

Macroeconomics and Monetary Economics**An Analysis on the Consumer Demand Dependence Relative to the Disposable Income for Romania during 2001-2011****Catalin Angelo Ioan¹, Gina Ioan²**

Abstract: In this paper, we have investigated the dependence of consumer demand for the disposable income of statistical terms. After the regression analysis, we obtained that, in the case of Romania, there is a huge marginal propensity to consume – 74.11% relative to the disposable income. Also, an influence of previous consumption of 66.58% in the present leads to the conclusion of a relatively constant purchasing habits of the population. The difference between 49.34% - the influence of previous income and 74.11% - the influence of current income suggests an appetite for risky consumption in the economy, rather inconsistent, as that of Romania.

Keywords: consumer demand; disposable income; regression

JEL Codes: R12

1 Introduction

The purpose of this paper is to statistically analyze the consumer demand from the disposable income 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.

Because the residual errors in the regression model undergoes a positive autocorrelation, finally was obtained the regression equation in which the consumer demand at the year i depends to a large extent on the consumer demand in the year $i-1$ and the disposable income in the years i and $i-1$.

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2. The Consumer Demand Depending to the Disposable Income

In this section we investigate the dependence of consumer demand for the disposable income. For data consistency calculations we will report to the 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:

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

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

Table 1

Year	Deflator GDP-Romania ($GDP_{\text{deflator},n}$)	Cumulative Deflator-Romania ($GDP_{\text{cumulative deflator},n}$)
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

Consider, first, the disposable income for the period 2001-2011:

Table 2

Year	The disposable income (current mil. lei) V
2001	117053.9
2002	150414.2
2003	192856.3
2004	237001.8
2005	280463.8
2006	333114.5
2007	401081.4
2008	499783.1
2009	491189.1
2010	507477.1
2011	519981.2

Source: Romanian National Institute of Statistics

Considering the cumulative deflator, we get:

Table 3

Year	The disposable income (mil. 2000-lei) V
2001	85192.1
2002	88712.9
2003	91729.8
2004	98023.5
2005	103294.1
2006	110726.8
2007	117981.3
2008	131734.0
2009	121567.0
2010	121233.7
2011	115985.9

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

Table 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 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

The research question consists to search the dependence of the consumer demand from the disposable income in comparable prices for the year 2000.

Let therefore the regression equation:

$$C=cV+C_0, C_0>0, c\in(0,1)$$

where:

- C – the consumer demand;
- V – the disposable income;
- c – the marginal propensity to consume, $c = \frac{dC}{dV}$;
- C_0 – additive constant (*representing the basic consumption without any income*)

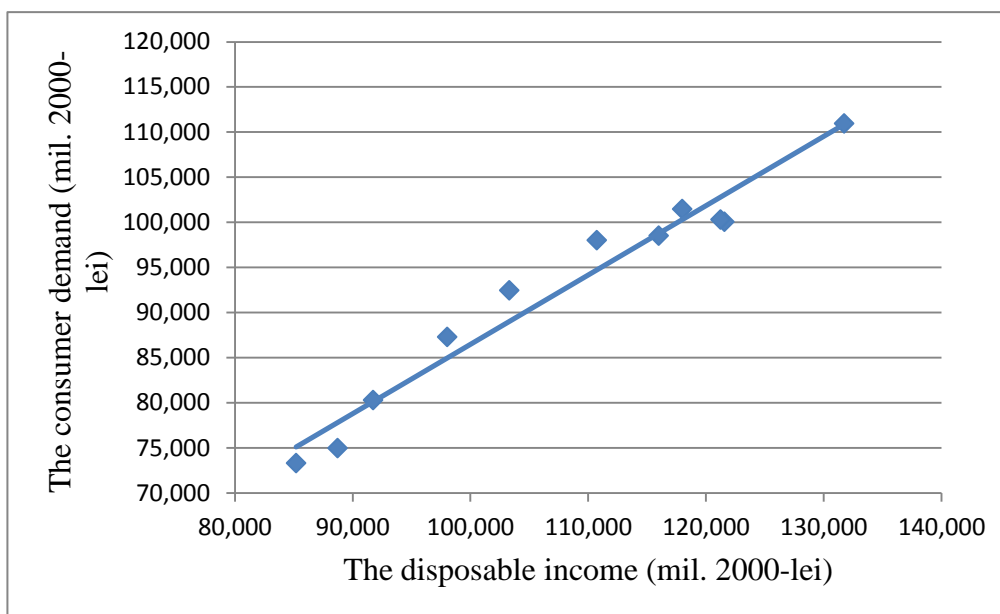


Figure 1. The dependence of the consumer demand from the disposable income

The regression analysis provides the following results:

SUMMARY OUTPUT	
<i>Regression Statistics</i>	
Multiple R	0.98057934
R Square	0.961535841
Adjusted R Square	0.957262046
Standard Error	2495.013436
Observations	11

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	1400546473	1400546473	224.9840586	1.12845E-07
Residual	9	56025828.39	6225092.044		
Total	10	1456572301			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept (C ₀)	9644.291665	5575.677504	1.729707584	0.11773907	-2968.76714	22257.35047
X Variable 1 (V)	0.768468236	0.051233031	14.99946861	1.12845E-07	0.65257107	0.884365403

RESIDUAL OUTPUT			
<i>Observation</i>	<i>Predicted Y</i>	<i>Residuals</i>	<i>Standard Residuals</i>
1	75111.68905	-1798.952513	-0.760020937
2	77817.36398	-2843.845598	-1.201467064
3	80135.69778	160.8685199	0.067963686
4	84972.24144	2319.549568	0.979962629
5	89022.54907	3434.167259	1.450865988
6	94734.29164	3279.258583	1.385420216
7	100309.1662	1156.801994	0.488725371
8	110877.713	68.73679831	0.029039903
9	103064.6354	-3008.380723	-1.270979816
10	102808.5722	-2507.526043	-1.059378876
11	98775.77949	-260.6778434	-0.1101311

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 (Savin, White, 1977, pp.1989-1996): 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 $d=0.651$. Because $d \in (0, dl)$ follows that the errors are positive correlated.

