5. THE MACROMODEL OF THE MOLDOVAN ECONOMY MEDIUM-TERM FORECAST FOR MOLDOVA

Alexandru STRATAN[1]
Marcel CHISTRUGA[2]

Abstract

Estimates of the macroeconomic indicators are carried out with an econometric model which tries to estimate the medium-term evolution of the Moldovan economy. The forecast takes into account the economic influence of the main economic partners of the Republic of Moldova and the internal evolutions of the monetary aggregate M2, the exchange rate,the interest credit rate and others. This is the final yearly forecast of the Moldovan macroeconomic indicators and this version of the macromodel incorporates previous experience and a new block – Public Finance.

Keywords: model, econometric framework, simulation, macromodel
JEL Classification: C5, C51, C52, C53

1. Introduction

In the Republic of Moldova there is a lack of forecasting and economic experience. The official macroeconomic forecasts are provided mainly with the help of Excel models. The method used relies totally on an Expert Analysis. This method of qualitative analysis can be a valuable tool in a variety of situations. Indeed, the value of an individual with long-standing experience in the economy should not be discarded. While expert analysis can produce reasonably accurate results, this forecasting method usually does not define explicitly the assumptions it relies on. This raises two possible problems. Firstly, expert analysis without explicit hypothesis leads to possible misunderstanding among different agencies observing the forecasting results.

[1] *Institute of Economy, Finance and Statistics of Moldova, Email:alex_stratan@yahoo.com.*
[2] *Institute of Economy, Finance and Statistics of Moldova, Email:marcelchistruga@gmail.com.*

Secondly, regarding the turnover issue within the Minister of Economy staff, this process impedes a well-functioning knowledge transfer between the staff in charge of modelling and forecasting tools.

This is why it was absolutely necessary for the economic science in Moldova to come up with a macro econometric model that could forecast and model different scenarios of economic activity. This paper is an incipient and brief overview of the forecasting in Moldova and the macro econometric model building.

The paper revises the short-term and medium-term forecasting of macroeconomic indicators of the Republic of Moldova. The forecasts are made on the basis of the macromodel of the Moldovan economy, elaborated at the Institute of Economy, Finance and Statistics. The model is a small medium-term demand-driven model of the Moldovan GDP. The model mainly determines the real flows of the Moldovan economy. A flow chart of the model is shown in Figure 1 (exogenous variables are in dashed boxes).

In the short run, the demand side, because of price rigidity, explains the production level. In the long run, we suppose that prices clear markets and, then, the production level is explained by the supply side of the model.

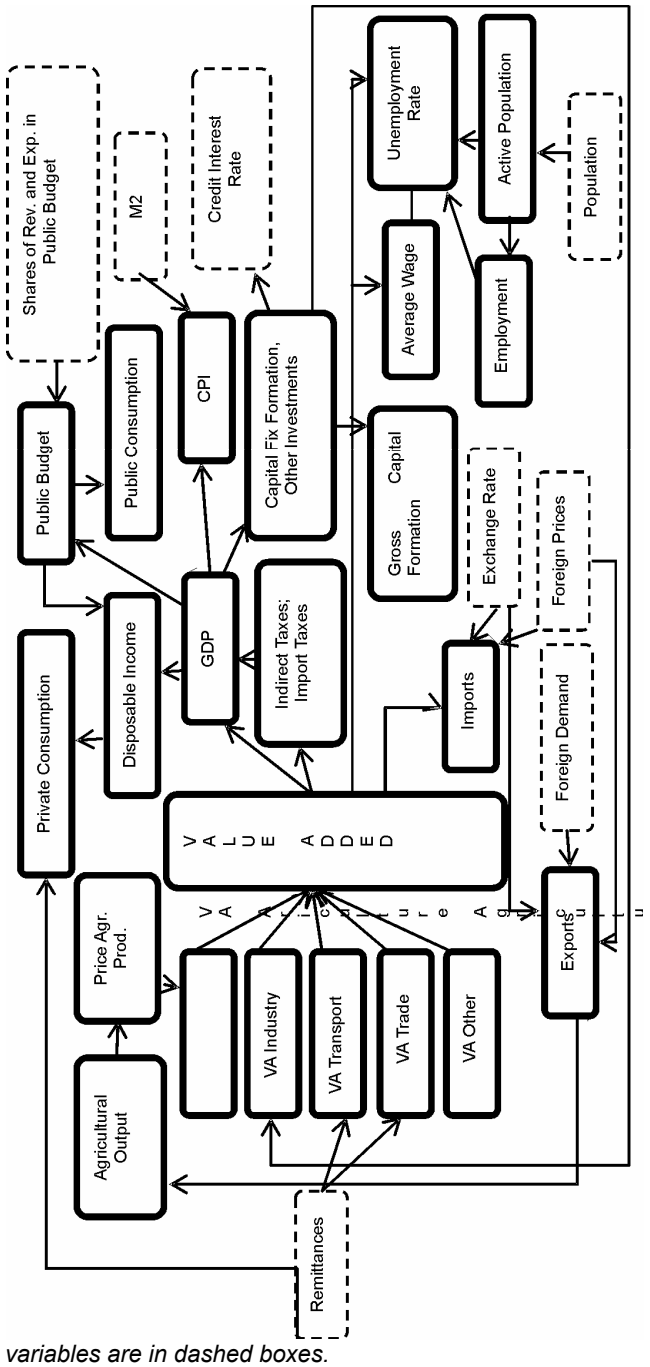
In the very short run, the demand variables play the key role because the price variations are supposed to be very weak. The sharing of supply between domestic production and imports depends only on demand, as described by a traditional Aggregate demand-Aggregate supply model. Then, the other variables can be computed, since the demand level is known: employment comes from the level of production, unemployed is the gap between working population and employment; wage variations - explained by the unemployment rate according to the augmented Phillips curve – are the main determinants of unit costs of production, prices, and income evolutions.

