



UPDATING THE ROMANIAN ECONOMIC MACROMODEL

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Abstract

The paper describes the version (2012) of the Romanian economic macromodel². The model has been constructed taking into account the important consequences induced by the integration of the country into the European Union and by the world crisis. Some supplementary requests of the government agencies which use this forecasting tool were also included.

The first chapter presents the general architecture of this version. As an applicative exercise, the second chapter estimates the preliminary indicators for 2013 and comments several predictive simulations for the next year. Some concluding remarks close our presentation.

Keywords: macromodel, simulations, scenarios

JEL Classification: C32, C51, C52, C53

During the last period, a new version (2012) of the Romanian economic macromodel has been constructed, taking into account the important consequences of the integration of the country into the European Union and of the world crisis. Some supplementary requests of the government agencies which use this forecasting tool were also included.

The first chapter of this paper presents the general architecture of this version. As an applicative exercise, the second chapter estimates the preliminary indicators for 2013 and comments several predictive simulations for the next year. Some concluding remarks end our presentation.

1. The 2012 Version

1. In comparison with the previous 2005 version (Dobrescu, 2006) four categories of changes have been introduced.

1.1. New sections were added. Among these we can mention:

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² Project "Strengthening the institutional capacity in evaluating and formulating macroeconomic policies for economic convergence with EU within the National Commission for Prognosis", SMIS code 27153.

- The evaluation of the potential GDP and the corresponding output-gap using a macroeconomic production function;
- The computation of the general consolidated budget revenues and expenditures in a structure compatible with the public finance medium-term planning;
- The utilization of the broad money aggregate M3 (instead of M2);
- The extension of the I-O tables with estimations concerning the sectoral final output;
- The introduction of the primary energy balance (in connection with the I-O coefficients) and of the CO2 emissions as a measure of environmental pollution;
- The estimation of the public debt and of the total external debt.

*1.2. Important segments of the macromodel are **significantly disaggregated**:*

- The I-O tables are calculated for 10 sectors (instead of 6), the number of technical coefficients increasing from 36 to 100;
- Labor market variables (including income) are modeled separately for: a) companies' sector, b) public sector, and c) the rest of the economy;
- Exports and imports were computed not only as aggregate indicators, but also distinctly for a) goods and b) services;
- Households' consumption is separated into market and non-market (self-consumption) components.

*1.3. The new version contains estimations along **three time dimensions**, namely:*

- Yearly as referential, which are derived from the system of simultaneous econometric and accounting interconnected equations;
- Quarterly-monthly estimations of the annual indicators, and
- Long-run forecast of economic growth.

1.4. There are also some statistical and modeling techniques improvements:

- An extended data base was used for the determination of all econometric estimators, specifically 1989-2011 years for the macroeconomic indicators and 1989-2009 for the I-O tables;
- The time series were stationarized applying more diversified tools;
- The econometric method of estimation has been chosen comparing the results of several alternative computational procedures.

2. The 2012 version of the macromodel has been constructed in two stages.

2.1. In the first stage, the following functional blocks (as autonomous systems) were built:

- Gross Domestic Product,
 - Public Budget,
- Monetary Sector,
 - Input-Output Tables,
 - Primary Energy, and
 - Long-Run Projections.

Their detailed description can be found in (Păuna and Sâman, 2013).

2.2. In the second stage the Integrated System has been assembled (National Commission for Prognosis - NC, 2013), gathering the main relationships of the entire

macromodel as yearly indicators. Such a compacting operation has involved not only the re-specification of some equations, but also the inclusion of new interdependencies revealed by the analysis of all statistical series.

Both mentioned stages have benefited from the qualified assistance of NCP specialists, who have assured the necessary data base and formulated a lot of valuable observations and suggestions during the modeling work.

3. Our paper aims to present a concise description of the Integrated System, which is organized into eight sections:

- Employment, capital, labor income,
- Macroeconomic production function and output gap,
- Domestic absorption and foreign trade,
- Prices, exchange rate, other monetary variables,
- General consolidated budget (GCB) and public debt,
- Balance of payments and external debt,
- Sectoral structure of economy,
- Primary energy consumption and CO2 emissions.

The content of these sections is quantitatively defined in Table 1.

Table 1

Macromodel of the Romanian Economy (2012 Version) – Integrated System

Section	Number of accounting relationships	Number of econometric relationships	Total
Employment, capital, labor income	20	6	26
Macroeconomic production function and output gap	17	10	27
Domestic absorption and foreign trade	26	13	39
Prices, exchange rate, other monetary variables	10	7	17
General consolidated budget and public debt	43	17	60
Balance of payments and external debt	7	4	11
Sectoral structure of economy	141	110	251
Primary energy consumption and CO2 emissions	33	14	47
Total	297	181	478

4. The macromodel relationships were chosen taking into consideration several criteria. First of all, the largely accepted theorems were taken into consideration. However, some of them have been slightly amended according to the peculiarities of

the current Romanian market economy and to the available statistical information. When two or more functional forms were available, the solutions which provided plausible results in simulations have been selected.

4.1. *The Employment, Capital, Labor Income section operates with the usual specifications concerning: labor force (15-64 years) and labor force participation rate; the tangible fixed assets at 2005 constant prices and the rate of tangible fixed assets depreciation; total employment and salaried persons for companies' sector, budget sector and the rest of economy; unemployment rate; labor income share in gross value added and monthly wage in companies' sector, budget sector and the rest of economy.*

In general, the official statistical series were used in econometric estimations. In two cases it was necessary to find specific solutions:

- The determination of tangible fixed assets at 2005 constant prices, as a volume of physical capital, and
- The approximation of the alpha coefficient (labor income share in gross value added) as an ingredient of the macroeconomic production function.

4.2. *The production function as such was modeled in a standard manner. The methodology applied by the European Commission's experts has been taken into account as much as possible (D'Auria et al., 2010).*

The new version of the macromodel includes two determinations of the gross domestic product at 2005 constant prices. The first determines the actual output (GDP05) from estimators based on primary statistical series. The other approximates the potential level of the output (GDPP05), with the help of equations derived from Hodrick- Prescott filtered series concerning the labor force participation rate, the unemployment rate, the alpha coefficient, and the total factor productivity. The output gap is computed as the GDP05/GDPP05 ratio.

4.3. *The utilization of resources relationships are defined in the section **Domestic Absorption and Foreign Trade**.*

- The households' consumption (market and non-market) is determined as a function of income, interest rate, and the share of the rural population.
- The public consumption variable contains the main positions of the general consolidated budget expenditures.
- The specification of the gross fixed capital formation variable includes the usual econometric specifications.
- The specification of exports and imports involve the following leading explicative variables: international competitiveness, dynamics of the world trade in real terms, domestic aggregate demand. Both exports and imports are computed not only as aggregate indicators, but also separately for goods and services.
- The inventory change is obtained as a residual from the accounting relationship of GDP utilization.

