Accounting and forecasting of the quarterly GDP[1]

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1. Short history of the Romanian national accounts

In Romania, the national accounts are elaborated by the National Institute of Statistics (NIS). Starting from the 80's, the System of National Accounts (SNA) has been used in the national accounting, together with the System of National Production (SNP), but until 1989, only the macroeconomic aggregates based on SPM have been issued. For 1989 and 1990, a method of conversion from SNP to SNA has been used. Since 1991, the computations have been performed according to the European System of National Accounts (ESA), version 1979.

Starting with 1998, Romania started using the European System of National and Regional Accounts, which was a revision of the previous 1979 version. The improvements consisted in harmonizing the methodology, increasing the precision and the accuracy of concepts, definitions, classification and accounting rules. ESA 95 is by and large consistent with the System of National Accounts of the United Nations (SNA93) with respect to definitions, accounting rules and classifications. However, there are some differences, due to the fact that the European Union requires better accuracy of the definitions and accounting rules.

The NIS issued and published two tables for each year starting with 1990 to 2004. The Input – Output table (detailed on 105 branches and products for working purposes and published on 34 branches and products) in current prices and previous year's prices, and the Integrated Table of the institutional sectors (for five sectors: commercial companies, government, households, non-profit companies serving households, the rest of the world), in current prices. At the present, the 2005 tables are under work.

Three versions of the accounts are compiled, depending on the available data: provisional, semi- final and final. The above mentioned tables are published only for the final version. All versions of the national accounts are issued in a short format in the Monthly Statistical Bulletin and in the Quarterly Statistical Bulletin.

The European Monetary Union (EMU) has proposed as an objective the estimation of a quarterly economic indicator, useful for certain analysis, comparisons or for taking decisions on short term, both at national level and the EU level for the benefit of the European institutions, governments, the European Central Bank, the National central Banks and economic and social agents. In order to fulfill this objective, the Eurostat has decided to draft a Quarterly National Accounts Manual, in which to harmonize the quarterly national accounts, as part of the National Accounts System. This manual offers both to member states, candidate states, but also to the non- European countries interested to develop the quarterly national accounts, a harmonized approach and a set of recommendations for computing the quarterly accounts.

[1] The paper includes findings of the research performed during the construction of a quarterly model, coordinated by Mr Emilian Dobrescu, together with experts from National Commission for Prognosis and researchers from Economic Forecast Institute, within the Romanian Academy.

Following the extremely rapid structural changes of the Romanian economy at the beginning of the transition years, the necessity to observe and quantify certain macroeconomic aggregated, especially the gross domestic product not only annually but also on a shorter interval became apparent.

Starting in 1997, NIS issued national quarterly accounts in response to the need of Romanian agents to analyze business cycles with a shorter frequency than the year.

In Romania, the quarterly accounts computations have to be finished in less than two months after the reference period, have to accurately present the reality of the national economy. The methods employed are based on the sources of available data, in particular the statistical and administrative data. Thus, the quarterly GDP is computed using production and expenditure methods, which offers the possibility to check the GDP's consistency in level and volume.

The estimations are published in the CESTAT Statistical Bulletin (drafted in cooperation with institutions and statistical offices from the member states joining the free exchange agreement CEFTA: Bulgaria, the Czech Republic, Hungary, Poland, Slovenia and Slovakia). Starting with 2002, the CANSTAT Statistical Bulletin (drafted in cooperation with institutions and statistical offices from candidate states to EU: Bulgaria, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovenia, and Slovakia) published these information as well. And from 2004, NIS has published the estimations in its Quarterly Statistical Bulletin.

The quarterly accounts are compiled in an aggregated version, respectively by four sectors (agriculture, industry, constructions, services) and by several components of expenses (final consumption – detailed by households, government, non-profit institutions), gross fixed capital formation, changes of the inventories, exports and imports of goods and services).

The quarterly national accounts in constant prices are computed in the previous year of the corresponding quarter prices, following the information provided by data sources (foremost the price and volume indices).

