

UDK 330.43:330.101.541(497.7) UDK 519.862.2:330.101.541(497.7) MACROABC - MK - 2007, A MACROECONOMIC MODEL OF MACEDONIA

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Abstract

Macroabc-MK is an empirical macroeconomic model of Macedonia. The August 2007 version is the fruit of the co-operation between Macedonian economists from Sector for Economic Policies and Regulatory Reform of the Secretariat General of the Government of Macedonia (GoM), Center for Economic Analyses (CEA), Department of Economics, Faculty of Law, University Ss Cyril and Methodius (Un C&M), and National Bank of Macedonia (NBRM), and Dutch economists from Micromacro Consultants (MMC), based on Macroabc models of other countries like the Netherlands, Poland, EU15, Indonesia, Ethiopia, Kenya, Namibia, Curacao, Aruba and Suriname. So small as well as big countries in four continents. In this article the background of the model is briefly explained: the organisation in several sheets, the consistency framework, the forecasting part and the main behavioural equations. An important role in this model played competitiveness: thanks to increase of productivity and decrease of taxes the domestic inflation is low and this stimulates exports, and then disposable income, followed by increase of consumption and investments. And thanks to the growth of exports, investments and consumption GDP goes up. The model can be used to make an Outlook and policy scenarios. For example it is used to calculate the impact of Government Programme 2006-2010 on the economy, and then the model automatically produces the output tables including real GDP growth, inflation, employment growth, effects on government revenues, expenditures and deficit, the Balance of Payments, foreign reserve stock, Government debt, number of unemployed.

The model is running till 2012, but many coefficients are still preliminary. So Macedonian economist can improve this model by analyzing the macroeconomic Macedonian time series that are in the model.

Key words: macroeconomic modelling, behavioural equations, simulations, scenario building.

Introduction

This article is the fruit of the workshops during 19-25 August 2007 at MMC's office in The Hague, The Netherlands of five economists from Macedonia and six MMC specialists. This visit builds also upon an earlier visit of 12 Macedonian economists to MMC during September 2003 and MMC's work before that visit in 2003 in which Macroabc-MK has been build, a start macro & fiscal model of the economy of Macedonia. The visit was financed by World Learning/USAID

The Macroabc-MK model is bi-lingual: all variable names are given as well in English as in Macedonian, and the model file contains a sheet Manual in English as well as in Macedonian. This article only gives brief

information to the Macroabc model Macedonia. The model file contains in sheet MANUAL with detailed description of this macroeconomic model. You can download the model (including manual) and Proceedings Papers of the visits to MMC from www.micromacroconsultants.com

The model consists of a database, using data from www.finance.gov.mk, www.imf.org, www.nbrm.gov.mk and National Accounts of State Statistical Office Macedonia. In August 2007 CEA and NBRM made a new sheet SOURCE. The model file itself uses the consistency framework of Macroabc. The coefficients in the behavioural equations initially were based on the Euralyse model (Macroabc for 15 EU countries), then calibrated, using the Macedonian data. Furthermore we borrowed some coefficients from the Makmodel of NBRM. Then, during the visits in 2003 and 2007 several coefficients have been improved in many workshop discussions. However, as the coefficients probably are not yet good enough based on the Macedonian reality, this version of Macroabc can only be used as demo-version how to use such a model as an auxiliary in policy preparation.

In this visit did participate: Todor Milcevski, Sector for Economic Policies and Regulatory Reform of the Secretariat General of the Government of Macedonia (GoM), Marjan Nikolov, Center for Economic Analyses (CEA), Aleksandar Stojkov, Department of Economics, Faculty of Law, University Ss Cyril and Methodius (Un C&M), Katerina Suleva, National Bank of Macedonia (NBRM), Filip Blazeski, the Business Environment Activity (BEA), USAID funded project that initiated the training. From the side of Micromacro Consultants (MMC) were involved Marein van Schaaik and Stephen Chong and four part time experts.

Macroabc Methodology

The methodology of Macroabc consists of constructing a combined instrument: a macroeconomic database and an analytical framework that uses the data from the database. The construction of this combined instrument is in most projects achieved through close co-operation of local staff expertise of local institutions (Ministries, Statistical Office, and Central Bank) and international consultants' expertise of data and instruments for economic analyses in a market economy. The first, preliminary version of Macroabc Macedonia was made by MMC and then discussed and improved in many workshops with Macedonian economists.