4.4. *The new version of the macromodel covers a set of important variables of the nominal economy.*

- Besides the consumer (CPI) and gross fixed capital formation (PK) price indexes, the integrated system provides also an estimation of industrial price index. Determined as the equilibrium point of demand and supply aggregate curves, the GDP deflator is also connected to the main price indexes (CPI and PK).
- The *exchange rate* is related – beside the usual determinants - to the foreign currency reserves of the National Bank of Romania.
- The impact of *monetary policy interest rate* on inflation needs some explanations. As already mentioned, this influence was at least until now relatively weak (Dobrescu, 2011). In our case, both the first difference of CPI and PK (d(CPI) and d(PK)) are stationary series, and the Granger test indicates a plausible direction of causality from inflation to interest rate on one lag and, conversely, on 2-3 lags. The interest rate (as a lag of the first difference) is included in the specifications of the consumer price index and of the investment price index. Its sign, however, is positive. It seems that economic operators are adapted to high interest rates, which anticipatively are included into projected cash flows, therefore into the corresponding prices.
- As a main *monetary aggregate*, the present version of the macromodel uses M3 instead of M2 – M3 being more representative for the nominal volume of transactions. Consequently, an econometric determination of the money multiplier is introduced, M0 remaining as an exogenous variable.

4.5. The **General Consolidated Budget** is represented by all its significant positions, which are connected to the main macroeconomic indicators.

- The new version introduces the legal rates of taxation as computational tools of public budget revenues. Such rates were computed for taxes on profits and on wages as income, for employees' and employers' social security contributions, and for the value-added tax. When differentiated regimes of taxation were applied in a year, the weighted averages have been estimated.
- Similarly to other models, the econometric specification has admitted the presence of non-linearities in the relationships between legal taxes and the corresponding effectively collected budget revenues. In atypical forms, the Laffer curve (Laffer, 1981, 2004; Becsi, 2000; Palda, 2001; Novales and Ruiz, 2002) is also present in the Romanian economy.

4.6. The section for the **Balance of Payments and External Debt** starts from the net exports and adds econometric relationships concerning the foreign investments (direct and portfolio), and net transfers. It also uses exogenous estimations for other items of financial and capital account, including the errors and omissions. Taking into account these indicators, the macromodel estimates – again, for the first time in the Romanian forecasting research – the dynamics of external debt.

4.7. As already mentioned, the **sectoral structure** is revealed by an input-output analysis.

4.7.1. For this, the ten-sector classification tables were compounded by aggregating the extended 105-branch nomenclature (INSEE, 2012). These are:

- Agriculture, forestry, hunting and fishing;

- Mining and quarrying;
- Production and distribution of electric and thermal power;
- Food, beverages and tobacco;
- Textiles, leather, pulp and paper, furniture;
- Machinery and equipment, transport means, other metal products;
- Other manufacturing industries;
- Constructions;
- Transports, post and telecommunications; and
- Trade, business and public service.

4.7.2. The technical coefficients, a_{ij} , have been computed in current prices for all the inter-industry relations among these sectors ($i, j=1, 2, \dots, 10$). Their columns (sca_j) were also determined, in order to simplify the estimation of sectoral gross value added.

4.7.3. The previous version of the macromodel used simple auto-regressions in the econometric determination of technical coefficients (utilizing exclusively lags and differences of estimated variable). A more thorough examination of the respective series showed the presence of co-movements in their evolution. Due to this circumstance, in the present version the econometric specifications for a_{ij} contain in many cases lags and differences not only of the estimated coefficient, but also of other coefficients, with which the first interact. The author has attempted to restrain as much as possible the co-linearities induced by such a solution. Nevertheless, this effect could not be completely avoided. In this context, however, it would be useful to mention that in our application the prediction of the sub-sequent technical coefficients is important, and not the accuracy of explicative contributions of different regressors.

4.7.4. The 2012 version of the macromodel includes an improved solution for the estimation of resources utilization, consisting in the approximation of sectoral structure of a single indicator – the final output, NY .

At sectoral level NY_i represents the difference between total output of the respective sector and its intermediate output. At macroeconomic level NY corresponds to the final resources of the economy in basic prices, under restriction of null foreign trade balance. Consequently, it equals the gross value added (GVA). Normally, such equality is valid only at the aggregate level and not at the sectoral one (in other words, $NY_i \neq GVA_i$). Even negative sectoral final outputs are possible.

The weights of the final outputs ($w_{nyi}=NY_i/NY$) have been econometrically estimated.

4.8. The last section of the macromodel is centered on **Primary Energy Consumption** in economic activities (CEP), on one hand, and in households from both urban and rural areas (CEH), on the another hand.

It is important to mention that productive consumption (CEP) is determined separately for all ten sectors of the input-output tables. The influence of the sectoral structure of the economy on its global energy-intensity can be thus more relevantly identified, a problem extendedly debated lately (Dobnik, 2011; Georgantopoulos *et al.*, 2011; Stern and Kander, 2011; Liddle, 2012; Viiding and Joller, 2012; Bruns *et al.*, 2013; Iddle and Lung, 2013; Zhang, 2013).

The losses from the energy system and the CO2 Emissions are also estimated.

This section of the macromodel had to surpass several data problems. There was not a single data series for the entire interval, there are several statistical series with different starting points (1993, 1995, and even 2001). Therefore, it was necessary to extend by a replotation based on very simple regressions the existing series. So, in the first stage, based on the primary data, the equations with leads have been estimated, the resulted parameters being hereinafter used for retro-estimations (beginning in 1990 year). Due to this limited goal (a rough extension of series), the quality of the involved regressions was not considered essential.

5. The econometric specifications took into consideration as much as possible the most relevant explanatory variables. In this respect, many specifications contain not only their own lags (or leads) and data concerning other indicators, but also a time-factor, generally with a decreasing trend of influence.

According to almost all researches on the emerging market economies, the transitional reforms introduce a lot of temporary effects that are step-by-step reabsorbed as the institutional framework stabilizes. Some of them simply disappear, while others persist only as a remnant, relatively constant effect. From this point of view, the following patterns are dominant in the macromodel:

c/t , which means a gradual elimination of the temporary transitional effects, and

$c^*t/(t+1)$ or $c^*(t+1)/t$, in which the remnant (relatively constant effect) is reached through an increasing and decreasing trend, respectively.

Depending on the peculiarities of different statistical series, these trajectories are slightly modified.

6. From a strictly technical point of view, the macroeconomic relationships and the sectoral ones raised different problems, which will be discussed separately.

6.1. The first category regards the behavioral equations for the sections: employment, capital, labor income; macroeconomic production function and output gap; domestic absorption and foreign trade; prices, exchange rate, other monetary variables; general consolidated budget and public debt; balance of payments and external debt; and primary energy consumption and CO2 emissions.

6.1.1. For these sections, 57 equations with 182 econometric estimators were defined. The corresponding system was solved using five algorithms:

- ordinary least squares (OLS),
- weighted least squares (WLS),
- two-stage least squares (2SLS),
- weighted two-stage least squares (W2SLS), and
- three-stage least squares (3SLS).

