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Savings Sensitivity & Economic Development Policies in Romania

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Abstract

Savings is an extensive macroeconomic process that is sensitive to many internal and external factors and to economic development policies. The paper proposes for the Romanian case the identification of the main determinants of the saving rate. An econometric study will analyze the saving from the point of view of the gross national income, the interest rate of the monetary policy and the growth rate of the resident population in Romania.

Keywords: Saving, Key Rate, Gross National Income, and Crisis.

Introduction

Studying concepts related to the macroeconomic saving function based on models involves various approaches, related to the study of a certain theoretical working hypothesis (such as those specific to Keynesian, neoclassical approaches, etc.). The behavior of saving is influenced by a number of factors, such as psychological, social, economic, geopolitical, etc., and the main sector in the economy that saves is households. Warneryd (1999) identifies certain causes for which households saves: as a habit, as a precautionary measure, for legacy and to get profit (eg interest on banks).

At the Europe's level, two Romanian economists, Niculescu-Aron and Mihăescu (2012), used a panel analysis to investigate the main determinants of household savings. The period studied is from 1995 to 2010, and as hypotheses derived from the study of the literature, the authors summarize that:

- a) Determinants of saving households in the EU in developed countries are not similar to those in developing countries and vice versa;
- b) Conclusions on interest rate influences are not the most relevant, because in more developed countries the interest rate has a higher influence on the saving rate (as described by Elmendorf, 1996);
- c) There is an inversely correlation between the evolution of income and the evolution of saving, up to a certain income threshold, after which the relationship starts to reverse, and a larger share of the income is redirected to saving (argument presented by Muradoglu in the year 1996).

Niculescu-Aron and Mihaescu (2012) used 15 countries (Austria, Finland, France, Germany, Ireland, Italy, the Netherlands, Portugal, Spain, Romania, Hungary, Latvia, Poland, Slovakia and Slovenia) and their proposed savings function is as follows:

$$HS = f(RG, D(RI), PPR, IR(-1), RDE, LE)$$

where, HS is the gross household savings rate (as a percentage of disposable income), RG is the growth rate of GDP in constant prices, D (RI) is the first-order difference in inflation, PPR represents the share of the rural population in the total population, IR (-1) is the long-term interest rate with a delay, RDE is the dependency ratio of persons over 65, and LE is the average life expectancy at birth.

The econometric model for the savings function has been built for both the short-term and the long-term relationship as follows:

$$\frac{S_t}{y_t} = \ln y_t + r_t + fli_t + \pi_t + govst_t + \varepsilon_t$$

Where $\frac{S_t}{y_t}$ represents the saving rate, $\ln y_t$ is the natural logarithm of the national disposable income, r_t is the real interest rate, fli_t is the index of financial liberalization, π_t is the rate of inflation, $govst_t$ is the government saving rate.

The choice of the variables presented were depended on the availability of the data series for the chosen time period.

Estimates of the model proposed by Bandiera et al. (2000) is in line with other studies, namely that it is not possible to clearly define a relationship between the degree of liberalization of the financial sector and the private saving rate. The mixed results are supported by the fact that when the effects are estimated separately for each country out of the eight mentioned, the long-term effect of the liberalization degree is negative for two of them, Korea and Mexico, positive for two of them, Ghana and Turkey, with no visible effect on the other four.

The Aim and Objectives of the Econometric Model

In order to achieve the objectives of macroeconomic policies, it is important that policy makers and monetary policy makers have a clear idea of the spectrum or volume of savings and investment, people's behavior towards saving, and how it can be improved for investment purposes. Policy architects need to understand the reasons for saving and investing in order to create the necessary framework to stimulate them. Understanding savings and preferences for them can help shape and implement saving tools that will later boost national savings.

Following the study of the specialized literature presented at the beginning of this chapter, the main determinants of the aggregate saving were the available income, the level of interest rates on the banking market and the level of inflation. The specific objectives of the econometric model built in this chapter are evaluation of the saving trend at the level of the Romanian economy; outlining the main determinants of aggregate saving in Romania; assessing the impact of monetary policy on national saving; identifying a pattern of growth in national saving, using our previous goals.