The interdependency of institutional development and economic policy for achieving economic and social development is generally recognized. Many countries have adopted adjustment/transition programs that not only change the structure of the economy, but also the role of the institutions. However, a common misconception is that changing a country's economic focus necessarily translates into the elimination or marginalization of government and social structures. The experience of the Netherlands demonstrates that this is not the case. The Central Planning Bureau of the Netherlands (CPB) is an independent government agency established 60 years ago by Dr. Tinbergen. The CPB's charter is to formulate, analyze, monitor and forecast different policy scenarios in a well-developed market economy. It has played a central and rather unique role in the Dutch economic policy formation. In particular, it contributed to the building of a consensus about economic policy between the government and the main social institutions (e.g., labour unions and employers' organizations).

Macroabc is methodology to construct an integrated data, forecasting, and simulation model based on the core of the macro models of the CPB and the experience to combine that knowledge with the needs of other countries (like Curacao, Poland, Kenya, Ethiopia, Indonesia, Namibia, Aruba etc.). In this section we use the name for the methodology as well as for the resulting model. It is a so-called aggregate demand, aggregate supply model (AD-AS model) that combines modern macroeconomic theory with pragmatic modelling. It is easily adapted to fit the institutional and behavioural relationships in other countries. The macro models of Surinam 'Macmic', of Curacao 'Curalyse' of the European Union 'Euralyse', of Poland 'M98D', Kenya 'KTMM', Indonesia 'MODFI', Aruba 'MARUBA' and Namibia 'Macroabc-NA', have been based on this Macroabc methodology. These models run in Excel or in solution programs like MicroTSP, EVIEWS or

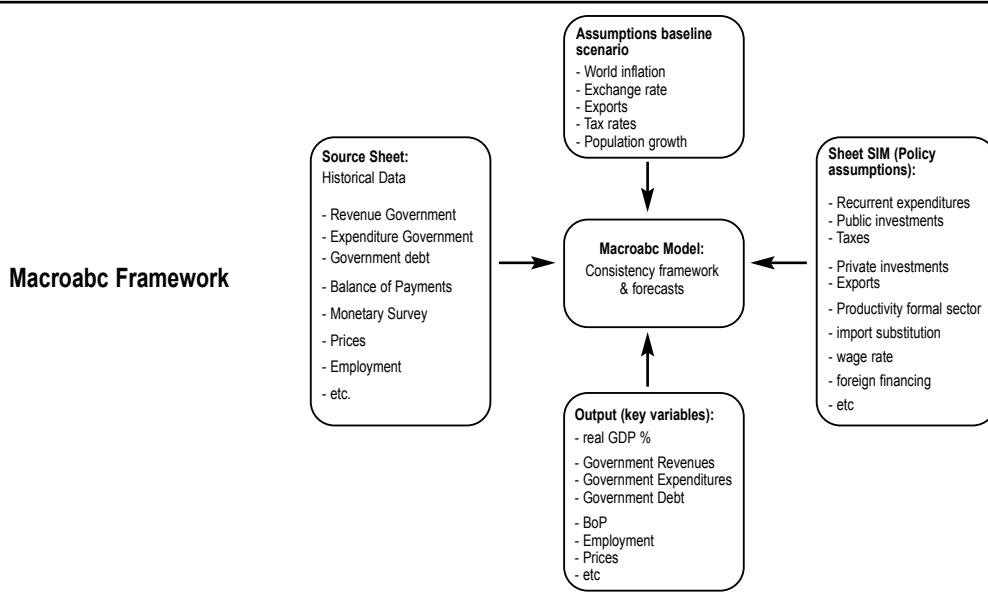
SIMPC. The ability to run a model in a standard spreadsheet increases a model's accessibility. In particular, because the spreadsheet models do not require multi-year specialized training in detailed computer programming languages, policy experts can participate more in model construction and execution.

The methodology of Macroabc is similar to the Financial Programming of IMF and more advanced than the Reduced Minimum Standard Model (RMSM-X) of the World Bank. From a theoretical point Macroabc Macedonia is close to the MAKMODEL of National Bank Macedonia (made in co-operation with the Dutch Central Bank that uses macro models that are members of the Dutch family of models like Saffier model of Dutch CPB and Macroabc-NL as shareware on homepage of MMC). However, the preliminary Macroabc-MK contains already more detailed fiscal variables than in Makmodel and Macroabc-NL.