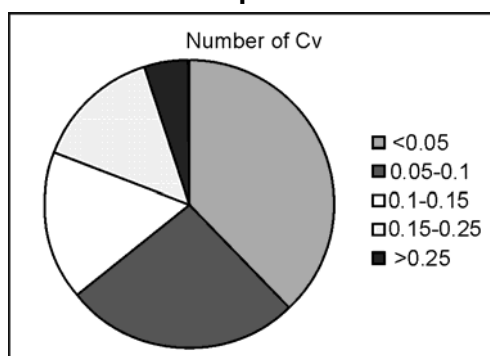
We should note that, given the available data base, other procedures provided by Econometric Views failed (near singular matrix for SUR, FIML, and GMM).

In the case of 2SLS, W2SLS, and 3SLS, instruments that are correlated significantly with the explanatory variables, but weakly with the disturbances of the equations, were

chosen. The instruments for the time-factor were the same as in the adopted specifications.

6.1.2. *The comparative examination of the obtained results has shown that, in all cases, the estimators were statistically significant. Irrespective of the adopted estimation procedure, their algebraic sign did not change. The coefficient of variation of estimators around their mean has been computed for all applied algorithms. Grouped into five classes - <0.05; 0.05-0.1; 0.1-0.15; 0.15-0.25; and >0.25 – the distribution of these coefficients of variation is given in Graph Cv.*

Graph Cv



In almost two thirds of the cases, the coefficient of variation does not exceed 0.1, which indicates a relatively high similarity of the computational output obtained through the five mentioned econometric algorithms. This could be interpreted as accrediting the robustness of the adopted econometric specifications. Nevertheless, the differences among methods are significant.

6.1.3. *The final decision with respect to the estimation technique was based on the predictive performance of the compared econometric results.*

- The system has been solved as a simulated exercise using successively each of the above mentioned five sets of econometric parameters. The data for 2011 were used as values for exogenous variables. In most cases, the estimations were close enough. At the same time, there were important disparities, including completely unexpected results.
- In order to obtain a global image of the predictive performance of the compared sets of econometric parameters, the relative squared error has been calculated. Surprisingly, its minimum level was obtained in the case of the OLS estimators. Consequently, OLS was selected as the solving algorithm for further forecasting simulations.

6.2. *The second group of econometric equations reflects preponderantly the sectoral structure of the economy. They are the input-output technical coefficients, the sectoral weights of the final output, and the sectoral energy-intensities of production.*

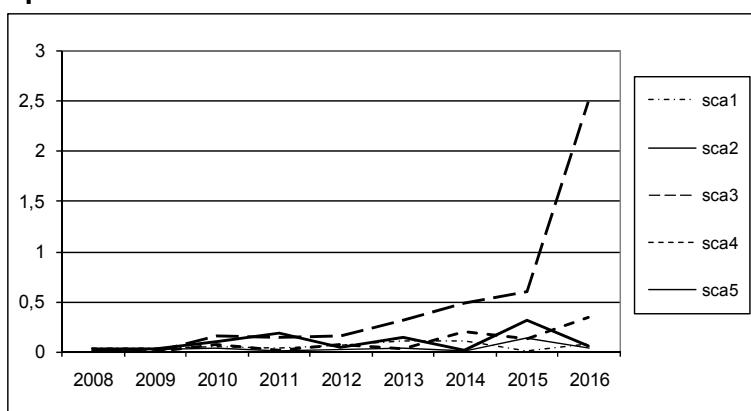
6.2.1. *The corresponding system contains 120 equations with 491 estimators (10 dummies are also added). It has been solved by OLS and WLS. The SUR method did not work. We should notice that both the OLS and the WLS estimators are identical; some minor differences appear only in the t-Statistic.*

6.2.2. The problems which could appear in the forecasting applications were examined in detail on the example of the A matrix.

- As an exercise, based on the OLS estimators, the successive annual levels of a_{ij} for 2010-2016 years have been computed. The obtained series fluctuated in a broad enough range. In order to facilitate this discussion, the simple change rates (module) of the technical coefficients were calculated for the ten columns of a_{ij} ($sca_j = \sum_j a_{ij}$ with j =fixed), according to the formula: $CRMs_{j,t} = ((sca_{j,t}/sca_{j,t-1} - 1)^2)^{0.5}$

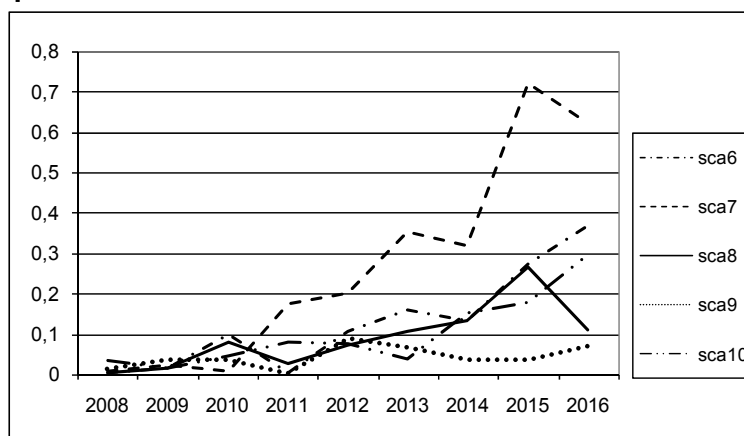
The results are presented in two graphs, the first for the projected evolution of sca1-sca5, and the second for the forecasted sca6-sca10.

GraphCRMs1: CRM of sca1-sca5 Based on OLS Estimators



Both graphs reveal a notable instability of sca_j projected with OLS estimators of SySs, especially after 2-3 years of the forecasted period. At the level of a_{ij} this volatility is higher. More alarming is the appearance in the forecasting period of some negative technical coefficients, (a_{ij}).

GraphCRMs2: CRM of sca6-sca10 Based on OLS Estimators



This is why a simple moving average (of three terms) has been also computed:

$$a_{ij,t}=(a_{ij,t-3}+a_{ij,t-2}+a_{ij,t-1})/3$$

As expected, the extrapolated colsums become in time quasi-stable. Consequently, a method using a weighted average of the two estimators – the OLS estimators and the simple moving average – was adopted in order to forecast the technical coefficients:

$$a_{ij,t}=(a_{ij,t-3}+a_{ij,t-2}+a_{ij,t-1}+oa_{ij,t})/4$$

where: $oa_{ij,t}$ is the forecasted level approximated by OLS estimators.

II. Predictive Simulations for 2014

The 2012 version of the macromodel has been already used in several forecasting medium-term applications. The present paper presents only the preliminary data for 2013 (based especially on statistics recorded in its first 2-3 quarters) and the predictive estimations for 2014.

1. For the 2014 forecast, two scenarios – basic and alternative – have been built.

The quantitative framework of simulations is characterized by several demographic data, the main indicators of international situation, expert forecasting estimations for agriculture and for the domestic economic environment perceived by the operators, structural parameters for the public budget and monetary policy.