2. The data sources

- The structural survey of enterprises (carried out yearly by NIS), provides detailed information regarding the activity of enterprises from all economic sectors, by ownership type, represents an important source for estimating the output, the intermediate consumption and the gross value added by sectors.
- The integrated households survey (conducted monthly by NIS), includes information regarding the living conditions of population (the structure of households, the educational level, the health situation of population, the number and type of dwellings, the ownership of durable goods, the employment status, household income and expenditure, the savings, etc.). The sample consists of persons present, temporarily absent (less than six months) or absent for a period longer than 6 months and who contribute totally or partially to a household budget (income and/or expenses).
- The household labor force survey – AMIGO (developed quarterly by NIS) is the main source of information regarding the employment and unemployment. The population, which is the focus of the survey, is composed by permanent residents of Romania, aged 14 and over, who contribute entirely or partially to the income and expenses of the households. Conscripts, pupils, students, hospitalized persons are included.

- Accounting documents drafted by private or state owned companies, banks, insurance companies, unions, political parties, religious organizations in observance of the accountancy law, are processed by the Ministry of Finances (MEF) and used by NIS.
- The execution of the general consolidated budget.
- The execution of autonomous public institutions budgets, financed entirely or partially from extra-budgetary funds, which are subordinated to ministries, public administration - central or local.
- Income statements of private entrepreneurs and family associations. They are centralized by MEF and used by NIS, for information regarding the household sector.
- The balance of payment drafted by the National Bank of Romania, according to the IMF methodology.
- Other sources, as the INTRASTAT system, statistical surveys of the imports and exports of goods, retailing, agricultural products balance, the annual survey regarding construction and dwellings.

3. **GDP Accounting**

GDP accounting is performed in Romania using 2 methods: the production method (by fields of activity) and the expenditures method, in current prices and previous year prices/the prices of the corresponding quarter in the previous year, with yearly and quarterly frequency.

As the quarterly accounts adopt the same framework as the yearly accounts, it is necessary to ensure consistency. Thus, in the case of flow variables, as GDP, the sum of the quarterly data is equal to the annual values.

In Romania, the data regarding the national quarterly accounts are not yet seasonally adjusted.

The quarterly national accounts data in constant prices are computed on the basis of the corresponding quarter of the previous year, resulti9nf form the information provided by the data sources (price and volume indices).

Revisions are a common feature of both yearly and quarterly national. Nevertheless, the revisions are more significant for the quarterly accounts because the quarterly information is more likely to change, as new and better data becomes available.

In the same time with the revisions, the figures are analyzed in comparison with the previous ones, in order to identify the changes of the initial estimations and to include them in published data. Any revision policy follows the principle of issuing the best available data. For this reason, reviews are regarded as an improvement in the quality of data and not as an independent problem.

When the yearly data are available, quarterly data are reviewed, in order to ensure consistency with the yearly figure in current prices. The same rule does not apply for figures in constant prices (the corresponding quarter of the previous year). The adjustments of the yearly data have also an effect over the quarterly figures.

The computation of the yearly accounts is performed independently of the computation of the quarterly accounts and the consequent harmonization represents the completion of the calculation process.

4. Difficulties

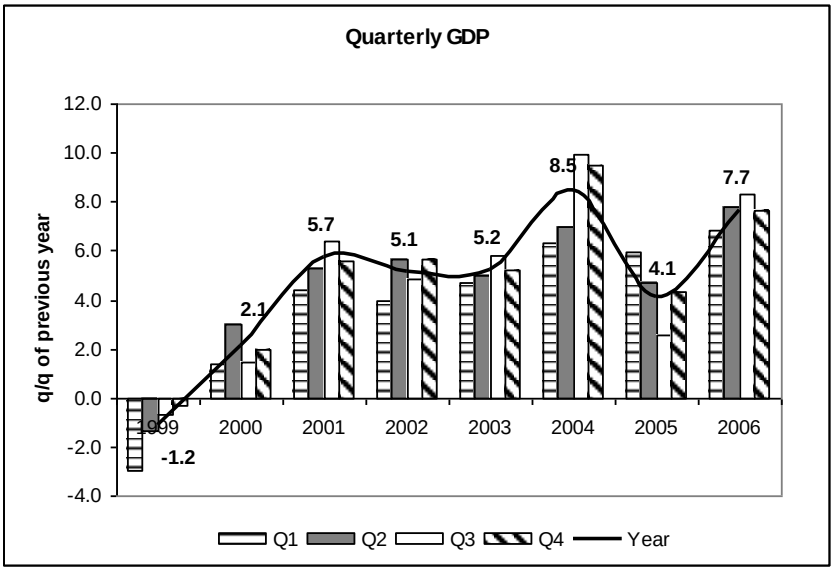
The transition of the Romanian economy from a sound centralized economy to a market economy led to many structural and legislative changes with impact on the available data for compilation of the national accounts and also on their comparativeness, with respect to the cover area and the calculation rules. The mathematical-economic methods were not yet applied, because the length of the time series did not allow this. At this moment, a certain stability of the economic growth has emerged, even if certain elements are fluctuating from quarter to quarter from the general growth trend.