The sheets of Macroabc-MK

The file contains several sheets for which we will give some short explanations:

- **Logbook** - Documentation for the changes and the improvements to the model;
- **Manual** - Detail explanations for the model;
- **Source 03 and Source 07** - Contains all data. Currently the data contains only data from the IMF and Ministry of Finance for Macedonia was used. The plan is to be updated with the data from State Statistical Office. The data has been divided into the seven segments: National Accounts; Balance of Payments; MoF Budget; Labour Market; Monetary Overview; Stocks and Prices. These figures are incorporated into the forecasts of the model;
- **MonCPI** - In this sheet monthly statistics on CPI from State Statistical Office are used to get an idea about the inflation in the present year;



- **SIM** - The user can insert figures that are automatically incorporated into the model forecasts. In this way it is easy to run simulation in the model.

● **Start model** - In this sheet the actual test version of the Macroabc-Mk start model is presented. Data from sheet Source and behavioural equations are used to make a macro-economic forecast for Macedonia.

● **Colours and columns** - Throughout this model the variable names are given in column A. Other columns are used to give the unit and source of different variables. For the rest of the worksheets every column presents a different year as is shown in row 2. The different colours of the different cells in this model also have a role:

1. Grey: These figures are directly obtained from sheet Source.
2. Yellow: Estimates made using certain assumptions.
3. Green: Behavioural or exogenous equations.
4. White (no colour): Definition equation.

Features of Macroabc

Macroabc is integrated data, forecasting, and simulation model designed to run also on Microsoft Excel. Macroabc data-model produces a comprehensive and consistent survey of the macro economy in the form of the National Accounts (SNA 1993) of a country, not only the National Accounts in a narrow sense, but and consistent with that, prices, an overview of the labour market, the monetary sector, and the public sector. Specifically the data model produces information on the following:

- macro economy;
- balance of payments transactions;
- government expenses and revenues and deficit;
- national income and expenditure;
- prices;
- monetary indicators;
- labour market indicators; and
- other key economic indicators.

The quality of the data is assured through a set internal definitions and parameters that compensate for data irregularities and therefore produce consistent results. This makes Macroabc a powerful and easy tool for the integration of data from different sources, for discussing the consistency requirements between these data sources, and for getting a quick overview of the current state of affairs in the overall economy. In addition to being a data model, Macroabc is also a forecasting and simulation model. As such, it can make simulations, forecasts and medium- and long-term scenarios. These calculations may serve as a base for forecasting the budget and for discussing macro economic policy issues.

Clearly, Macroabc has to be adapted for different countries because data, institutional development, and economic progress vary by country. This is also the reason we stress local staff participation (institutes like Ministry of Finance, Planning, National Bank, Statistical Office) in the construction of Macroabc because they have the best knowledge of the local conditions. Involving local staff also serves the overall goal of involving more people in the discussions about how the economy operates and how it may be directly or indirectly influenced by policy. Our experience suggests that this overall goal is achieved naturally in the Macroabc approach, because the use of a spreadsheet allows for an immediate and transparent relationship between the verbal discussions, the modelled equations and the modelling output.

Macroabc operations

Macroabc runs in a spreadsheet. Every row has information about one variable, and every column concerns one year, except for the first column, which contains the names of the variables. Macroabc distinguishes between primary variables and secondary variables. Primary variables form the core set of variables: once these variables are given a value, the remaining variables (the secondary variables) can all be calculated through simple definitions. Primary variables may be exogenous or endogenous. Endogenous variables may be further subdivided into behavioural, institutional, and identity variables. Equations for behavioural variables are mostly based on a theoretical foundation, while institutional variables reflect the institutional context of the country. Secondary variables are all endogenous, as their equations are identity relationships linking these secondary variables to the primary variables.

To start the model, we first input historical data for the primary variables. The data-model of Macroabc then calculates the secondary variables according to the identities. For future years the values of the endogenous (behavioural and institutional) primary variables are calculated by formulas. The exogenous primary variables are given values based on external sources. Once the set of primary variables for the future is complete, the secondary variables for the future are again calculated through the identity equations.

As explained above, to initialize the model we need only values for the primary variables. In the standard version of Macroabc, there are 50 primary variables. An overview of the types of primary variables, the number of each type, and their data sources is given in the following table.