1.1. The main hypotheses are common for both mentioned scenarios.

- The external economic situation remains relatively critical due, especially, to the persistence of crisis effects on the European Union.
- The internal business environment is marked by institutional uncertainties, many structural reforms in progress, unconsolidated credibility on foreign capital markets. As a result, the expected output gap ameliorates slowly.
- On the other hand, after the important recovery of agricultural production in 2013, the sector will continue to grow, but at a modest rate.
- Concerning the general consolidated budget, the simulations are realized considering small changes in taxation. Only the impact of the reduction in the value added tax on some food products has been included. One may notice a reduction in the number of salaried persons in the budget sector.
- The Government measures adopted during 2013 have led us to predict an improvement in the European funds absorption degree.
- A moderate evolution of the gross disposable income is assumed, as a result of a more flexible labor market and a rationalization of the public expenditures.
- Therefore, the monetary base is projected to have similar dynamics. A slight decrease in the interest rate has been also predicted.
- The foreign currency reserves of the National Bank of Romania remain approximately constant.

1.2. Two differences characterize the alternative scenario comparatively to the basic one.

- In the next year, a double-ballot, elections for the **European Parliament** (May) and for the Romanian Presidency (November), is scheduled. The probability that such a context would induce a slow-down of the structural reforms is significant.

Consequently, the alternative scenario was computed assuming a lagged adjustment in of the budget sector (especially its employment) and, also, a higher pressure on the nominal revenues, in general.

- Such an “agitated” domestic political atmosphere and possible future international tensions could keep the uncertainty of economic environment at a high level, which evidently would discourage investment and other factors favoring a compression of the present significant negative output-gap.

2. The results of simulations for 2013-2014 years are presented in Table 2, compared to the 2013 Autumn Forecast projection of the National Commission for Prognosis.

Table 2

Results of Macromodel Simulations for 2013-2014 Years – Synoptic

Indicators	Symbol		2012	2013	Base Sc. 2014	Altern. Sc. 2014
Gross domestic product, current prices, bill. RON	GDP	NCP		625.6	658.6	
		Model	587.4994	627.4839	669.2077	670.7443
Index of gross domestic product, constant prices (previous year=1)	IGDPc	NCP		1.022	1.022	
		Model	1.006888	1.023887	1.026249	1.016756
Index of households consumption, constant prices (previous year=1)	ICHc	NCP (market)		1.003	1.018	
		Model	1.006283	0.99653	1.01411	0.98339
Index of public consumption, constant prices (previous year=1)	ICGc	NCP		1.000	1.017	
		Model	1.065881	1.023061	0.985384	1.005476
Index of gross fixed capital formation, constant prices (previous year=1)	IGFCFc	NCP		0.987	1.051	
		Model	1.049871	1.027966	1.059844	1.018505
Export of goods, bill. EURO	XGE	NCP		48.2	51.7	
		Model	45.056	46.40817	50.26808	50.27462
Import of goods FOB, bill. EURO	MGE	NCP		52.7	52.2	
		Model	52.43	56.47727	61.23871	60.67803
Current account, bill. EURO	CAE	NCP		-1.48	-1.91	
		Model	-5.151	-7.3585	-8.66699	-8.3899
Ratio to GDP of the current account	rCAE	NCP		-0.010	-0.013	
		Model	-0.03907	-0.05211	-0.05764	-0.05611
Unemployment rate, ILO definition	Ru	NCP		0.073	0.07	
		Model	0.07037	0.071879	0.070667	0.072811
Registered unemployment rate	Ru1	NCP		0.049	0.048	
		Model	0.055	0.059776	0.058312	0.061531
Consumer price index (previous year=1)	CPI	NCP		1.041	1.024	
		Model	1.0333	1.048668	1.03048	1.065174

Indicators	Symbol		2012	2013	Base Sc. 2014	Altern. Sc. 2014
Industrial production price index (previous year=1)	IPPI	NCP		1.024	1.020	
		Model	1.0612	1.04701	1.043951	1.043951
Gross domestic product deflator (previous year=1)	PGDP	NCP		1.042	1.030	
		Model	1.04809	1.043141	1.039215	1.051327
Exchange rate RON/EURO	ERE	NCP		4.42	4.45	
		Model	4.456	4.443329	4.450641	4.485896
Employment, mill. persons, AMIGO definition	E	NCP		9.32	9.46	
		Model	9.263	9.12089	8.961894	8.941216
Salaried persons in economy, mill. persons, AMIGO definition	ES	NCP		6.27	6.36	
		Model	6.2294	6.130077	6.074172	6.222619
General consolidated budget revenues, bill. RON	BR	MPF, NCP		209.285	221.9211	
		Model	193.1482	211.7103	225.54	224.8156
General consolidated budget expenditures, bill. RON	BE	MPF, NCP		222.691	235.957	235.957
		Model	207.9221	226.0138	240.9268	251.8517
General consolidated budget balance, bill. RON	BB	MPF, NCP		-13.406	-14.0359	-14.0359
		Model	-14.7739	-14.3035	-15.3868	-27.0361
Ratio to GDP of the general consolidated budget balance	Cbb	MPF, NCP		-0.02151	-0.02125	-0.02125
		Model	-0.02515	-0.0228	-0.02299	-0.04031

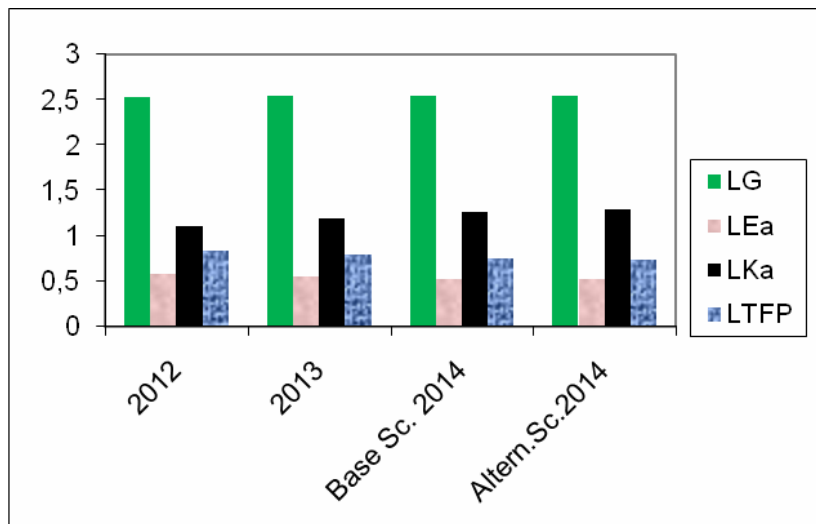
3. Therefore, the economic growth continues to be positive, but modest.

3.1. In order to reveal its main supply-side determinants, some auxiliary indicators reflecting the global output, (LG), employment, (LEa) and capital, (LKa), effects, and also the so-called total factor productivity (LTFP) were computed, as follows:

- $LG = \log(GDP05)$
- $LEa = \log(E^{\alpha})$
- $LKa = \log(K05^{(1-\alpha)})$
- $LTFP = LG - (LEa + LKa)$

Their evolution during 2012-2014 is plotted in Graph Output1.