The adjustments regarding the data sources and the methods implemented after 1989, represent the alignment of the Romanian statistical practices and standards to the international standards, with direct influence on quality improvement in the development of the national accounts.

5. Quarterly national accounts applications

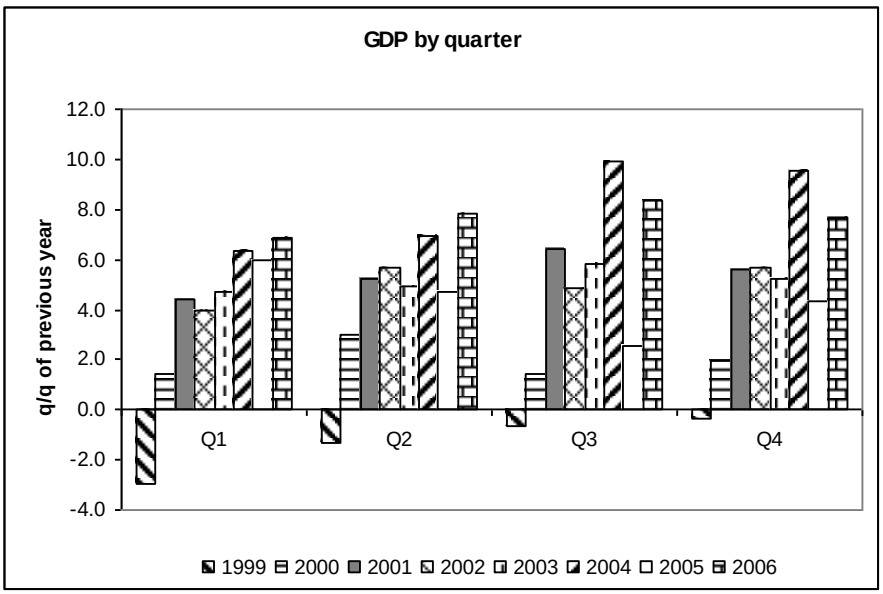
The quarterly national accounts are used in Romania to calculate the gross domestic product, while aggregates as: the national income, the disposable income, the net lending and borrowings are not yet computed.

The quarterly national accounts are very significant for the short term analysis (the current year) of the economic situation in Romania. Their importance derived essentially from the fact that they represent the only series of indicators that have a short term *lag*, able to provide an illustration of the economic activity.

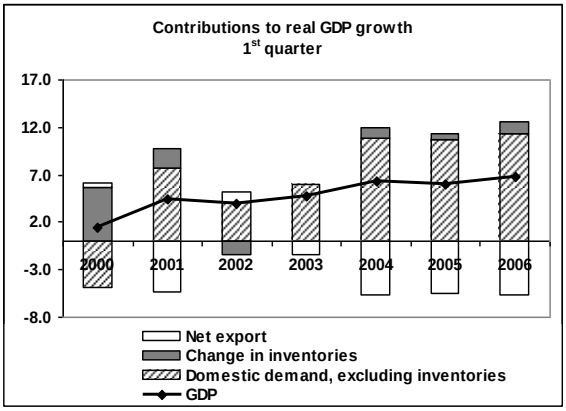


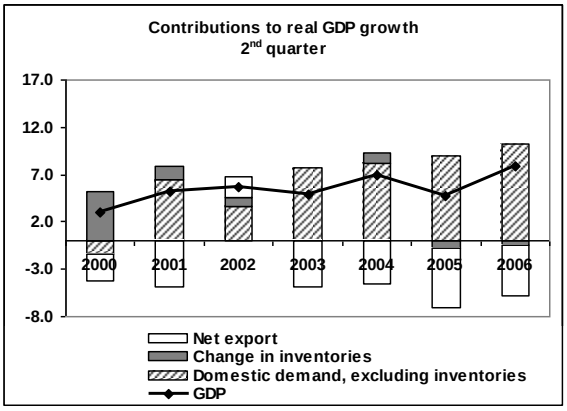
Looking at the quarterly developments it can be noticed that in general the first quarter of every year had smaller increases in comparison to the other quarters, while the third quarter had in general the highest rates.