Tentative primary variables types:

Number of primary variables	data source	institution
4 value added, wage bill, investment, depreciation	statistical office	industries, farmers, trade unions
6 transactions with abroad	national bank	+ ministry fin.
14 government transactions	ministry of finance	government
6 monetary variables	central bank	government
4 prices	statistical office	market, government
16 labour market etc.	ministry of labour, household surveys	voters, workers

Based on these 50 primary input variables only Macroabc calculates hundreds of other variables automatically and consistently by definitional relationships. These secondary variables are generally grouped together according to familiar concepts, and arranged in the form of standard output tables. Some of the standard output tables produced by Macroabc are:

- National Accounts for the sectors Enterprises, Government, Households and Rest of the World
- Value added and factor distribution by sectors of economic activity
- National income and expenditures (constant prices)
- Monetary survey
- Balance of payments
- Government finance (with separate tables for revenues and expenditures)
- Labour market survey
- Overview of key variables

Of course, client specified tables may be added with little difficulty, and the tables may be altered to fit the needs of a particular project. In particular, the 'Overview of Key Variables' table will need special attention as each country's key variables differ.

Using figures from different sources and presenting the results according to the needs and customs of various institutions, Macroabc becomes an instrument that offers a complete and consistent survey of the macro economy, budget variables, monetary indicators, and labour market of a country. Because of its flexibility, it is easily tailored for each particular country.

To use Macroabc as a tool for forecasting, simulating policy options, and scenario building, we start with the 50 primary historical variables and projected variable. As mentioned above, there are three types of primary variables: exogenous, behavioural, and institutional. Variables concerning external factors (e.g. the increase in import prices) may be taken as exogenous, and we may simply use the forecasts published by international institutions like IMF and World Bank.

Behavioural variables are calculated on the basis of other variables in the spreadsheet and predetermined coefficients. For example, consumption may be calculated as a function of disposable income and the share of savings. The values of the behavioural coefficients are based on a combination of time series analysis, economic theory, overall plausibility of the total model results, and comparative studies. In particular for economies in developing, historical research alone is not adequate because the developing process affects behavioural relationships. Macroabc has, among others, behavioural equations for imports, employment, unemployment, wage formation, investments, consumption prices, money supply, net primary and secondary income transfers from abroad, depreciation, exports, exchange rate.

Institutional variables (also called semi-behavioural) comprise the last set of data. They include, for instance, government variables such as direct taxes, indirect taxes, government wages, investment, and consumption.

The Macroabc methodology was originally developed for the Netherlands, but has been implemented successfully for Suriname, Curacao, the European Union, Poland, Kenya, Indonesia and Ethiopia. It is our experience that the Macroabc methodology of combining core of the model components (of CPB model and other Macroabc models) with local expertise produces a practical and user friendly instrument that is very helpful in policy discussions. A standard version of Macroabc can be started almost immediately, based on recent values of only 50 primary variables. Later on, the model may easily be expanded as more information and expertise becomes available and as more specific needs are identified.

Macroabc in detail

With the framework outlined above, one can use Macroabc for:

- historical analysis
- forecasting/prognosis
- policy simulations
- constructing scenarios
- monitoring and updating

The following table gives an impression of Macroabc:

**DIAGRAM
MACROABC.WKS
as bookkeeping
& prognosis model**

	PAST	FUTURE
1 PRIMARY VARIABLES:		
14 Enterprises	123	abc or 123
21 Rest of the world	123	abc
30 Government	123	abc or 123
47 For monetary survey	123	abc
59 Prices	123	abc or 123
68 Labour market etc.	123	abc or 123
96 SECTOR ACCOUNTS	abc	abc
519 MONETARY SURVEY	abc	abc
613 RESOURCES & EXPENDITURES	abc	abc
665 BALANCE OF PAYMENTS	abc	abc
714 GOVERNMENT FINANCE	abc	abc
765 LABOR MARKET SURVEY	abc	abc
786 BALANCE VARIABLES	abc	abc
806 HELP VARIABLES	abc	Abc
819 DEFINITIONS	abc	Abc
1020 SOCIAL ACCOUNTING MATRIX	abc	Abc
KEY FIGURES	abc	Abc

National accounts contain a large number of interdependent variables. Most of the macro data are printed twice, once as an asset and once as a liability and many are calculated from others. As a result, an enormous volume of data is generated from a select number of key variables. Macroabc methodology concentrates on the key variables.