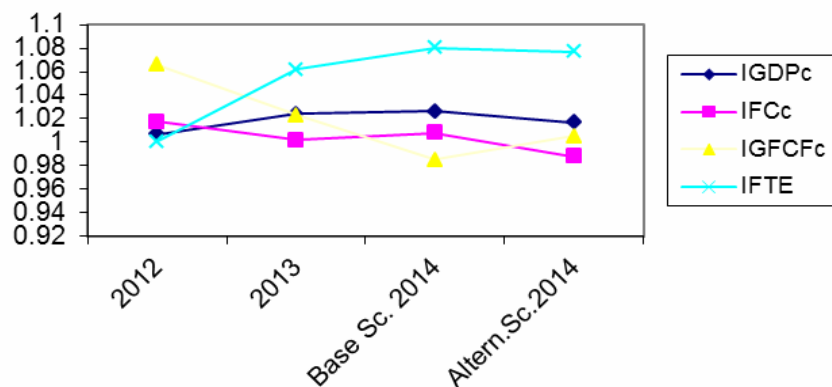
Graph Output1



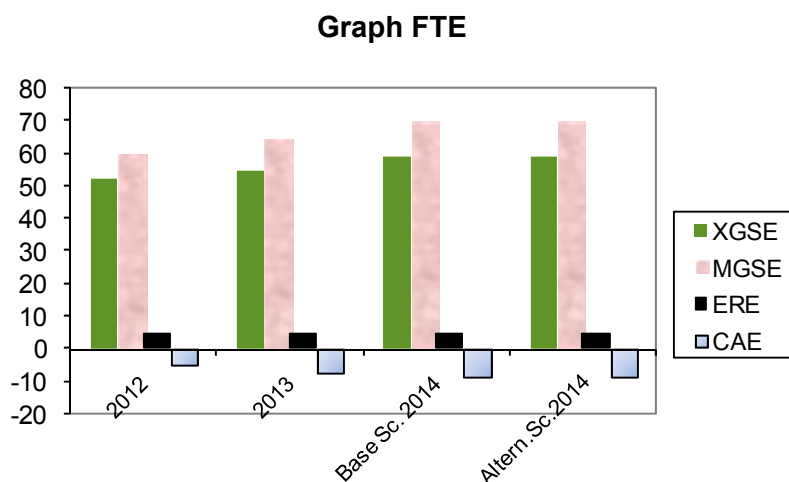
As Graph Output1 shows, both employment and total factor productivity slightly reduce their relative contribution to economic growth. This is based preponderantly on the capital dynamics.

3.2. On the another hand, the demand-side approach reveals the major role of the foreign trade in economic growth. The Graph Output2 presents the annual indices at constant prices of the gross domestic product (IGDPc), the final consumption (IFCc), the gross capital formation (IGFCFc), and the foreign trade in EURO (IFTE).

Graph Output2



4. In order to outline that the expanding foreign trade has been obtained under a relatively stable exchange rate of RON to Euro (ERE), this is plotted in the Graph FTE, together with the volume of exports, imports, and the balance of payments of the current account, all in Euro.



According to the macromodel simulations, the ratio of the current account to GDP remains between 5.2 and 5.8%, which can be considered as sustainable under the present international financial circumstances.

5. The structure of the economy is approximated by the weights of the sectoral gross value added (wgvai), presented in Table 3.

Table 3

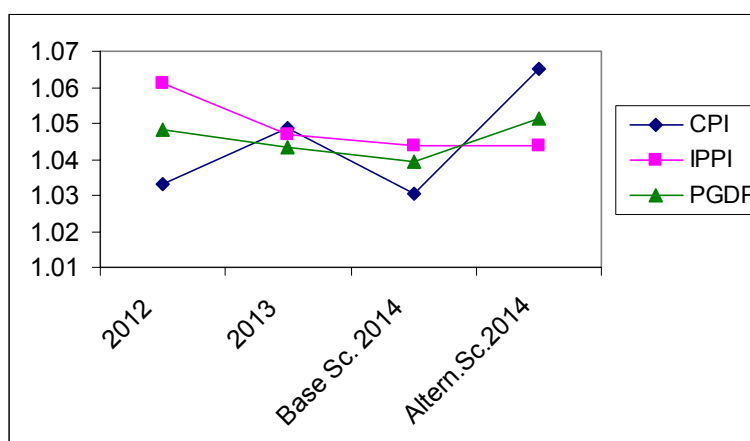
Sectoral Structure of the Economy (wgva_i)

Sectors	2012	2013	Base Sc. 2014	Altern. Sc. 2014
wgva1	0.060135	0.065933	0.063301	0.063301
wgva2	0.016933	0.015066	0.014992	0.014992
wgva3	0.043834	0.03835	0.039143	0.039143
wgva4	0.063293	0.040914	0.037202	0.037202
wgva5	0.047684	0.047009	0.048104	0.048104
wgva6	0.082718	0.102939	0.103382	0.103382
wgva7	0.070724	0.0699	0.067497	0.067497
wgva8	0.098187	0.108347	0.107751	0.107751
wgva9	0.107591	0.098281	0.103022	0.103022
wgva10	0.408901	0.413262	0.415605	0.415605
Total	1	1	1	1

Therefore, both scenarios for 2014 are structurally similar. From this point of view, the changes compared to the previous years are also small enough.

6. A prudent monetary policy of the National Bank of Romania allows to keep the inflation, measured by the GDP deflator (PGDP), consumer price index (CPI), and industrial production index (IPPI), at a low level (see Graph Prices).

Graph Prices



The differences registered between the basic and alternative scenarios for 2014 result first of all from their real output discrepancy.

7. The energy efficiency ameliorates, under practical stabilization of CO2 emissions as a main indicator of pollution (Table 4).

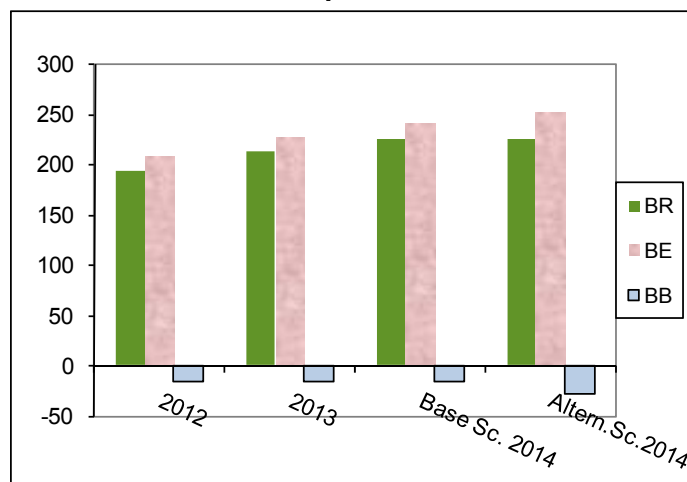
Table 4

Primary Energy Consumption and CO2 Emissions

	Symbol	2012	2013	Base Sc. 2014	Altern.Sc.2014
Global energy-intensity of the economy, koe per thou. RON-GDP05	Egl	122.8613	113.4291	109.4408	109.8385
Recalculated total consumption of primary energy, thou. toe	RECCER	41520.05	39248.15	38862.16	38642.56
CO2 emissions, mill. t	CO2	107.1663	107.63	110.3807	109.757

8. The Graph GCB illustrates the revenues (BR), expenditures (BE), and resulted balance (BB) of the general consolidated budget (billion RON).