- Calculating the autocorrelation coefficient ρ of errors e_i through: $\rho = \frac{\text{Cov}(e_i, e_{i-1})}{\sigma(e_i)\sigma(e_{i-1})} = 0.6658$, we shall consider the new data series: $C_i^* = C_i - \rho C_{i-1}$,

$$V_i^* = V_i - \rho V_{i-1}.$$

Table 6

Year	The disposable income (mil. 2000-lei) $V_i^* = V_i - \rho V_{i-1}$	The consumer demand (mil. 2000-lei) $C_i^* = C_i - \rho C_{i-1}$
2002	31988.92	26159.2
2003	32661.42	30376.44
2004	36946.45	33827.38
2005	38026.47	34334.63
2006	41949.73	36452.46
2007	44255.34	36204.94
2008	53177.75	43386.67
2009	33853.59	26184.02
2010	40289.99	33679.91
2011	35264.02	31730.97

- The new regression analysis provides the following results:

SUMMARY OUTPUT	
<i>Regression Statistics</i>	
Multiple R	0.93615389
R Square	0.876384106
Adjusted R Square	0.860932119
Standard Error	1902.344299
Observations	10

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	205252476.8	205252476.8	56.71659685	6.7274E-05
Residual	8	28951310.64	3618913.83		
Total	9	234203787.4			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept (C ₀)	4447.212844	3869.421679	1.149322357	0.283621783	-4475.689548	13370.11524
X Variable 1 (V)	0.741128641	0.098409837	7.531042216	6.7274E-05	0.514195148	0.968062133

RESIDUAL OUTPUT

<i>Observation</i>	<i>Predicted Y</i>	<i>Residuals</i>	<i>Standard Residuals</i>
1	28155.11772	-1995.918284	-1.112832746
2	28653.52763	1722.910028	0.960615829
3	31829.28824	1998.092864	1.114045193
4	32629.71981	1704.908471	0.950578985
5	35537.35819	915.1065698	0.510221568
6	37246.1099	-1041.171746	-0.580509744
7	43858.76483	-472.0920824	-0.263216953
8	29537.07456	-3353.050517	-1.869507607
9	34307.27728	-627.3690527	-0.349792289
10	30582.38887	1148.583748	0.640397764

- For the number of data N=10 and the number of degrees of freedom k=1, the Durbin-Watson test provides the values: dl=0.88 and du=1.32, and the Durbin-Watson value statistic: d=1.346. Because $d \in (du, 4-du)$ follows that the errors are uncorrelated.
- The empirical correlation coefficient ρ (multiple R) is 0.936, while the critical value of the correlation coefficient for N=10 and a significance threshold of 95% is $r_c=0.632$. Because $\rho > r_c$ follows that a linear dependence between variables may exist.

- Significance $F=0.000067$ (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 $\alpha=0.05$. From the econometric theory it is known that if Significance $F<\alpha$ then the null hypothesis H_0 is rejected with probability $1-\alpha=0.95$, 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 $\alpha=0.05$. Thus, for the coefficient of the independent variable V^* we have $P\text{-value}=0.000067<0.05$ and for the remainder we have $P\text{-value}=0.2836$.
- The intervals [Lower 95%,Upper 95%] representing the confidence intervals where are the coefficients, are for the independent variable V^* : [0.5142;0.9681] and for the remainder: [-4475.6895;13370.1152]. Because 0 not belonging at the appropriate interval for V^* implies that for a higher probability of 0.95 its coefficient belong to its respective range. A further analysis confirms that the coefficient of the remainder belongs in the interval [62.9066;8831.5191] with a probability greater than 0.71.
- The regression equation is thus: $C^* = 0.741 V^* + 4447.2128$ or other:

$$C_i = 0.741 IV_i + 0.6658C_{i-1} - 0.4934V_{i-1} + 4447.2128$$

where: C_i - the consumer demand in year i , V_i - the disposable income in year i .

From these data, it follows that the marginal propensity to consume is 0.7411 which implies that at an increase in the disposable income of 1 billion lei, the consumer demand will increase to 741.1 million.

It also should be noted that $R\text{ Square} = \frac{SPE}{SPT} = 0.8764$ shows that the consumer demand is explained at the rate of 87.64% of the disposable income.

3 Conclusions

The above analysis shows that for Romania there is a huge marginal propensity to consume 74.11% relative to the disposable income. Also, the percentage of 66.58% which means the influence of previous consumption at present leads to the conclusion of a relatively constant purchasing habits of the population.

Another interesting fact is the percentage of 49.34% where the income corresponding to the previous year adversely affect consumption. The comparison of two percent (49.34% -74.11%) reflects a traditional Romanian optimism when a

present higher income leads to increased consumption regardless of failures preceding period.

This facts correlated with a negative trade balance of Romania, can lead to instability of the market, meaning that the Romanians' appetite for shopping implicitly lead to a deterioration in the country's foreign trade balance.

4 References

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