Taking advantage of practical statistical experience in making National Accounts, a Model Team could construct a primary data set of 50 variables, which gives enough information for Macroabc to calculate the other variables needed for the output data and to estimate the behavioural relations. In principle one can make, starting with only 50 variables, 50 factorial other variables. That is nearly infinite. The current model Macroabc contains some 1000 rows, which is enough to support a 50 primary variable model.

The column with the heading "historical data" indicates the data model of Macroabc. The first 98 rows contain the 50 primary variables (plus comment lines). Historical data are collected outside of the model and are indicated as such with a 123 in the cell. All the other cells in the column are secondary variables, and their entries are calculated by definitional relationships from the primary variables (sometimes indirectly, through an intermediary secondary variable). All of these secondary cells contain formulae, as indicated by the entry abc.

There are three types of secondary variables. The first type, balance variables, indices, and help variables, are found in rows 92..149. (The row numbers here refer to Macroabc-NL, as shareware on www.micromacroconsultants.com). These variables provide validity checks on the primary variables or are used as intermediary steps in the calculations of the formulae for the behavioural relationships later on. The second set of secondary variables is called key figures, or main indicators. Rows 152..199 give the outcomes for the key figures for the current year (the current column). Most of the time these outcomes are presented in percentage growth rates. Rows 190..226 give the same outcomes for a given base scenario, and rows 228..264 contain the differences between the current outcomes and the outcomes in the base scenario. The last sets of secondary variables are output tables of various kinds and are listed under the other grouping in the Diagram above.

The column with the heading "projected data" uses the same logic as the historical data column... The only difference is that for the cells of the primary variables, we now see either 123 or ABC, that is, some of

these rows now also contain formulas. For the future, we need forecasted values for the primary values. For the exogenous primary variables, these forecasts are taken from outside the model and we can simply enter the exogenous forecasts as numbers. Hence these cells are still of the '123' type. For the endogenous (behavioural or institutional) variables, a formula is used to calculate the forecasted values, so these cells are now of the 'abc' type. As input for these formulas only primary values are needed or variables of the first set of secondary variables (those in rows 92..149). That is, if we call rows 1..149 the core part of the model and rows 152..1010 the output part, there is never a feedback from the output part back to the core part. As a result, rows 1..149 can run independently of the rest of the model, and their functioning or outcomes would not be affected if we simply threw out all the other rows.

Once the primary variables in the column "Projected Data" are filled in or calculated, the remainder of the column is calculated by definition just as before. Of course, while for expositional reasons the figure contains only one historical data column and one projected data column, in practice there may be many of each.

Theory behind the Behavioural equations in brief

As also noted above, behavioural variables are calculated on the basis of other variables in the spreadsheet and behavioural coefficients. The values of the behavioural coefficients are based on a combination of time series analysis, economic theory, feasibility of model results, and comparative studies. In the case of developing economies, historical research must be augmented with these latter components because the development process affects behavioural relationships, causing a structural change in the time series. Where possible evidence from other countries is used to calibrate local statistics.

Below is a discussion of the most important behavioural equations, and their significant explanatory variables. See the Flow Diagram for the relations between variables and the box with 12 main behavioural equations for an overview of the formulas and levels of the preliminary coefficients. See for a detailed discussion of economic theory for example in Van Schaaijk: 'A macro model for a small economy', The Hague, 1991 as shareware on www.stuseco.org See at the bottom the section in English where you can download MACMIC EN.

- Consumer behaviour.

Consumption is determined by intertemporal optimization. In that case consumption is determined by the real disposable income, wealth and interest rate. Since data on wealth was not available, we left out wealth and interest rate from the equation, but we make a difference between the consumption rates of income from labour and remittances on the one hand and profit income from the other hand. The change in the value of consumption is a function of net disposable income of wage earners and profits.

- Investment behaviour.

Many investments theories are available (accelerator theory; neo-classical investment theory; vintage theory; adjustment cost models; Tobins q; the finance approach; Keynesian approach; supply factors). However in practice it is quite difficult to find a theory with high forecasting capacity. So for the time being we use a rather simple investment function: Investments in industries are a function of gross value added of industries (accelerator) and profit rate.

- The export function

Exports are the foreign demand for Macedonian products. If we assume that the rest of the world has a CES utility function, then the growth of Macedonian exports are determined by the growth rate of relevant trading partners and the difference in domestic and international inflation: The change in the quantity of exports is a function of the change in world trade, the difference between export and import

prices and production capacity. At this moment in Macroabc-MK test version we only brought a macro export equation, but we think that we need a special micro block of the export sector, in which we model each of the most important export products separately. (See e.g., Van Schaaijk: 'A macro model for a small economy', The Hague, 1991 as shareware on www.stuseco.org)

- The demand for imports function.