Graph GCB



The ratio of the public deficit to GDP represents approximately 2.3% in 2013 and the basic scenario for 2014. Instead, the alternative scenario for 2014, involving a delay in sector budget reforms, would push it up to 4%. Consequently, the ratio of the public debt to GDP would reach 41.6% in the basic scenario and 43.2% in the alternative one.

III. Closing Considerations

1. Two remarks seem noteworthy with respect to the predictive simulations for 2014, detailed in Table 2.

1.1. The **Basic Scenario** has been constructed under hypotheses similar to those adopted by the Government in consensus with the International Monetary Fund, the European Commission, and the World Bank. The main indicators of this scenario are close to the 2013 Autumn Forecast projections of the National Commission for Prognosis (nominal and real gross domestic product, domestic absorption, foreign trade, inflation and exchange rate, ratio of the public budget deficit to GDP).

The most important difference between the macromodel estimations and the NCP forecast in the current account does not appear due to the differences in the surplus of imports against the exports of goods, but mainly from other positions of the balance. This question has to be further studied.

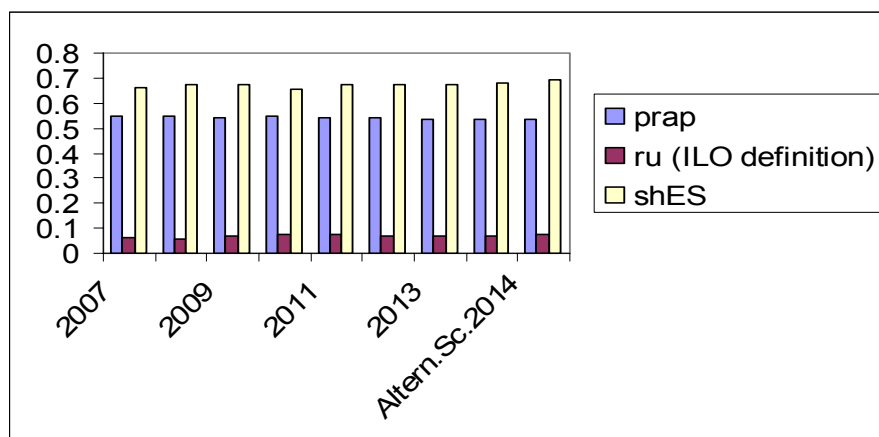
1.2. The **Alternative Scenario**, due to the modified assumptions adopted, is characterized, as compared to the basic scenario, by worsened indicators, especially those related to the dynamics of the real output, investment process, inflation, and the rate of public budget deficit. In other words, if the basic scenario could be considered as a slight, but sound economic recovery, the alternative one preserves de facto the stagnation under an accentuated inflationary pressure.

The projection for 2014 is significant in a larger retrospect of the eight year period after the integration of Romania into European Union. Our final comments will address, therefore, three questions: the characterization of the post-crisis state of the Romanian economy, its degree of readiness to enter the Eurozone, and the practical abilities of the new version of the macromodel revealed by the simulations.

2. How should we evaluate the economic potential of Romania in the middle of the present decade?

2.1. The framework of the labor force dynamics is represented in Graph LF, containing series for the labor force participation rate (*prap*), unemployment rate according to ILO definition (*ru*), and the share of the number of salaried persons in employment according to AMIGO definition (*shES*).

Graph LF: Structural Parameters of the Labor Force

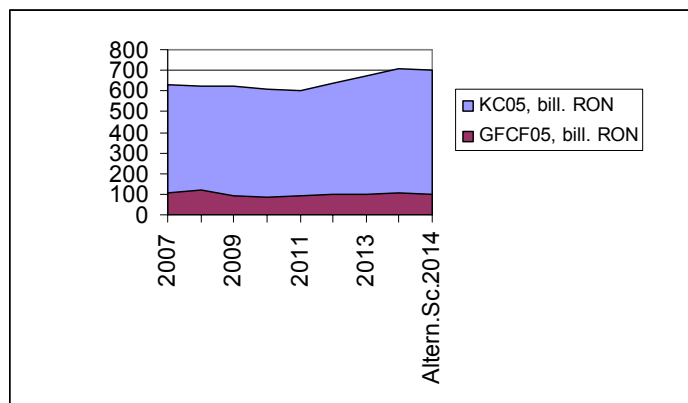


Therefore, before 2011 the participation rate exceeded 54%, while during the subsequent years it has systematically decreased to this level. If this trend is maintained, it could have serious consequences for the future development of the country.

Another problem refers to employment itself. In the absence of significant macroeconomic policies stimulating the business environment, it seems improbable that the compression of the number of salaried persons in the public sector (according to the adjustment reforms) will be reabsorbed by the private firms.

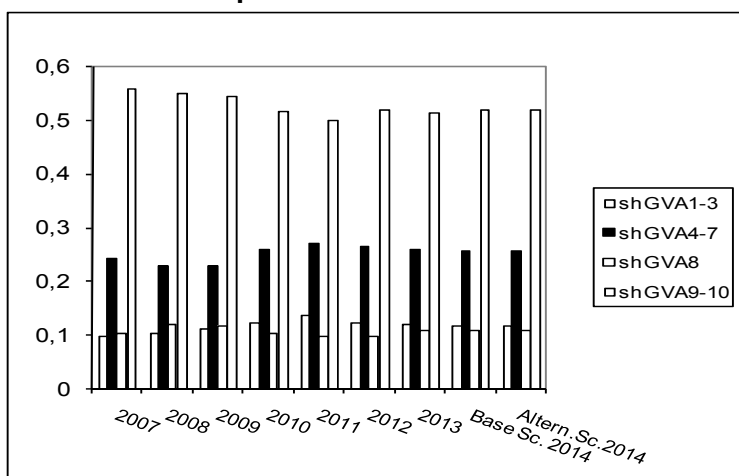
2.2. After the most acute crisis years (2009-2010), the gross fixed capital formation returns to an ascending path. The stock of tangible fixed assets at constant prices witnesses also a notable growth (Graph K).

Graph K: Capital (2005 Prices)



2.3. There are also some structural changes. For more clarity, the branch-classification will be compressed into four mega-sectors: primary (positions 1-3 in the macromodel), manufacturing industries (4-7), construction (8), and services (9-10). According to the forecast, their share in the gross value added of the Romanian economy will change as follows (see Graph S).