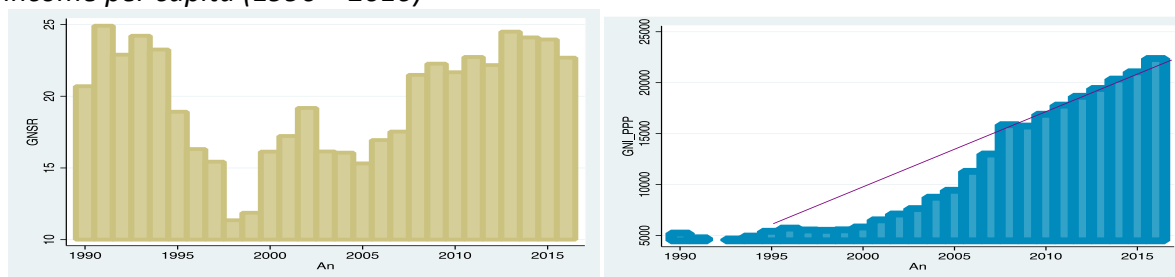
Description of the Data used and its Sources

For the construction of the econometric model, the following series of data were taken:

1. Gross National Savings Ratio (gnsr) for the period from 1990 to 2016. This time series has been taken over from the World Bank database. This rate is expressed in percentage points. In the raw data processing stage, the percentage variation of this variable ($\frac{x_1-x_0}{x_0} - vp_gnsr$) was built.
2. Gross national income per capita (gni) in PPP (purchasing power parity, expressed in USD) for the period 1990 to 2016. GNI is expressed the same as the previous series, the source was the World Bank and similar, the growth rate of this macroeconomic indicator was built ($\frac{x_1-x_0}{x_0} - vp_gnsi$);

The evolution of these two variables between 1990 and 2016 is shown in the following graphs:

Fig. 1: Evolution of the Gross National Savings Rate (1990 – 2016) Fig. 2: Rate of gross national income per capita (1990 – 2016)



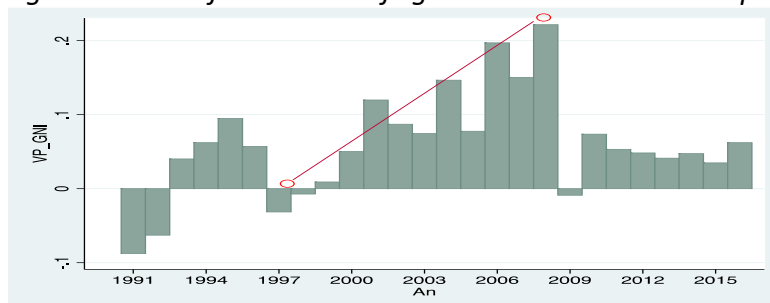
Data source: World Bank (data processed by the author)

Data source:

World Bank (data processed by the author)

It can be seen from the graph above that since 1995 there has been a serious trend in Romania to increase gross national income per capita, the maximum being reached at the end of the time series in 2016. The highest growth rates of gross national income per capita were reached in 2001, 2004, 2006 and 2008, and with the beginning of the economic crisis at the level of the Romanian economy (2008), this growth rate has undergone a significant correction. The average gross national income per capita growth rate for the period under review was around 6 percent.

Fig. 3: Rate of increase of gross national income per capita (1990 – 2016)

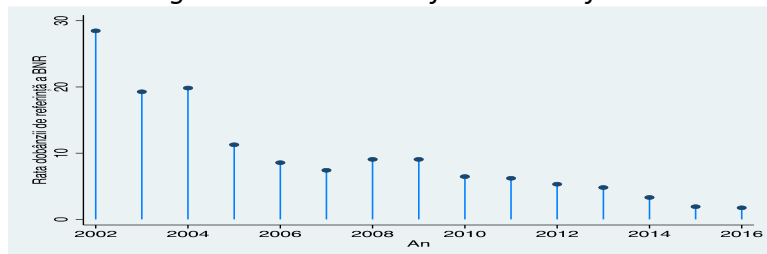


Data source: World Bank (data processed by the author)

3. The monetary policy rate expressed in percentage points for the period from 2002 to 2016 (the interval was chosen according to the availability of the data). The primary

data were taken from the database of the National Bank of Romania, the frequency being monthly. To bring the data to a unitary frequency (yearly, as is the one of the first two variables described), we have recourse to building an annual arithmetic mean $(\frac{\sum_{i=1}^{12} \text{monetary policy rate}}{12} - \text{mpir_NBR})$;