For the production of final output of the private sector (Consumption + Investments + Exports) domestic value added as well as imports is needed. The share of domestic value added to imports will change if domestic inflation differs from international inflation. The direct plus indirect import intensity of different final demand categories (C, I, E) can differ, but because a Cumulated Production Structure (CPS) Matrix of Macedonia is not available, we cannot take into account these differences. In empirical studies it is often found that the elasticity of imports to final output is higher than 1. This may be explained by a trend towards internationalization. This gives the next equation: The change in the quantity of imports is a function of real final output and the difference between internal and external inflation.

- Prices.

In a market economy with many competing firms the marginal prices will follow marginal costs (the combination of wage costs, import costs and capital costs). However if the capacity utilization rate changes, the profit margin will change and the marginal price might differ from the marginal cost price. On top of that will export prices be sensitive to foreign competitor's prices. Because we have yet no good figure for the utilization rate, we neglect that factor for the time being. Concerning the consumer price we take also the change in indirect taxes as one of the costs components: The change in the consumer price is a function of the change in costs and the change in the indirect tax rate.

- The export price

The export cost price is not only a function of import prices and wage costs. The export prices also will be affected a lot by international competitors prices.

- The investment price

The change in the price of investment goods is a function of the change in costs.

- Wage determination

The changes in the wage rate can be explained by a process of bargaining. In this process the employers are most interested in gross wage costs and employees (individuals and trade unions) in net real wages. The change in strength of employers versus employees is given by the change in the unemployment. (Phillips curve effect). So the components in the wage equation are the consumption price, the labour productivity and the change in unemployment and the change in direct tax pressure.

- Employment

If we assume that the production of the value added takes place in a CES production function with capital and labour, the employment will follow the production growth minus productivity increase minus the growth of wages cost compared to other costs (with for the time being the consumer price as indicator). Because the labour intensity of several components of final output differs, we have to include differences in labour intensity, but because a CPS matrix of Macedonia is not available, that is left out. But we made a start to also introduce production capacity. (For the time being 85% weight to production and the remaining 15% to production capacity. So the growth of employment in industries is a function of growth of the final output and real production capacity and the labour productivity and relative wage costs.

- Unemployment

The change in unemployment rate is the result of changes in supply and demand. However both supply and demand changes do not influence for 100% the unemployment. On the supply side the "dis-

couraged worker effect" has to be taken into account. Also on the demand side a change in demand will fully affect the unemployment figure because not all unemployed are registered, and if employment increases, new employed are also recruited from this labour reserve. So the change in unemployment rate is a function of some part of change in demand for labour and the increase in labour supply.

- The exchange rate is exogenous, given the policy of NBRM.
- Money Supply

For the time being we assume that NBRM will accommodate the need for additional money as far as it comes from real GDP growth (and we assume that NBRM takes last years real GD growth as indicator) and an inflation target. So money growth is set equal to real GDP growth and an inflation target.

During the workshops in September 2003 and August 2007 several experts of MMC have discussed the theory behind these and other equations. The flexible approach of Macroabc includes starting with a simple version, and ending in a sophisticated framework as in the case of the macro models for the Netherlands for example.

Box: List main behavioural equations in Macroabc-Mk-2007

Components of GDP: (lags not mentioned)

1. Consumption: changes with net disposable income (95% net household income including remittances from abroad, 70% profits) (lags)
2. Private investments volume growth: $16\% * \text{gross value added of enterprises at market prices} + 0,3 * (\text{return on investment minus the real interest rate}) * \text{value of invested capital} + \text{?} \% \text{ of public investment}$
3. Export volume % change: $0,5 * \text{relevant world trade growth} - 0,9 * (\text{export price minus world market price in denars})$
4. Import volume % growth: $1,05 * \text{real final demand growth, reweighed for import intensity} + 0,1 * (\text{consumption price minus import price})$

Prices:

