A FINANCIAL PROGRAMMING MODEL – REPRESENTATIVE INDICATORS AND SCENARIOS

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Abstract

The article presents the limitations and advantages of a financial programming model applied to Romania's case in order to draw up economic growth scenarios under the government policies conditions. This type of financial programming model gives the best forecasting results for the economies facing periodic restructuring or in case of shifting from economic expansion period to crisis period. The use of models during such instability periods is necessary rather for testing the policies' impact on the economy evolution in the short run than for pointing out the medium-term evolution trends.

Keywords: financial programming, government policies, taxation bases

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1. Introduction

Econometric models and financial programming models of high complexity (the Emilian Dobrescu model, the Lord model, the RMSM model), as well as econometric models addressing certain issues, such as the model for determining the potential GDP, or the model for determining the long-term economic growth have been used in Romania after 1989. The econometric models applied to the transition economies are generally facing three types of problems entailing forecasting errors:

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- too short and fragmented data series;
- the forecasted indicators are, generally, not consistent with the overall logic of the model or the consistency of all projections is difficult to be achieved;
- the institutional factors of qualitative nature are neglected.

Such problems may be fixed by financial programming models such as those used by the International Monetary Fund and by the World Bank (RMSM, RMSM-X), models based on "equilibrium" statistical equations, with a low share of behavioral equations.

The RMSM (Revised Minimum Standard Model-World Bank) model was built up in 1973 in view to serve the World Bank purposes of achieving a comparative analysis of countries' real GDP growth in correlation with the level of investments, imports and external credits. By means of specific parameterization, the model answers problems of the following types:

- the necessary level of investments in view to sustain the GDP growth rate, when the other elements are pre-determined;
- the necessary level of imports in view to achieve the desired GDP growth rate, while investments and consumption are residual elements, each on its turn.

In both cases, the real exports growth is exogenous. The existing difference between exports and imports determines the need for external credits. The RMSM model consists of:

- the database (historical; series), including the situation of external debt;
- a system of accounting equations describing the accounts of economic sectors and certain behavioral relationships between the economic variables;
- a series of economic variables, parameters and coefficients whose exogenous values are introduced for each year of the projection period;
- an ex-post set of weights and economic indicators allowing for checking the projection consistency, which may also be used for economic analyses.

The RMSM-X (Revised Minimum Standard Model – X) model resulted from the integration into the previous macroeconomic model of the World Bank (RMSM) of the IMF financial programming model (extended Polak model). In parallel with its use by the World Bank and IMF, the model also comprises a set of economic/accounting equations allowing for drawing up analyses and forecasts of economic growth for the countries asking for

funds. The model may be also used for checking the macroeconomic consistency, provided that the values of certain indicators set up as targets or economic policy measures are consistent with the whole macroeconomic framework.

The model scenarios are to be carefully analyzed, several iterations on setting up assumptions and simulation results being necessary to obtain plausible results, on one hand in relation with the internal and international context and, on the other hand, in relation with the economic policy parameters. In case of unlikely results related to model consistency, for example the economic growth supposed as target would entail an external deficit much higher than what would be reasonably borrowed, such a situation indicates incompatibilities between the exogenous variables (assumptions) and the economic policy parameters. In this case, the model should be readapted by changing the assumptions.

The RMSM-X model is generally functioning in the regime of "closure on private". In this situation, certain specifications are made on the exogenous parameters and variables. The main purpose of "closure on private" is to analyze the economic consistency between the macroeconomic targets, such as the real GDP growth, inflation, external reserves in months of imports, real exchange rate level and the forecasted fiscal-budgetary policies, expressed by income and the current and capital expenditure. Moreover, the balance of payments sustainability should be checked by analyzing the memorandum indicators, such as external debt share in the GDP and the external debt service in relation to exports.

