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An analysis on the net export dependence relative to GDP and the consumer demand for Romania during 2001-2011

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Abstract. In this paper, we have investigated the dependence of net export based on GDP and the consumer demand in Romania during 2001-2011. After determining the regression equation, the main conclusion is that in Romania is an excessive dependence of net exports from the level of consumption. The fact is easily explained in terms of negative trade balance, the Romanian consumption being based on a very large proportion of imported products. An increase in GDP will lead to a higher negative trade balance therefore it must, imperatively, a modify in export structure in the sense of either adapting to global requirements or a higher quantity and quality production in traditional areas already.

JEL Codes: R12

Keywords: net export, GDP, consumer demand, regression

1 Introduction

The purpose of this paper is to statistically analyze the dependence of net export based on GDP and the consumer demand in Romania during 2001-2011.

For accuracy and adequacy of calculations, we have reduced the existing data (GDP, the money demand) using GDP deflator at the level of year 2000.

2 The net export depending to the GDP and the consumer demand

In this section we shall investigate the dependence of net export to GDP and the consumer demand. For data consistency calculations we will report all computations to the level of year 2000.

Considering the GDP deflator for year n: $GDP_{deflator,n}=\frac{\text{nominal GDP}_n}{\text{real GDP}_n}$ we first compute the cumulative deflator for the year n relative to 2000:

$$GDP_{\text{cumulative deflator},n}=\frac{GDP_{\text{cumulativedeflator},n-1}}{GDP_{\text{deflator},n}}=\frac{1}{\prod_{k=1}^{n} GDP_{\text{deflator},n}}$$

where $GDP_{deflator,2000}=1$.

Table no.1

Year	Deflator GDP-România ($GDP_{deflator,n}$)	Cumulative Deflator-România ($GDP_{cumulative\ deflator,n}$)
2000	1.443	1
2001	1.374	0.727802038
2002	1.234	0.589790954
2003	1.24	0.475637867
2004	1.15	0.413598145
2005	1.123	0.368297547
2006	1.108	0.332398508
2007	1.13	0.294157971
2008	1.116	0.263582412
2009	1.065	0.247495222
2010	1.036	0.238895002
2011	1.071	0.223057892

Source: The World Bank

Let now consider GDP for the period 2001-2011:

Table no.2

Year	GDP (current mil. lei) Y
2001	117945.8
2002	152017.0
2003	197427.6
2004	247368.0
2005	288954.6
2006	344650.6
2007	416006.8
2008	514700.0

2009	501139.4
2010	522561.1
2011	578551.9

Source: Romanian National Institute of Statistics

Considering the cumulative deflator, we get:

Table no.3

Year	GDP (mil. 2000-lei) Y
2001	85841.2
2002	89658.3
2003	93904.0
2004	102310.9
2005	106421.3
2006	114561.3
2007	122371.7
2008	135665.9
2009	124029.6
2010	124837.2
2011	129050.6

Also, let the consumer demand, for the period 2001-2011:

Table no.4

Year	The consumer demand (current mil. lei) C
2001	100731.7
2002	127118.8
2003	168818.7
2004	211054.6
2005	251038.1
2006	294867.6
2007	344937.0
2008	420917.5
2009	404275.5
2010	419854.1
2011	441657.1

Source: Romanian National Institute of Statistics

At the level of 2000-currency, the situation is as follows:

Table no.5

Year	The consumer demand (mil. 2000-lei) C
2001	73312.7
2002	74973.5
2003	80296.6
2004	87291.8
2005	92456.7
2006	98013.6
2007	101466.0
2008	110946.4
2009	100056.3
2010	100301.0
2011	98515.1

Also, let the net export for the period 2001-2011 is:

Table no.6

Year	The net export (current mil. lei) NX
2001	-8972.10
2002	-8547.90
2003	-14761.30
2004	-22238.00
2005	-29370.10
2006	-41405.30
2007	-57788.90
2008	-67114.40
2009	-30273.50
2010	-27054.90
2011	-29780.90

Source: Romanian National Institute of Statistics

At the level of 2000-currency, the situation is as follows:

Table no.7

Year	The net export (mil. 2000-lei) NX
2001	-6529.9
2002	-5041.5
2003	-7021.0

2004	-9197.6
2005	-10816.9
2006	-13763.1
2007	-16999.1
2008	-17690.2
2009	-7492.5
2010	-6463.3
2011	-6642.9

The research question consists to search the dependence of net export from GDP and the level of consumer demand in comparable prices for the year 2000.