5. Consumption price % change: $0,47 * \text{import price} + 0,34 * (\text{wage rate minus trend in Labour productivity}) + 0,19 * \text{consumer price (lagged) as indicator for capital costs} + 100\% \text{ change in indirect tax pressure.}$
6. Export price % change: $(1-0,36) * (0,47 * \text{import price} + 0,34 * (\text{wage rate minus trend in Labour productivity}) + 0,19 * \text{consumer price last year}) + 0,36 * \text{world trade price in denars (lagged)}$
7. Investment price % change: $0,47 * \text{import price} + 0,34 * \text{wage costs minus trend in Labour productivity} + 0,19 * \text{consumer price last year}$
8. Wage rate businesses: $2,5 + 1 * \text{consumer price (half year lag)} + 0,3 * \text{Labour productivity trend} - 0,05 * \text{unemployment rate} - 0,5 * \text{increase in the unemployment rate} + 0,6 \text{ change in direct tax pressure}$

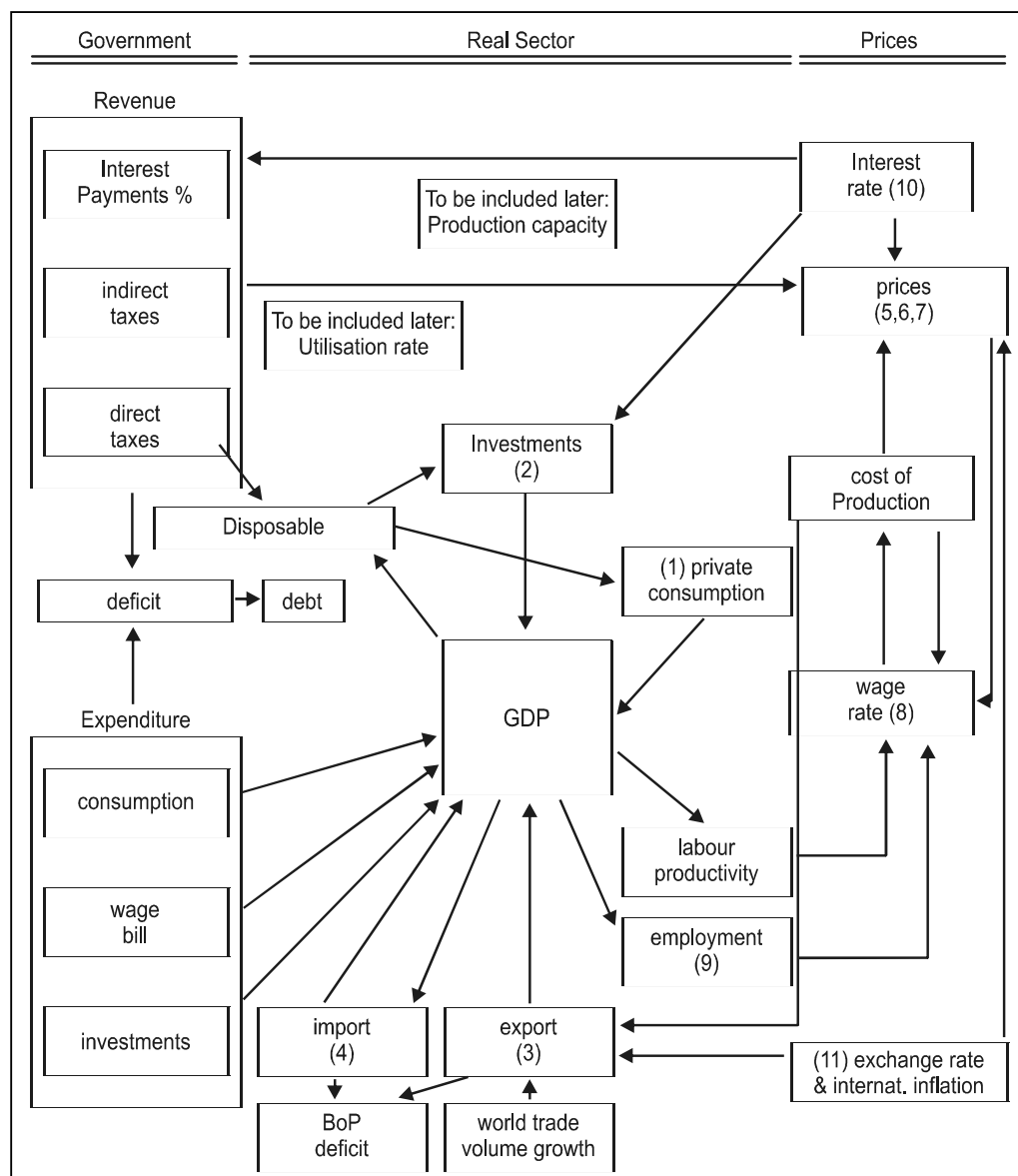
Employment

9. Employment businesses % change: $-1 * \text{change in Labour productivity trend} + 0,85 \text{ real production growth} + 0,15 * \text{real growth in production capacity} - 0,1 * \text{real wages}$
10. Unemployment rate increases with 60% of growth supply minus demand