2. The Romanian financial model: An useful operational tool in developing scenarios for a transitional economy

A version of the World Bank RMSM-X model was adapted in Romania through the assistance program granted by ADE (Aide de la Decision Economique) consulting company from Belgium, in collaboration with Crown Agents Company, during 1996-1998, carried out alongside five missions. The macroeconomic model developed by the National Commission for Economic Forecasting (NCEF) was initially structured into two files, the first one comprising the database, beginning with 1990, while the second one included the three years forecast of macroeconomic indicators. Originally

conceived in this form, the model had, as starting point for projections, a base year which, for the first two missions was 1995, while for the next two 1996 was set up as base year.

Efforts were made during the third and the fourth mission of Phare assistance program to develop a new version of the model in view to include a detailed set of monetary-budgetary indicators, structured into two sets of files: data files, comprising the historical data series for detailed blocks of indicators, and scenarios files, comprising projection tools and projection results.

The main characteristics of the financial programming model are exemplified by the model blocks, as follows:

(1) Account of GDP formation (in real terms) and employment

Total gross value added at factor costs (QA0) can be disaggregated into four activity sectors:

Agriculture, sylviculture	(QA1)
Industry	(QA2)
Non-government services	(QA3)
Government services	(QAG)

Gross value added growth for industry and agriculture and GDP growth are set exogenously:

$QA0 = QA0_{-1} (1 + g)$

g = GDP growth rate, exogenous

$QAi = QAi_{-1} (1 + gi)$

gi = exogenous growth rate of value added for agriculture and industry, i= 1,2;

Gross value added of the non-government services (QA3) is a residual.

The growth rate of value added in public administration is estimated by model as the sum of growth rates of public sector employment and productivity.

Employment in the public sector is an exogenous policy variable, which needs to be set by the user.

Employment for the other three non-government sectors is determined on the basis of "Verdoorn elasticity" (the growth of output is accompanied by growth of productivity implying an elasticity of employment with respect to production lower than one):

$$Li = Li_{-1} *(1+ai *rQAi)$$
where:

Li = employment in sector i

ai = elasticity of employment in sector i with respect to value added in sector i.

According to the importance of restructuring measures, the values of Verdoon elasticities are set (measures of ample restructuring require low coefficients values).

(2) Account of GDP utilization (in real terms)

Specific to this account, private consumption and gross investment are projected through their exogenous growth rates; public consumption depends on employment in the government sector and the growth rate of material expenditures; and separately, the exports and imports are forecasted in the external trade block linking to the growth rate of foreign markets and GDP.

After setting up these exogenous variables in the model, consistency checks are absolutely necessary by analyzing the contribution of changes in inventories to GDP growth and, in a medium term view, to ICOR (Incremental-Capital-Output-Ratio).

ICOR indicates the amount of Lei to be invested (at constant prices) for 1 Leu increase in the GDP. Consequently, it reflects the investments effectiveness. On medium term, ICOR is equal to the investment rate (total fixed investments/GDP) divided by the growth rate of the economy. The available data suggest a value of 5.0 for ICOR, which is relatively high (low effectiveness of investments). On medium term, the economy's liberalization would contribute to a higher effectiveness of investments and, consequently, to a gradual diminution of ICOR.

The change in inventories contribution to GDP growth should normally range between -0.3% and +0.3%. When the economy is relatively stable, the increase in inventories tends to add a low percentage (between 0.1% and 0.3%) each year to the GDP growth. Economic fluctuations could induce, during certain periods, a negative contribution to GDP growth.

(3) Exports and imports in constant US dollars

Both for exports and imports a disaggregation into three categories was adopted:

QXG1$, QMG1$:   Food products
QXG2$, QMG2$:   Energy products
QXG3$, QXG3$:   Other exports (or imports) of goods
QXG$, QMG$:   Total merchandises exports or imports, FOB

Since imports are CIF recorded, insurance and freight are isolated and computed as a fixed proportion of total imports to permit passage from CIF to FOB:

QXS$, QMS$:   Non factor services
QX$, QM$:   Total exports (or imports) of goods and services

Exports and imports are estimated in $US at the price and the exchange rate of the base year.