Let therefore the regression equation:

$$NX=\nu_C C+\nu_Y Y+NX_0,\ \nu_Y\in(0,1),\ \nu_C\in\mathbf{R},\ NX_0\in\mathbf{R}$$

where:

- NX – the net export;
- C – the consumer demand;
- Y – GDP;
- ν_C - a factor of influencing the net export from the consumer demand;
- ν_Y - a factor of influencing the net export from GDP;
- NX_0 – additive constant (*representing the net exports in the absence of added value and consumer demand*)

The dependance of the net export from the consumer demand

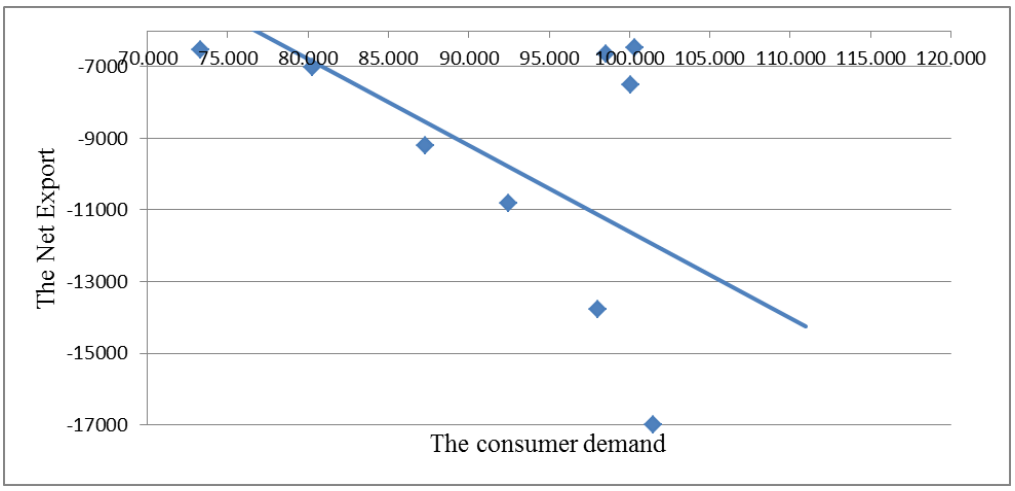

Fig.1

The dependance of the net export from GDP

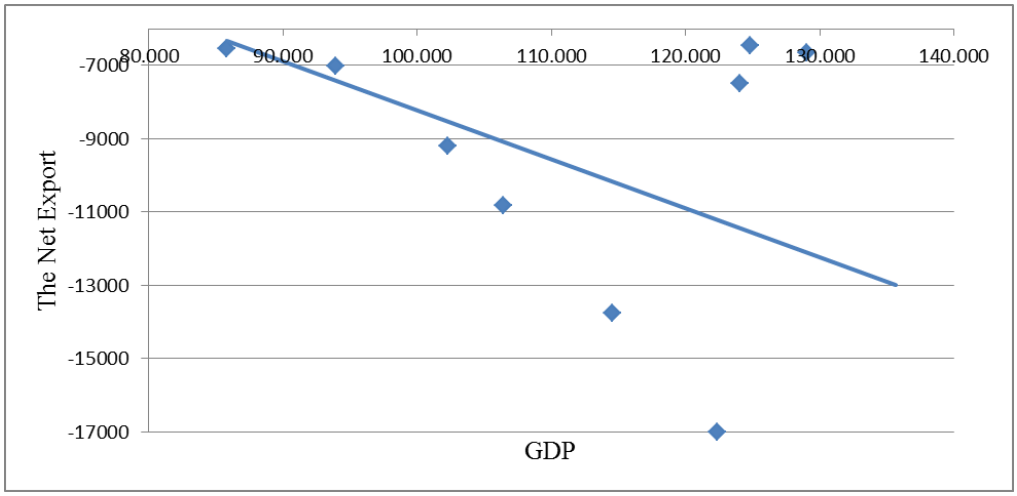

Fig.2

The regression analysis provides the following results:

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.849661503
R Square	0.72192467
Adjusted R Square	0.652405837
Standard Error	2627.845818
Observations	11

