters of the econometric model describing the relationship between the unemployment rate and the final consumption of the population made by means of the ordinary least squares method (OLS)

Regression Statistics	
Multiple R	0,539205
R Square	0,290742

Observations	13				

ANOVA

	df	SS	MS	F	Significance F
Regression	1	1,11E+10	1,11E+10	9,66761	0,043122
Residual	11	1,83E+11	1,66E+10		
Total	12	1,94E+11			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	578418,9	392597,1	4,47331	0,016869	285682	944251
unemployment rate	-45139,5	55245,23	-3,81707	0,043122	-166733	76454,48

Source: Processing of the data taken from the statistical publication România în Cifre and the website https://statistici.insse.ro, processing made by means of the software package Data Analysis from Excel

Table no. 6
Assessment of the parameters of the econometric model describing the relationship between the GDP, the inflation rate, the unemployment rate and the final consumption of the population made by means of the ordinary least squares method (OLS)

Regression Statistics	
Multiple R	0,99934
R Square	0,99868
Observations	13

ANOVA

	df	SS	MS	F	Significance F
Regression	3	1,94E+11	6,45E+10	2268,912	2,86E-13
Residual	9	2,56E+08	28438276		
Total	12	1,94E+11			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%
Intercept	62842,55	23024,76	2,729347	0,023249	10756,93	114928,2
GDP	0,661669	0,016875	39,20918	2,27E-11	0,623494	0,699843
the rate of inflation	-704,852	226,9417	-3,10587	0,012603	-1218,23	-191,474
unemployment rate	-3493,35	2530,55	-1,38047	0,200758	-9217,86	2231,149

Source: Processing of the data taken from the statistical publication România în Cifre and the website https://statistici.insse.ro, processing made by means of the software package Data Analysis from Excel
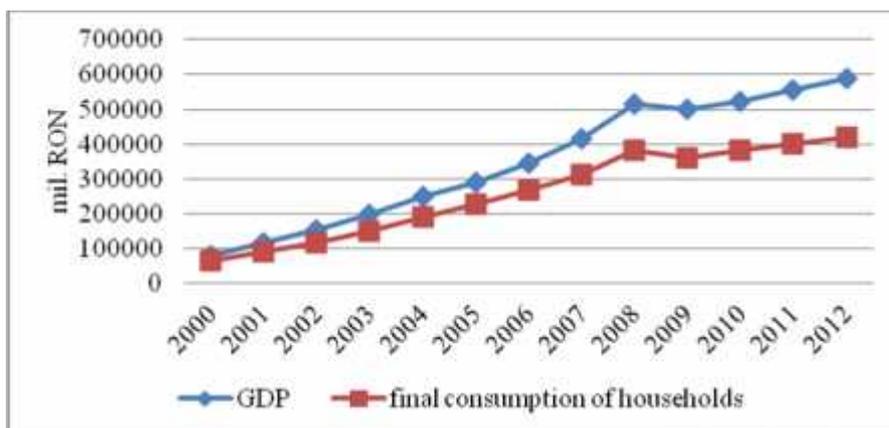
Appendix B

Figure no. 1. Evolution of the positive indicators GDP and final consumption of the population in the 2000-2012 period

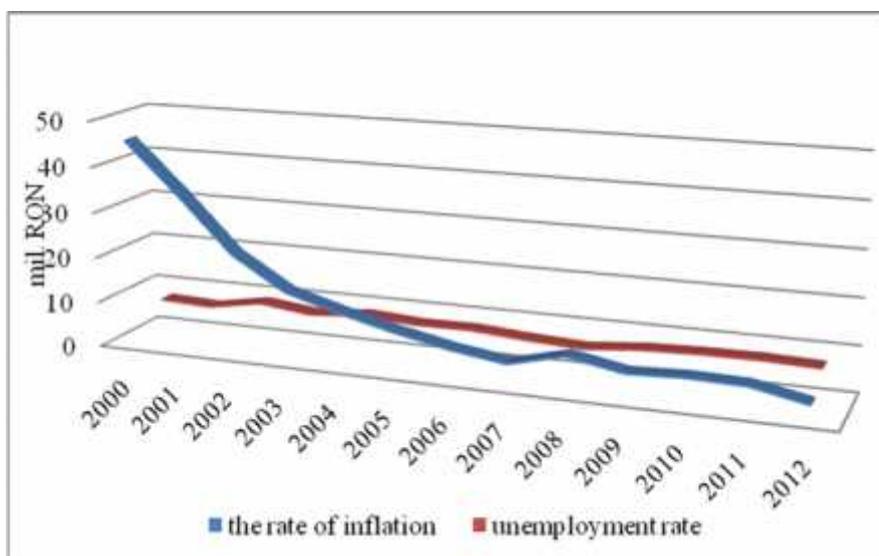*Figure no. 2.* Evolution of the negative indicators inflation rate and unemployment rate in the 2000-2012 period