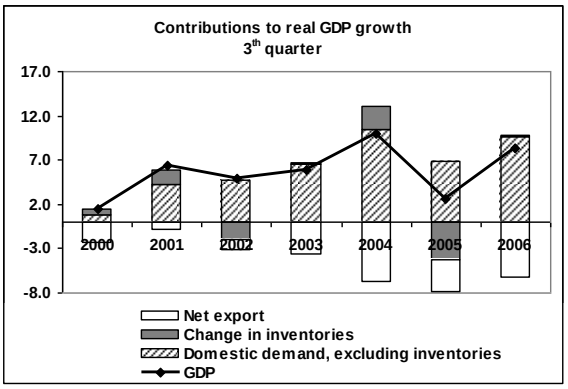
If we look at the evolution of each quarter during the period (especially because the quarterly data in Romania are computed against the corresponding quarter from the previous year) we can see an evolution with many inflexion points.

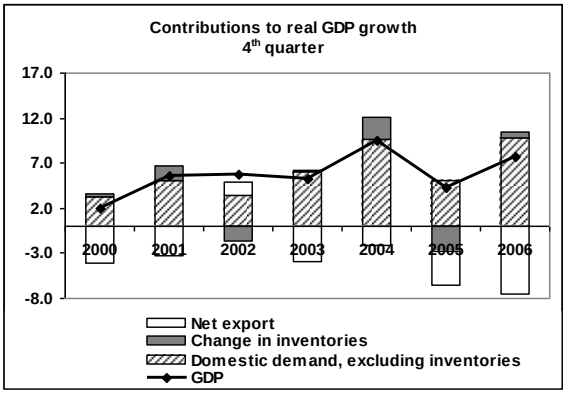


The analysis of the economic evolution is more important for the Romanian economic actors as it includes also other indicators, especially aggregate demand indicators, through which the user can see what item has contributed more to the positive or negative evolution of the economy.









6. Romanian economy quarterly model

The Romanian economy quarterly model is realized in collaboration with specialists from the Romanian Centre for Economic Policies (RCEP) and the coordination of Mr. Emilian Dobrescu, researcher, member of the Romanian Academy, the model being realized under PHARE RO2003/005-551.02.03 program: "*Strengthening the analysis capacity, macroeconomic forecast and the elaboration of economic policies within The National Commission for Economic Forecasting, Ministry of Economy and Trade and Prime Minister Cabinet*".

The development of a quarterly model, complementary with the annual one appeared as a necessity for the Romanian economy, having some practical advantages, worth to be mentioned: the fact that it permits the explicit integration of all the available quarterly information, with the condition for these not to be the subject for some major revisions in the forecast period, the possibility to take into account the effect of the quarter structure from the previous year (carry-over effect), and also the fact that the business cycles are better described by the quarterly data, which captures more precisely the dynamics and the structure of the delayed effects (lags) within a year.

In short term, the Romanian model is a Keynesian model, based on the demand. On the long term, it is a neoclassical model, with output determined by the factors of production. The long term equilibrium is determined by the supply. That's the way adopted in most of the analyzed countries (Belgium, France, Austria, Slovakia, Spain, and Montenegro).

The main difficulties in model construction are determined by the Romanian economy characteristics - a transition economy, still facing many distortions, only partially functioning in observance of free market economy laws. This fact has a direct influence in the data base (in the absence of the quarterly or annually National Accounts the majority of the data series were constructed starting from monthly or yearly data series) and also in the short, medium and long term behavior of the main model's variables.

The data base

The statistical series have quarterly frequency and cover the period 1990 Q1 – 2004 Q4. Generally, the data are obtained from the official statistics, but some data series raised special problems, the majority of the series being processed from monthly data series; others have been obtained through the "quarterly decomposing" of the annual data series.

The revised data for 2005-2006 are used for checking the forecasts.

The data base, already existent, includes quarterly data series which are necessary for the specification of the model and must be up-dated regularly based on a methodology designed especially for the needs of the data series that haven't been published yet by the NIS. The data series that exhibited seasonality were de-seasonalised using *tramo-seats* methodology which is recommended by Eurostat. A condition for the data base consistency is that the data base must be compatible with the officially published annual data.

With respect to the model specification, as a demand based model, the behavioral equations from the *Output* block are modeling the consumption, investment, export and import behavior.

The consumption is separated in private and public consumption, the last being an exogenous variable. Because there is no available data series on private and public investment, at this stage investment is not brake down in its components.