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	2	143423121.2	71711560.62	10.38459139	0.005979293
Residual	8	55244589.15	6905573.644		
Total	10	198667710.4			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Intercept (NX_0)	22030.6504	7194.467907	3.062165358	0.015531463	5440.177653	38621.12314
X Variable 1 (C)	-1.078715251	0.296656614	-3.636242035	0.006624893	-1.76280663	-0.394623872
X Variable 2 (Y)	0.608583677	0.209905893	2.899316774	0.019912554	0.124539819	1.092627535

RESIDUAL OUTPUT

Observation	*Predicted Y*	*Residuals*	*Standard Residuals*
1	-4811.367319	-1718.545345	-0.731166225

2	-4279.878875	-761.5952247	-0.324025611
3	-7438.012782	416.979543	0.177406642
4	-9867.564163	669.9686185	0.285042479
5	-12937.57155	2120.635777	0.902238198
6	-13977.89631	214.8363809	0.091403527
7	-12948.80777	-4050.257825	-1.723208371
8	-15084.94459	-2605.230821	-1.108412292
9	-10419.16308	2926.616466	1.245147892
10	-10191.71412	3728.433727	1.586286228
11	-5701.023474	-941.8412973	-0.400712468

The regression analysis revealed the following:

- For the number of data N=11 and the number of degrees of freedom k=1 (the number of independent variables), the Durbin-Watson test provides the values[1]: dl=0.93 and du=1.32, and the Durbin-Watson value statistic: $d=\frac{\sum_{i=2}^{n}(e_i - e_{i-1})^2}{\sum_{i=1}^{n} e_i^2}$ (where e_i are residues derived from regression) is d=1.474. Because $d \in (du, 4-du)$ follows that the errors are uncorrelated.
- The empirical correlation coefficient ρ (multiple R) is 0.850, while the critical value of the correlation coefficient for N=11 and a significance threshold of 95% is r_c=0.602. Because $\rho > r_c$ follows that a linear dependence between variables may exist.
- Significance F=0.00598 (*which means the probability that the regression equation can not explain the evolution of the endogenous variable – the phenomenon having links purely random*) is much smaller than α=0.05. From the econometric theory it is known that if Significance F<α then the null hypothesis H0 is rejected with probability 1-α=0.95, so it is possible that at least one regression coefficient to be different from 0. In this case, we can consider this requirement met.
- The values P-value are an essential indicator for the revealing the variables which significantly influencing the process if they are less than α=0.05. Thus, for the coefficient of the independent variable C we have P-value=0.0066<0.05 and for the coefficient of the independent variable Y we have P-value=0.0199<0.05. For the remainder we have P-value=0.0155<0.05.
- The intervals [Lower 95%,Upper 95%] representing the confidence intervals where are the coefficients, are for the independent variable C: [-1.7628;-0.3946], for the independent variable Y: [0.1245;1.0926] and for the remainder: [5440.1777;38621.1231]. Because 0 not belonging at the appropriate intervals for C, Y and remainder, implies that for a higher probability of 0.95 their coefficient belong to their respective ranges.
- The regression equation is thus:

NX=-1,0787C+0,6086Y+22030,6504

From these data, it appears that at an increase of consumption with 1 billion lei, net exports decreased by 1.078 billion lei. Also, an increase of 1 billion lei in GDP leads to an increase in net exports of 608.6 million at the level of 2000.

[1] Savin N.E., White, Kenneth J., The Durbin-Watson Test for Serial Correlation with Extreme Sample Sizes or Many Regressors, Econometrica, Vol.45, No.8, 1977, pp.1989-1996

It also should be noted that R Square= $\frac{SPE}{SPT}$ =0.7219 shows that the net export is explained at the rate of 72.19% of GDP development and the consumer demand.

3 Conclusions

The above analysis shows that for Romania there is an excessive dependence of net exports from the level of consumption. The fact is easily explained in terms of negative trade balance, the Romanian consumption being based on a very large proportion of imported products.

Also, it is noted that an increase in GDP would lead to a reduction in the trade deficit. On the other hand, the marginal propensity to consume of Romania is about 0.74 (relative to GDP). An increase of 1 billion lei of GDP would lead to an increase of 608.6 million net exports, but also an increase in consumption of about 740 million. Change in exports will be decided: -1.0787*740+608.6=-189.64 million lei.

We therefore conclude that for improving the trade balance is insufficient the GDP growth.

It must, imperatively, a modify in export structure in the sense of either adapting to global requirements or a higher quantity and quality production in traditional areas already.

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