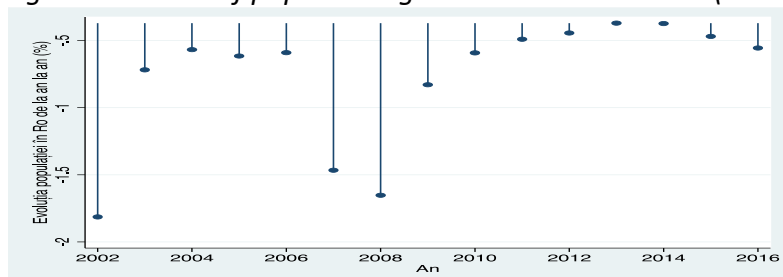
Fig. 4: The evolution of the NBR reference interest rate (2002 – 2016)



Data source: World Bank (data processed by the author)

- The growth rate of the resident population in Romania, expressed in percentage points for the period between 2002 and 2016. The primary data series were taken over from the World Bank, initially expressed in absolute values and subsequently converted figures in growth rates of year after year $(\frac{x_1 - x_0}{x_0} - \text{pop_gr})$.

Fig. 5: Evolution of population growth rate in Romania (2002 – 2016)



Data source: World Bank (data processed by the author)

It can be seen from the chart below that the population of Romania had the most pronounced decrease rate in the years 2002, 2007 and 2008.

Specification of the Econometric Model

In this study, we wanted the gross saving rate to be expressed according to the rate of increase of gross national income and the NBR monetary policy rate as follows:

$$vp_gnsr = f(vp_gni, mpir_nbr) \quad (1)$$

Where vp_gnsr is the percentage change in the gross saving rate of national saving, vp_gni is the percentage change in gross national income and $mpir_nbr$ is the reference interest rate. Three models were tested during the research. Due to the availability of the data (presented in the previous section), 14 years of analysis were introduced (2002 - 2016). Thus, the equations of the regression models will have the following form:

$$vp_gnsr_t = L_vp_gni_t + L_mpir_nbr_t + \varepsilon_t \quad (2)$$

$$vp_gnsr_t = L_vp_gni_t + L_mpir_nbr_t + pop_gr + \varepsilon_t \quad (3)$$

$$vp_gnsr_t = vp_gni_t + mpir_nbr_t + pop_gr + \varepsilon_t \quad (4)$$

Variables that have L in the front represent the variables that are taken with a delay. For example, in the first model, we considered that saving from t will be influenced by the income and interest rate at t-1.

Regard to inflation, we believe that monetary policy is the main instrument for keeping inflation in Romania under control, and the main interest rate is the main transmission channel. An introduction to the inflation model would lead to over-specification of the model, which could, in my opinion, hurt the accuracy of the estimates.

Data Processing and Multiple Regression Estimation

In the first stage of data process, time stationarity was tested using the Dickey-Fuller test. From the tests it was revealed that all time series are stationary, according to table no. 1.

Tabel no. 1: Dickey-Fuller test for time stationarity test

Variable	Statistical test value	Reliable confidence interval 99%	Reliable confidence interval 95%	Reliable confidence interval 90%	Value of p-statistic
<i>vp_gnsr</i>	-4,381	-3,750	-3,000	-2, 630	0,0003
<i>vp_gni</i>	-3,456	-3,750	-3,000	-2, 630	0,0092
<i>mpir_bnr</i>	-3,748	-3,750	-3,000	-2, 630	0,0035
<i>pop_gr</i>	-3,056	-3,750	-3,000	-2, 630	0,0300

Source: Own estimates

In the second step the regression equations for the three models described by equations (2), (3) and (4) were run. The estimates of the first model (1) are presented in table no. 2.