The Foreign Trade Block divides Romania's trade into definitive import and export and also import and export for active processing / after active processing, the latest having an important share in the foreign trade.

The other blocks (*Budget, Labour Market and Monetary*) are less detailed at this stage, and will be disaggregated more in a later stage , especially the budgetary block, which has a major importance in the analysis of the macroeconomic growth sustainability.

Characteristics of the model

The majority of the behavior equations contain an "errr correction mechanism" based upon the existence of a co - integrated relation between variables that are not stationary.

The dynamic equations included in the model are built in two stages:

- The long term co-integration equations is estimated;
- The short term dynamic equation, which includes as an error correction term the residual error of the long term equation, is estimated. This coefficient measures in each period the adjustment speed towards the equilibrium.

The tests used for the series analysis are:

- Augmented Dickey – Fuller stationary test;
- Granger causality test;
- Johansen cointegration test.

The behavioral equations contribute to the interpretation of the elasticity coefficients and also to the identification of each variable contribution. They were constructed using economic theories, the specificity of the Romanian transition economy, the econometric tests and the adjustment of the data resulted as against the real data. The OLS (Ordinary Least Squares) was used as an estimation method of the behavioral equations.

The models' blocks are the following: the Demand block; The foreign trade Block; Prices – salaries; Financial – monetary.

The demand block

Gross domestic product is obtained within the demand block, as an accounting equation – as a sum of consumption, gross capital formation and net exports (the latest computed in the foreign trade block).

Built as an equation with an error correction term, the short term dynamic equation includes the residuals from the long term co - integration equation, the gross disposable income, the non governmental domestic credit and a dummy variable. The long term determinant of the household individual consumption is the disposable gross income (in real terms).

The long term equation for the gross fixed capital formation includes the average active interest rate for the non-banking clients and also the domestic aggregate demand as explanatory variables. The exogenous variables from the short term dynamic equation are the residuals of the long term equation, the interest rate, the aggregate domestic demand and a dummy variable.

Exogenous variables

a) Variables that are derived in other blocks:
   - The foreign trade balance, computed in the foreign trade block;
   - The non governmental domestic credit, evaluated in the Monetary block;
   - The gross disposable income, which is evaluated with variables from the Salary – Employment block.

b) Economic policy variables:
   - IRA, the average active interest rate for non-banking clients;
   - CG, governmental consumption;
   - VS, changes in stocks.

c) Other exogenous variables:
   - The residuals of the long term equations;
   - Dummy variables;
   - Factor variables for seasonal adjustment.

The foreign trade block

The equations system includes:

- The short term dynamic equations for the foreign trade volume: import / export of goods and services, CIF imports of goods, exports of goods;
- The short term dynamic equations for the foreign trade prices: the import of goods and services deflator, the export of goods and services deflator, the exchange rate;
- Additional equations: some behavior equations specific to the prices block, accounting and definition equations.

Exports of goods and services: Both the long term, and the short term equation contains as explanatory variable: the export demand of the main partners (12 countries) for Romania, the competitiveness index weighted with a temporal factor and an inertial term.

Export of goods: The long term equation depends on the export demand of the main partners (12 countries) for Romania and the competitiveness index; the short term one depends on other variables like the exchange rate, the volume index of the industrial output and an inertial factor.

The import of goods and services: Both the long term and the short term equation depends on the domestic demand for the households' consumption, public consumption, gross fixed capital formation and also the demand for exports (the share of the re - exported goods being significant).

CIF imports of goods: The long term equation depends on the domestic demand for consumption (the households' consumption, public consumption), gross fixed capital formation; the short term equation includes also other variables: the demand for export, a temporal factor and an inertial one.

The long and short term equation for deflator of exports of goods and services include as explanatory variable the GDP deflator, imports deflator and competitiveness index, which contains the international prices index.

The long and short term equation for the deflator of imports of goods and services include the GDP deflator, the exchange rate and an inertial term as explanatory variables.

The exchange rate index depends on the consumption prices index, NBR foreign currency reserve index and a temporal factor.

Exogenous variable

a) Variables computed in other blocks:
   - The final consumption: includes the households consumption and public consumption (The demand block);
   - Gross fixed capital formation (The demand block);
   - The M2 money supply (index – The monetary block);

b) Variables which characterize the rest of the world:
   - The export demand for Romania (the main 12 partner countries);
   - The ratio Euro / American dollar;
   - The international prices index;

c) Economic policy variables:
   - The NBR foreign currency reserve (index);
   - The volume index of the industrial output.