Graph S: Sectoral Structure



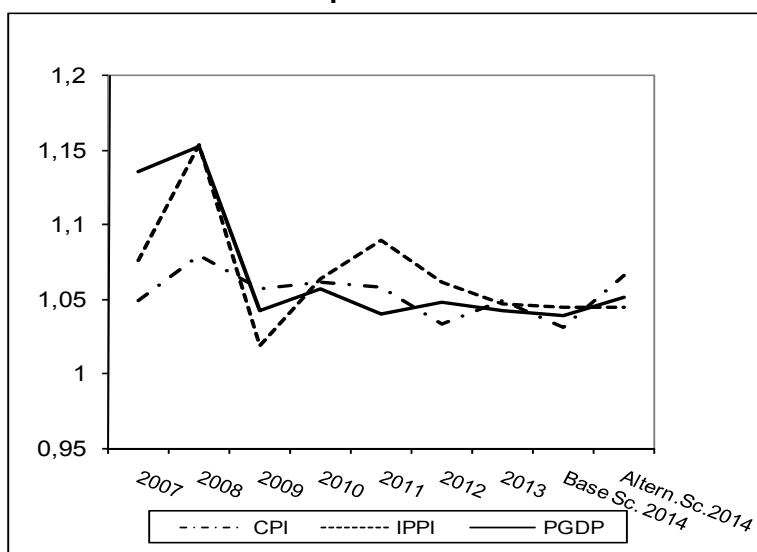
- The share of the primary mega-sector expanded, especially during recession (from 9.76% in 2007 to 13.53% in 2011). Despite the slight reduction during the last years, this share continues to be higher than the pre-crisis level.
- The share of the manufacturing industries also improves, tending to stabilize at 25-26% of the total gross value added.
- Because of the inertial feed-back of recession, the constructions generally stagnate.

- An indubitable reduction can be seen in the case of services (from 55.73% to 51.86% in 2014). Probably, such a correction is more compatible with the actual development stage of the Romanian economy.

3. The nominal macroeconomic parameters and the main equilibriums were positive during the last years.

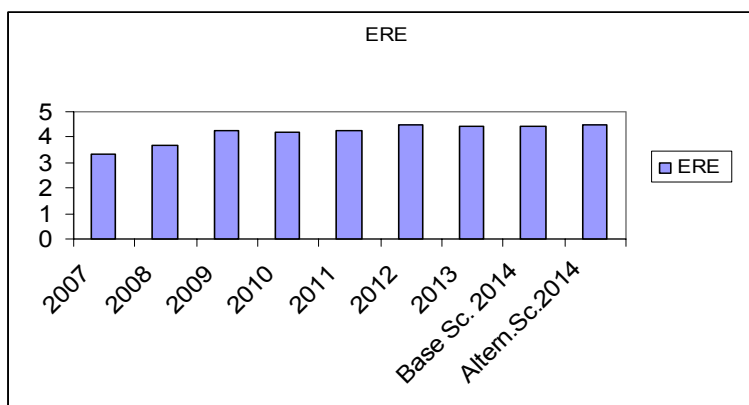
3.1. The leading price indices (GDP deflator – PGDP, consumer price index – CPI, and industrial production price index – IPPI) change within a narrow range (Graph P).

Graph P: Prices



3.2. The volatility of the exchange rate (RON/Euro) was also attenuated (Graph ERE).

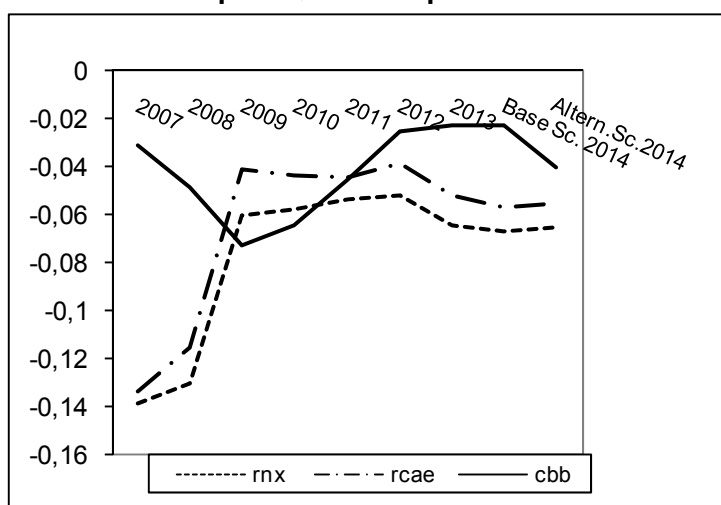
Graph ERE: Exchange Rate



The National Bank of Romania has reduced successively the monetary policy interest rate, as an important premise for diminishing the interest practiced by the commercial banks.

3.3. The public budget construction, together with the improvement in the foreign trade balance, allowed during the last years for keeping the most important domestic and external macroeconomic equilibriums within sustainable limits (Graph EQ).

Graph EQ: Main Equilibriums



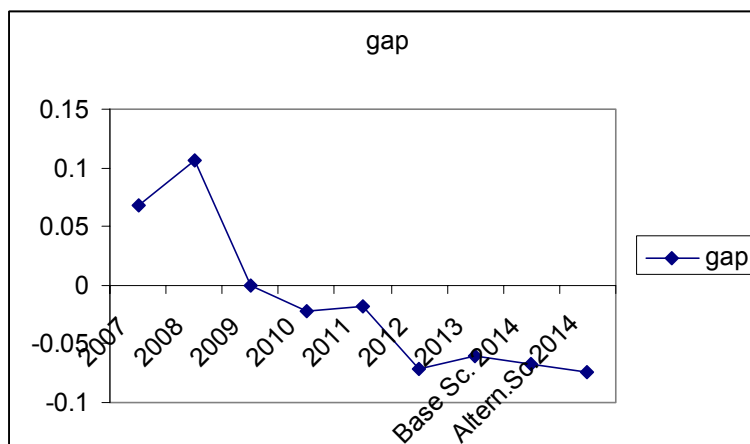
As expected, the ratio of the current account (rcae) to GDP is similar to the same indicator computed for the net export (rnx). The public budget deficit (cbb) is firmly set inside the limits established by European Union for the member countries. Consequently, the public debt also changes within a very narrow range.

3.4. According to the present macromodel estimations, the openness degree of the Romanian economy will increase from 0.72 in 2006 to 0.85-0.86 in 2014 – a sign of an advanced integration of the Romanian economy into the European Union and into the international foreign trade, in general.

4. Certainly, the conservation of these domestic and external equilibriums would create favorable premises for a subsequent healthy, medium and long-run economic growth.

4.1. The Graph O presents the relative **output gap** ($gap = GDP05/GDPP05-1$).

Graph O: Relative Output Gap



Therefore, after the pre-crisis period characterized by relatively high positive output gaps, the Romanian economy witnessed successive negative gaps. For 2014, the macromodel simulations place this gap at around -7%. In other words, the Romanian economy has two reserves for accelerating its economic growth: a) the increase in the potential output itself and b) a better utilization of the existent capital endowment (physical and human), i.e. the decrease until zero in the present negative output gaps. Both ways need a significant improvement in the business environment, by consolidating the legal framework of economic activity, and by fighting more effectively against corruption, fiscal evasion and bureaucracy.

4.2. It is worth mentioning that the macromodel estimations (especially for the general consolidated budget deficit, inflation, exchange rate, public debt) seem to be encouraging regarding the prospects of the Romanian economy for entering the ERM2. There are, of course, many problems that have to be discussed in such a context (Allam, 2009; Dulkys, 2009; Chang, 2010; European Commission, 2013; Lastra and Louis, 2013).

One of them concerns the relationship between inflation and dynamics of the exchange rate, which influences the conversion rate, RON/Euro (CRE). At the moment the Euro is adopted, the established CRE affects all the prices and nominal revenues. As a result, it is important to reach - until entering the ERM2 - a **comparative price level** (CPL) bearable by the domestic economy, but compatible with the Euro Area. The following table presents this indicator computed for the final consumption by households, including indirect taxes, as ratios to the average level of EU28 (Eurostat, 2013).