All categories of exports are related functionally, with elasticities to the real growth of foreign demand and to the real exchange rate:

$$QXGi\$ = QXGi\$_{-1} *(1+e1*rQWX\$+e2*rRER)$$

where:

$QXGi\$$ = the exports of goods of category i at prices and exchange rate of the base year,

$QWX\$$ = the world demand in constant US dollars,

RER = the real exchange rate of the Lei with respect to the US dollar.

Coefficients e1 and e2 are the demand and the price elasticities of export, respectively.

The real exchange rate is defined as

RER = E*PW$ / PA

where:

E = nominal exchange rate (Lei/US$),

PW$ = the world price level in US dollars (approximated by the index of the manufacturing unit value)

PA = domestic price level in Lei (GDP deflator)

This relation indicates that RER is the ratio of international prices expressed in Lei to domestic prices. When RER increases because the nominal rate depreciates (more Lei are needed to buy one dollar), because the foreign prices in dollars are rising faster than the domestic prices, then the real exchange rate appreciates since the purchasing power of the foreign currency in terms of lei is improved.

The elasticities e1 and e2 are estimated by econometric simulations or by assumptions of the experts; taking account that in the long run the value of e1 should be 1 for all countries.

The value of the price elasticity e2, which is positive, will also depend on the type of exports. If the export products are not adapted to the world demand, as is often the case for a number of traditional production in the former socialist countries, then as long as restructuring and transformation of the productive capacity is not done it is likely that the export price elasticity will be very low.

The equations for imports have a similar form:

$$QMGi\$ = QMGi\$_{-1}*(1 + m1*rQA - m2*rRER) \quad i \neq 2$$

with

QMGi$ = the imports of goods of category i at prices and exchange rate of the base year, and QA the GDP.

Elasticities m1 and m2 must be obtained from empirical analysis or from empirical values observed across similar countries. Elasticity m2 has a negative sign, since an increase (appreciation) in the real exchange rate means an increase in the relative price of foreign goods with respect to domestic ones and will, therefore, reduce the willingness to import.

A different equation is adopted for the import of energy. The reason is that the real exchange rate is an inappropriate indicator of the relative prices of energy products. Indeed, the world price of energy products is dominated by the dollar price per barrel of oil and the domestic price of energy in Romania is administrated.

Thus, the equation for energy product has been specified as:

$$QMG2\$ = QMG2\$_{-1}*(1 + m1*rQA - m2*rPM2\$*E/PAD)$$

where:

PM2$ is the price of imported energy in US dollars and PAD an index of the administrated price of domestic energy

This equation shows that an increase in the administrated prices will increase the demand for imported energy, which is presently "discouraged" by the sort of protection given by the low administrated prices.

(4) The balance of payments

The accounting assumptions for the balance of payments refer to the future development of the public and private capital accounts (the expected

non-reimbursable loans, the new loans under negotiation) and to the international environment assumptions (international interest rates).

Most components of the capital account are exogenous:
- capital grants (non-reimbursable loans) from international organizations and bilateral assistance;
- net foreign direct investment;
- net portfolio investment;
- new medium and long-term loans;
- short-term credit;
- bilateral credit arrangements;
- external debt.

The endogenous elements of the capital account are:
- the repayment of public and private foreign debts;
- The gap fills loans.

(5) Prices

The GDP deflator is exogenous and represents the leading indicator of inflation in the model. Note that it could be endogeneised on basis of the relationship between prices developments and the evolution of the monetary stock. The important assumptions of this block are the following:
- the estimation of the general level of inflation and the nominal exchange rate (assumption regarding the real exchange rate policy);
- the evolution of the real wages in the economy and in the Government sector.

(6) Monetary sector

The important endogenous variable is the money supply from three sources: net foreign assets, credit to government and to private sector. The key variable of economic policy (exogenous) is the credit to non-government sector, the other two resulting from the balance of payments, and from the financing account of the Government, respectively.

The strongest assumption for this block refers to the interest rate, allowing for the calculation of monetary sector income and expenditure, as well as for the credits distribution towards the non-government sector. This

variable should be estimated in relation with inflation rate. Several monetary indicators are included in this block: broad money, velocity of money, etc.