The prices block

The equations system includes:

- The short term equations for the domestic prices depends on consumption price index, GDP deflator, gross capital formation deflator and consumption deflator;
- The short term equation for the foreign trade depends on the import of goods and services deflator, the export of goods and services deflator, the exchange rate;
- Additional equations: accounting and definition equations.

The long and short term equation of the GDP deflator includes the consumption prices index and the gross fixed capital formation deflator as explanatory variables.

The long and short term equation of the consumption prices index (CPI) is estimated on the base of the M2 money supply index and the exchange rate index.

The consumption deflator is estimated on the base of consumption prices index and an inertial factor.

Exogenous variables

a) Variables derived in other blocks:
   - The M2 money supply (index – The monetary block).

b) Variables characterizing the rest of the world:
   - The ratio Euro / American dollar;
   - The international prices index;

c) Economic policy variables:
   - The NBR foreign currency reserve (index);

The financial – monetary block

The financial – monetary block of the quarterly model of the Romanian economy contains three behavioral equations, respectively for the non governmental credit, for money supply (M2) and for the medium and long term external debt.

The Engle – Granger methodology was employed for the estimation of the equations, since the data series are not stationary. The estimation was performed on quarterly data series, with seasonal adjustments for the period 1997-2005 (the maximum available interval for the GDP components).

The variables used in the model construction are:

- the consumption price index;
- the non governmental credit;
- the exchange rate EUR / RON;
- the households' consumption, constant prices;
- the active nominal interest rate;
- imports;
- the monetary base;
- the money supply (M2);
- the currency reserves of the NBR;
- the medium and long term external debt;
- GDP in constant prices.

The real non governmental credit equation

Since the variables are 1st degree integrated, the determination of the real non governmental credit evolution equation was realized through the application of Engel – Granger procedure. The long term equation on the long term (the co -integration equation) of the real non governmental credit is:

$$cr_nonguv_r_sa = f(c, hc_r_sa, eur_r_sa, trend)$$

The symbols used are as following:

cr_nonguv_r_sa - represents the non governmental credit in constant prices, seasonally adjusted;

c – constant;

hc_r_sa – the households' consumption, constant prices, seasonally adjusted;

eur_r_sa – the real exchange rate EUR/RON, seasonally adjusted;

trend – a quadratic trend.

The medium and long term external debt equation

Like the estimation of the real nongovernmental credit equation, for the medium and long term external debt the estimation was realized based on the Engle – Granger methodology. The co integration equation of the medium and long term external debt is:

$$total_debl_eur_sa = f(c, res_nbr_eur_sa, m_eur_sa)$$

where:

total_debl_eur_sa – the medium and long term external debt, EUR, seasonally adjusted;

res_nbr_eur_sa - the currency reserves of the NBR, EUR, seasonally adjusted;

m_eur_sa – imports, EUR, seasonally adjusted.

The real money supply equation

Taking into account the results of the unit root tests, the estimation of the real money supply equation was realized in two stages using the Engle – Granger methodology. In the first stage the co-integration equation of the real money supply was estimated by the following relation:

$$m2_r_sa = f(c, m0_r_sa, y_r_sa)$$

where:

m2_r_sa - represents the M2 money supply in constant prices, seasonally adjusted;

c- constant;

m0_r_sa – the monetary base, constant prices, seasonally adjusted;

y_r_sa – GDP, constant prices, seasonally adjusted.

7. The conjuncture survey in industry

The survey performed within The National Commission for Prognosis was created in order to provide information needed for the quarterly forecast of some macroeconomic indicators. As a consequence, the data and information obtained are used within the framework of a mathematic – economic quarterly model for industry, which provides the dynamic of the main indicators: output, productivity, demand, stocks.

The survey is based on a representative sample of 647 economic agents, which provide a 64.6% coverage rate.

The questionnaire used highlights the evolution trends for 11 indicators that characterize the industrial sector.

The computation method used for the processing of the conjuncture surveys uses the successive weighting method which takes into account the structural changes of the output, the orders and stocks, using as beginning of the year corrections vectors of quarterly computed coefficients.

The current system of the conjuncture surveys includes also some internal corrections. This method is, practically, combining the results of the surveys with the trends coming from a statistical analysis of the real data and extrapolates them after well defined criterion.

Hence, it was taken into consideration the evolution of some industrial sub branches characterized by energetic resources equilibrium and also the increase of the output capacity usage, according to the probable dynamic of the domestic and external demand.