Table 5

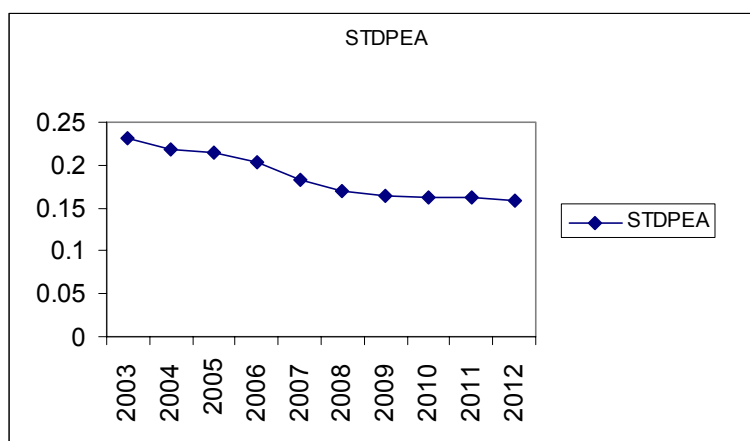
Comparative Price Levels (CPL) in the Euro Area

Year	Austria	Belgium	Cyprus	Estonia	Finland	France	Germany	Greece	Ireland
2003	1.035	1.068	0.911	0.622	1.269	1.102	1.064	0.861	1.267
2004	1.035	1.07	0.914	0.632	1.241	1.102	1.05	0.878	1.262
2005b	1.027	1.066	0.905	0.648	1.238	1.084	1.035	0.884	1.237
2006	1.021	1.079	0.905	0.686	1.229	1.087	1.028	0.892	1.247
2007	1.027	1.076	0.884	0.735	1.198	1.082	1.019	0.899	1.242
2008	1.053	1.105	0.878	0.768	1.209	1.109	1.037	0.918	1.298
2009	1.079	1.123	0.898	0.773	1.24	1.122	1.07	0.95	1.256
2010	1.054	1.113	0.896	0.764	1.231	1.109	1.045	0.958	1.183
2011	1.065	1.111	0.89	0.78	1.249	1.103	1.033	0.957	1.165
2012	1.059	1.096	0.882	0.801	1.241	1.093	1.02	0.931	1.152
Year	Italy	Latvia	Luxembourg	Malta	Netherlands	Portugal	Slovakia	Slovenia	Spain
2003	1.039	0.545	1.035	0.722	1.08	0.862	0.508	0.764	0.886
2004	1.052	0.562	1.033	0.734	1.064	0.876	0.55	0.757	0.912
2005b	1.049	0.571	1.118	0.731	1.049	0.852	0.555	0.762	0.913
2006	1.044	0.608	1.115	0.749	1.042	0.851	0.581	0.768	0.919
2007	1.026	0.667	1.149	0.756	1.022	0.858	0.633	0.79	0.93
2008	1.026	0.751	1.173	0.775	1.042	0.88	0.699	0.829	0.952
2009	1.048	0.76	1.215	0.78	1.079	0.892	0.732	0.879	0.977
2010	1.031	0.733	1.222	0.775	1.084	0.878	0.713	0.87	0.971
2011	1.046	0.738	1.231	0.78	1.083	0.872	0.725	0.859	0.973
2012	1.047	0.749	1.22	0.783	1.082	0.868	0.716	0.851	0.956

Based on this data, two series of standard deviations against the mean of EU28 (equals to 1) were computed:

- a) the annual levels for the entire sample (denoted by STDPEA) and,
- b) the country levels for the entire period (denoted by STDPC). The first series is plotted in Graph STDPEA.

Graph STDPEA



Some reduction is evident, but in the last years STDPEA is maintained around 0.15. The country levels are detailed in Table 6.

Table 6

Country Levels STDPC for 2003-2012

Austria	Belgium	Cyprus	Estonia	Finland	France
0.049011	0.092928	0.10438	0.286371	0.235256	0.10003
Germany	Greece	Ireland	Italy	Latvia	Luxembourg
0.0433	0.09334	0.235337	0.041838	0.342052	0.166992
Malta	Netherlands	Portugal	Slovakia	Slovenia	Spain
0.242503	0.066196	0.131699	0.367956	0.192919	0.067904

Therefore, in individual cases this indicator exceeds 0.15, reaching sometimes even 0.35 in the entire 2003-2012 decade. But even in the last year, the country CPLs are placed between 0.716 and 1.241.

Consequently, for Romania, a CPL of 0.7-0.75 could be admitted as a reasonable target for the Euro Area pre-accession strategy. Obviously, such a problem would need a separate analysis, taking into account that the CPL for 2012 was estimated for Romania at 0.574. However, it is essential to remember that CPL cannot be arbitrarily influenced. The researches grouped around the famous Harrod-Balassa-Samuelson theorem and Penn Effect have demonstrated the organic link of CPL with the real economy, more specifically with the stage of its development.

5. At the end of the paper, it is necessary to point out several issues regarding the macromodel itself.

5.1. Despite the remarkable efforts of the NCP specialists and of the modeling team, the database - on which the econometric relationships have been built – could not avoid some vulnerabilities: very short and fractured series, frequent changes in statistical information, absence, in many cases, of stationarity in levels, incoherence among inter-related indicators, etc. Consequently, it was necessary to use indirect

algorithms of retro- and extrapolating data, and to accept some specification compromises (first of all, related to the colinearity effects), which can induce thorny problems in practical applications.

5.2. *In order to minimize the subsequent implications, two modeling innovations have been adopted.*

5.2.1. Beside the usual accounting and behavioral relationships, the macromodel – taking into consideration the experience of its previous version – contains several so-called latent anchoring parameters. From this point of view, three fields were involved in the 2012 version: global output, foreign trade, and prices (this solution being already adopted in the 2005 version).

These latent anchoring parameters ensure the computational compatibility of some inter-connected equations. Thus, the above predictive simulations have used such parameters for different years.

5.2.2. No econometric specification can cover the entire complexity of the real processes, especially when they are very dynamic, as in the most emergent economies. Consequently, the macromodel allows for the introduction of some expert corrective coefficients, as exogenous variables with two main goals:

- a) to reflect better the implications of possible discretionary influences (Government and other authorities, National Bank, trade-unions, etc);
- b) to attenuate clearly implausible econometric estimations.

5.3. *These solutions extend the flexibility of the macromodel, but – on the another hand – increase the responsibility of users, the forecasting becoming an increasingly interactive (human-computer) procedure. Two traps must be carefully avoided.*

Due to its complicated structure and circumstances in which econometrics was estimated, the macromodel offers somehow reliable estimations only on short-medium term. An excessive increase in the forecasting temporal horizon is very risky. The results obtained in such cases could significantly distort our image of future economic developments.

Second, special caution is necessary when we use latent anchoring parameters and expert corrective estimations. Any manipulating temptation, which can accompany the utilization of such techniques, must be avoided.

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