Table no. 2: Estimates from the first model (2)

Source	SS	df	MS	Number of obs	=	14
Model	.037383633	2	.018691817	F(2, 11)	=	2.98
Residual	.068934677	11	.006266789	Prob > F	=	0.0923
				R-squared	=	0.3516
				Adj R-squared	=	0.2337
Total	.10631831	13	.008178332	Root MSE	=	.07916

<i>vp_gnsr</i>	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
L_vp_gni	.5383037	.3415974	1.58	0.143	-.2135471 1.290155
L_mpir_bnr	-.0065285	.0030182	-2.16	0.053	-.0131716 .0001145
_cons	.033619	.0435205	0.77	0.456	-.062169 .1294071

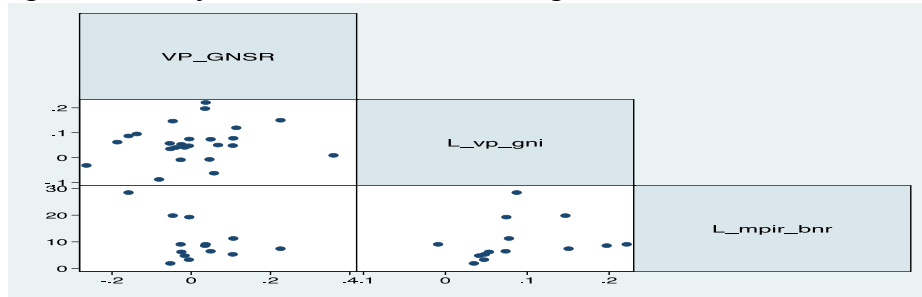
Source: Own Estimates

Further, the other two regression models were run, in which the population growth variable was introduced.

As a result of the regression equation used, it was decided to consider the first model (1) as a reference model. This was due to the analysis of test values t for each estimate. It is also noted that from the third model the values were excluded with a delay and a simultaneity was considered for the evolutions of the variables that determine the evolution of the gross saving rate in the Romanian economy. This simultaneity could not be verified by the results. After choosing the optimal multiple regression model, we resorted to the third stage in applying post-

estimation tests, verifying that the model complies with the classical regression model assumptions. The matrix of correlation of the variables of the chosen model looks like this:

Fig. 6: Matrix of Variables used in Modeling



Source: Own Estimates

The first test was that of residual heteroscediction. The Breusch-Pagan test was used and the errors were found to be homoscedastic. The results of this test are reproduced in table no. 3.

Table no. 4: Breusch-Pagan test for heteroscedasticity

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Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
Ho: Constant variance
Variables: fitted values of vp_gnsr