(7) Government sector

Revenues from direct and indirect taxes, as well as from social contributions for one year, are projected by multiplying the appropriate tax base, derived from the projected National Accounts by the implicit taxation rate of the previous year:

- taxes on wages and social security contributions are based on wages in the private sector and in the government sector;
- taxes on profit are based on non-wage factor incomes in the private sector;
- VAT and excise duties are computed on private consumption; custom duties on the value of imports;
- other direct and indirect taxes grow in line with inflation, considering the real level unchanged
- non tax and capital revenue are exogenous
- On the expenditure side, most of the budgetary components are estimated by identifying the real growth rates and specific price of the expenditure:
- wages and salaries are estimated as the product of the number of public employees and the wage rate;
- material expenditures depend on exogenous volume growth rate and the general price inflation;
- transfers are determined on the assumption that the budgetary policy tries to maintain the real purchasing power of social transfers, and indexed on the GDP price;
- capital expenditure are exogenous, but constitute, with the financing account, the main point of interference with the Public Investment Program.
- The main assumptions to simulate the Government account refer to:
- the changes in the taxation rate, the tax bases or the introduction of new taxes;
- the wage and employment policy of the Government;

- the real growth rate of the material expenditures and social transfers;
- the Public Investment Program.

(8) Flow of funds matrix

A flow of fund matrix is computed in the forecast period, which presents in a matrix form the current and capital transactions within the domestic economy and with the rest of the world, and the identity of the GDP. Current account transactions record the flow of funds arising from the generation and the distribution of income, as well as the uses of income. Capital account transactions record the investments and capital transfers, as well as the changes in financial assets and liabilities.

The domestic economy is broken down into Government sector, monetary sector and a private sector, which is a residual. The conversion of IMF modules in the institutional sectors' accounts plays an important role in resolving the consistency of the forecasts on a transition economy with institutional instability.

The preparation of a medium term projection involves a number of tasks:

a. The update and the analysis of the database, with the view of obtaining a consistent set of data that allow to analyze the recent economic developments and to observe the impact of the economic policy measures adopted in the past (the accuracy of information referring to the events produced in the year considered as base year in the model is very important);

b. Preparation of international assumptions refers to, for example, an expansion of Romanian export markets (the demand for imports by Romania's trade partners), international inflation, international energy prices, and international interest rates. The most important sources of this information are the regular publications IMF World Economic Outlook that contains forecasts of the world economic developments, OECD Economic Outlook that contains forecasts for the OECD economies, and the short term economic forecasts of the European Commission;

c. Preparation of economic policy assumptions requires a good knowledge and understanding of the recent economic policy developments and of the future direction of the national economic policy (objectives

assumed by Government, the context of agreements concluded by the Ministry of Finances and the National Bank with multilateral agencies, the state of the discussion with the IMF and the World Bank), the future monetary policy targets, exchange rate policy, fiscal policy developments (decreasing the deficit by compression of expenditures or by increased revenues), restructuring policy targets, developments in the area of subsidies and administrated prices;

d. Preparation of exogenous variables (GDP growth, growth rates of agriculture, industry and private services, real exchange rate, exogenous components of the balance of payments - workers remittances received and paid, investment income, unrequited transfers paid and received by the Government, by the private sector, direct foreign investments, portfolio investments);

e. Simulation of many iterations between the policy assumptions and the assessment of the exogenous targets in order to obtain consistent and reliable forecasts.

The assumptions established within the model algorithm may be split up into three groups: technical coefficients; behavioral relations; policy decisions.

It is absolutely necessary to set up a number of technical parameters: the share of currency in circulation in M2, the share of term deposits in M2, the average rate of interests for external debt, the average maturity of the external debt.