Monetary variables:

11. Exchange rate: fixed rate of Denar to Euro since 1998
12. Money supply: increases with real GDP growth +2%

Flow diagram of Macroabc - MK



Semi-Behavioural equations

The institutional or semi-behavioural equations reflect the current institutional setting of the country. Some of the most important equations of this type are:

- Import duties are a function of the value of imports and the average import duty rate.
- Taxes on consumption are a function of value of consumption and the VAT rate of the preceding year.
- Direct taxes on industries are a function of disposable profit income and the profit tax rate.
- Direct personal income tax is a function of disposable income and profits.

The behavioural and institutional equations allow to perform bookkeeping and more economic analysis. The set of these equations in Macroabc is normally purposefully limited. Of course, one may expand this set in any direction based on the questions to be addressed by the model, such as a more detailed breakdown of medium term budgetary projections. This we have done already in the case of Macroabc-MK.

Simulations

The test version of Macroabc-MK already contains a sheet SIM. If you bring a number there, for example wages in 2004 5 % higher then in the base line, after pushing F9 (recalculation) you can see immediately in sheet model (look in rows part Key Variables, columns in part Deviation of Baseline) the effects in deviation of the base line for all main variables for the years 2004-2007. This is a way to analyze the effects of:

- Exogenous on the economy (as higher international trade, higher international inflation)
- Internal shocks (like wage impulse)
- Effects of policy measures (as lower tax rates, lower government employment)

One can also use the model to construct scenarios (packages of partial changes).

However, take care: so far Macroabc-MK is only a test version. It can be used to get an idea how to use such a model in practice in policy preparation. But because the model has not been tested yet (actually several coefficients in behavioural equations are preliminary) it does not give yet output that can be used already in real live.

Conclusion

Macroeconomic models appear to have high uncertainties: the actual values may differ from the model forecasts. Research of CPB Netherlands (See the chapter by Dr. Free Huizinga in the Macroabc-MK Proceedings Paper of September 2003) shows four reasons for uncertainty:

- As starting values for the forecast preliminary data of statistical office are used, that differ from the actual values (5%)
- Model coefficients are inaccurate (15%)
- Exogenous variables like world trade growth and world inflation (calculated by IMF, OECD, WB etc.) appear wrong. 50% of the uncertainty comes from this factor.
- Shocks in individual equations (30%).

So an important part of the uncertainty cannot be improved by improving the model. This means that we have to take into account explicitly this uncertainty. For this reason the importance of macroeconomic models lies more in the use as instrument for policy simulation and scenario building then forecasting.

Besides the empirical macroeconomic models two other approaches exist: ARIMA and AGE models. In case of an Arima model the forecast of a variable is based on its path, it is an extrapolation. The disadvantages are that forecasts of several variables made by ARIMA models have no connection, so there is no internal consistency. No economic linkages are included, so the models cannot be used for economic analysis. Furthermore these models have the same kind of inaccuracy as macroeconomic models

Applied General Equilibrium (AGE) models can be used for long term analysis, but they are very complex> And they have no dynamics: they give you an end result but give no

Information about the way how to realise that. It is like a night train that brings you from A to B but you can not have a look where you travel.

Macroabc-MK is like a helicopter. It starts from a consistent data base taken into account figures from several institutes (like Statistical Office, National Bank, Ministry of Finance). It gives a consistent set of figures for key variables for the next as well as the following years. It can help to do alternative policy simulations to see what is the effect of measures on a complete set of key variables. It can be used for scenario building as well as historical analysis. It can be complemented with expert opinion, that can be inserted by add factors in a consistent way. So it is a helpful tool for macroeconomic and fiscal analysis, if one takes into account that the baseline always will be inaccurate. However the accuracy of this version of Macroabc-MK can be improved by historical analysis like regression analysis and then running of variants and discussing the results with experts in all kind of fields (fiscal, sectors of industry, wage experts, monetary experts).