      chi2(1)      =       1.03
      Prob > chi2  =       0.3096
    
```

Source: Own estimates

In the second applied test, error self-correlation was tested using the Durbin alternative test and Durbin-Watson value. The value of the Durbin-Watson test is 2,739, which suggests that there is an error autocorrelation. This is also confirmed by the Durbin alternative test in terms of the statistic F probability value (0.0138).

Table no. 5: Durbin Alternative Test

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Durbin's alternative test for autocorrelation

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lags(ρ)	F	df	Prob > F
1	8.893	(1, 10)	0.0138

H0: no serial correlation

Source: Own estimates

To correct this, we applied the Cochrane-Orcutt method (1949). This method addresses linear regression model adjustment for serial correlation of errors. The application of this technique can be synthesized as follows:

estimating least squares regression (OLS); using the error term in step 1 to estimate $e_t = \rho e_{(t-1)} + u_t$, obtaining an estimate for ρ (e_t representing the error term); the estimation of ρ is used together with the data for the dependent variable and the independent variables to estimate the generalized difference equation; this equation is:

$$y_t - \rho y_{t-1} = \alpha(1 - \rho) + \beta(X_t - \rho X_{t-1}) + e_t \tag{5}$$

Using the error term obtained in step 3, in step 2 we re-estimate ρ . Repeat this procedure until the estimation of ρ becomes constant, and finally the general equation of differences is estimated for the last time.

Estimates of the new regression model are presented in the following table. A number of 14 iterations were used, the value of ρ stabilizing around -0.7664 after the second iteration. It can be seen how Durbin-Watson's value was transformed from 2,739 as it was in the initial regression, to 1,946, the self-correction of errors being solved.

Table no. 6: Estimation of regression model after applying Cochrane-Orcutt technique

Cochrane-Orcutt AR(1) regression -- SSE search estimates

Source	SS	df	MS	Number of obs	=	13
Model	.103241951	2	.051620976	F(2, 10)	=	16.87
Residual	.030600708	10	.003060071	Prob > F	=	0.0006
				R-squared	=	0.7714
				Adj R-squared	=	0.7256
Total	.13384266	12	.011153555	Root MSE	=	.05532

vp_gnsr	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
L_vp_gni	.9711111	.181975	5.34	0.000	.5656454 1.376577
L_mpir_bnr	-.0057828	.0015391	-3.76	0.004	-.0092121 -.0023535
_cons	-.0073958	.0205378	-0.36	0.726	-.0531569 .0383653
rho	-.7664323				

Durbin-Watson statistic (original) 2.739559
Durbin-Watson statistic (transformed) 1.946968

Source: Own Estimates

It is also probable that the two coefficients of the dependent variables are significantly different from 0 and the value of the square R increased to 0.7714 from 0.3516 (initial value). The value of square R suggests that 77.14% of the change in the gross national saving is explained by the evolution of the other two variables, the percentage changed in gross national income (with a delay) and the evolution of the reference interest rate of the National Bank of Romania. In addition, the probability of the F test indicates that the model is a correct one.

Conclusions and Interpretations

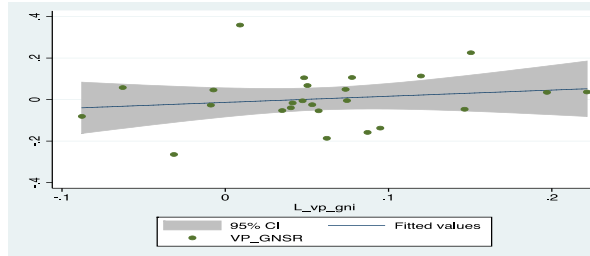
Depending on the estimates obtained in the previous section of this research, the adjusted regression equation can be rewritten as follows:

$$vp_gnsr = 0,971 * L_vp_gni - 0,00578 * L_mpir_nbr + e_{adj} \quad (6)$$

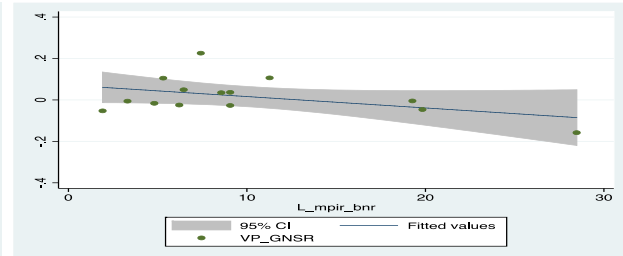
It has been steadily removed from this equation because it is not significantly different from 0, according to the statistical value t. It can be noticed that there is a positive correlation between the percentage change in the gross saving rate and the percentage change in gross national income, while there is a reverse correlation between saving and the reference interest rate. These relationships are described through the following graphs:

Fig. 7: Correlation between vp_gnsr and L_vp_gni

Fig. 8: Correlation between vp_gnsr and L_mpir_nbr



Source: Own estimates



Source:

Own estimates

From an economic point of view, these results indicate that an increase in the previous year's gross national income by one percentage point will lead to an increase in the gross national saving rate by 0.97 percentage points this year. We could see that the sign of the monetary policy rate coefficient is (-). As I have outlined in the previous section, a lax monetary policy will lead to stimulating credit and consumption, which will stimulate the phenomenon of unsaving. Thus, an increase in the monetary policy rate in the previous year will lead to a fall in the gross national saving rate by 0.57 percentage points in the current year.

In conclusion, as we have proposed, we have succeeded in identifying the main determinants of the saving rate. National income contributes to a large extent to the evolution of this rate, being positively correlated with the overall saving function. Moreover, one of the theories on monetary policy is validated, namely that stimulating credit in an economy will cause a fall in national saving.

One of the main weaknesses of this econometric model is the low number of observations introduced in the analysis. This can be improved in future research, either by introducing new observations into the model or by finding sources that provide data at a different frequency than the original one (eg quarterly frequency data).

However, we believe that this study has achieved its objectives and has succeeded in explaining it in a simple way that it can be easily understood by macroeconomic policy makers and decision makers, but robust enough, backed by the weight of the significance, to prove that the econometric model is a correct one, adjusted to the macro-system of the Romanian economy.

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