Behavioral relationships refer to variables in real terms and to price variables (for example, relation between investment and GDP growth in the form of an incremental capital output ratio (ICOR), imports elasticity in relation to GDP and to real exchange rate, employment elasticity in relation to economic growth in agriculture, industry and private services, etc.), to the pricing policy of commercial banks (average interest rate in real terms offered by commercial banks on deposits and the difference between this one and the interest rate applied to credits), and to the short term evolution of certain components of the balance of payments (direct investments, net portfolio investments, external credits on medium and long term for the monetary sector or for the private sector).

The most important set of assumptions necessary to the model refers to the political decisions adopted by the Government. The model should

reflect the changes that could result during the forecasting period and the most suitable moment of application. These assumptions could refer to budgetary revenues (taxation rates on profits, wages, VAT, excises, custom duties), budgetary expenditure (growth rate of employment and wages in the Government sector, growth rate of material expenditures, transfers, subsidies, and capital expenditures), monetary policy (financing of the budget deficit, real interest rate of treasury bonds), other governmental objectives and policies (external versus internal financing of the consolidated budget deficit).

The model was applied to develop three scenarios, P1, P1b and P2, of which the first two were "reference scenarios" whose main objective was to point out the difficulties and constraints which the economic policies would have to face in the forecast period.

Scenario P1b is identical to P1, except for the calculation procedure of the external debt service. The objective of this scenario is to provide a projection tool which should produce more accurate forecasts of the balance of payments, based on the information provided by the National Bank on the time schedule of new disbursements on agreed loans, as well as of interest and repayments due on the outstanding debt.

Scenario P2 was implemented in order to assess the impact of the policy measures agreed by the Government with the IMF.

The basic assumptions on the future developments of the real economy are the same for all the three scenarios, differing only as regards the general consolidated budget and the balance of payments. From a technical point of view, the endogenous mechanisms of the projection model approximate very reasonably the evolution of the accounts of public finance. However, inconsistencies in the data on domestic debt and the foreign debt remain to be clarified.

The projections were used as a support for the macroeconomic analyses regarding the government policies impact over the orientation of economic growth in the Romanian restructuring of economy, during 1998-2004 particularly, the preparation of simulations to analyze the consistency and feasibility of the medium-term strategy and the elaboration of the Public Investment Program.

The main conclusion which can be drawn from this exercise is that Romania should relatively easily achieve its targets regarding the reduction of external imbalances. Monetary targets might be more difficult to achieve,

unless the velocity of money, which remains very high, continues to diminish. The main risks are related to the budget targets: because of a declining GDP, the fiscal revenues threaten to come short from what was forecasted. This threat would justify corrective measures such as, for example, the cancellation of the program of reduction in income taxes or in social security contributions.

3. Conclusions

The presented model is an improved version of the financial programming model RMSM-X used for the quantitative assessment of the Romanian Government Program and for the establishment of the development scenario attached thereto. From this perspective, the model becomes an operational tool to check the consistency between the macroeconomic forecasts and the budget programs approved by the Budget Law.

An important conclusions resulting from the model as regards the medium term evolutions in times of economic crisis is that only the introduction of structural reforms (retrenchment of the state from activities where it only contributes to generate losses) in the government program of stabilization measures (together with monetary and fiscal policy) can lead to the situation where stabilization can be supported by and lead to a sustainable growth.

The stimulation of growth by other measures than those of the structural reforms would immediately put the current account and government deficits under pressure. As these deficits are already difficult to fund, the major macroeconomic equilibrium would be disrupted and the only tangible result would be a vicious circle of inflation and depreciation, which would undermine any growth prospect and create an environment even more difficult to implement structural reforms.

Generally, three major factors explain the slowdown of progress in implementing the structural reforms:

- political reasons: lack of consensus on the magnitude and the direction of reforms and the desire of groups controlling vested interest to maintain their position and extract rents from it;
- the fear of the adjustment costs; in particular, it is often believed that not maintaining existing social subsidies and workers' jobs

(mainly in the public sector and public companies), whatever the effectiveness, would entail socially and politically unaffordable costs;

- the lack of experience in administration, which is not technically capable to assess the costs and benefits of various policy alternatives, to formulate economic policy strategies and prepare the supporting measures, to monitor the adopted economic policies.

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