In the very short run, the effect of inflation rate on the real variables is very limited but in the medium and long run, it becomes the major explanation. Indeed, at the domestic level, the level inflation modifies the sharing of added value between wages and profits, which in turn modifies investment and capital accumulation. Through the real money balance effect, the saving rate is also changed by increase in inflation. Therefore, an increase in inflation reduces the medium growth rate because of its negative impact on investment (profitability effect) and on consumption (money balance effect)[3].

[3] *Usually, the inflation rate affects also the exposed sector, as it determines competitiveness evolution and market shares (imports and exports). An increase in inflation reduces the medium growth rate because of its negative impact on the trade balance. This macroeconomic linkage has not been integrated into the Moldovan macroeconomic model as the competitiveness effect was not significant in exports and imports equations.*

Figure 1

Flow chart of the Moldovan macromodel



Note: Exogenous variables are in dashed boxes.

2. Data and Methodology

The model uses data from 1998 to 2011. Sources of data are the National Bureau of Statistics, the Ministry of Finance, and the National Bank of Moldova. In addition, in the process of developing the macroeconomic model, it was necessary to build long time series of the real national accounts. Unfortunately, the National Bureau of Statistics calculates real macroeconomic data on the basis of a previous year index prices only. In this context, the year 2000 was chosen as the base year for our database. Because of often and big fluctuations in macroeconomic indicators, an appropriate year was difficult to choose. It seems that after the Russian crisis of 1998, some relative stability was achieved and the economic growth was resumed in 2000.

Moldovan forecasts are based on a General Equilibrium Model with 77 simultaneous equations. The model uses 110 variables - 34 endogenous and 33 exogenous. It is a model similar to those used in Ukraine, Poland, Lithuania[4] and Romania[5].

The macro model of the Moldovan economy has 6 blocks:

1 – The real sector of the economy
2 – Prices
3 – External Sector
4 – Public Budget
5 – Wages – Unemployment
6 – Exogenous Variables.

Behavioural equations for Moldova were estimated using annual data from 1989 to 2009. Almost all equations were estimated using the Ordinary Least Squares (OLS)[6]. They were estimated in levels, in order to implement the simplest forecasting formulas. Nevertheless, the dynamic behaviour was taken into account by estimating a partial adjustment model when the lagged dependant variable was significant. All the equations were estimated with the E-Views software.

3. Results and Discussions

All behavioural equations that were estimated for the macroeconomic model are listed in the appendix.

Table 1 lists all behavioural equations that have been estimated for the macroeconomic model.

[4] *Andersen, F M, Celov, D., Grinderslev, D., A. Kazlauskas (2005), "A macro-econometric model of Lithuania LITMOD",* Econometric Modelling.

[5] Dobrescu, E., *Macromodels of the Romanian Market Economy*. Bucureşti, Editura. Economică, 2006.

[6] *Contrary to the usual methodology developed in the economic literature, time series properties of the variables were not examined and cointegration tests were not applied because of the brief span time series.*

The forecasts below (Table 2) were made on the basis of the 2010 version of the model[7]. GDP is calculated as the sum of the following economic sectors: agriculture, industry, trade, transport, and communications.

Table 1

Main blocks and estimated equations of the model

Real Sector Block:
Value Added in sectors of the economy:
Agriculture
Industry
Construction
Trade
IT and Transport
Other types of activity
GDP at factor prices
GDP at market prices
Net Taxes on Products and Imports
Agricultural Output
Gross Capital Formation
Investments in Fixed Capital
Private Consumption
Public Consumption
External Sector:
Exports of food and beverages
Exports of other products
Exports of services
Imports of mineral products
Imports of other products
Imports of services
Total Exports
Total Imports
Net Export
National Public Budget Sector
Tax Revenues:
Direct Taxes
Indirect Taxes
Excise Tax
VAT
Taxes on foreign trade
Non-Tax Revenues
Other Revenues
Expenditures:
General State Services

[7] *"Forecasting and monitoring of the national macroeconomic indicators of Republic of Moldova, 2007-2010",* Research paper*, Institute of Economy, Finance and Statistics, 2010.*

External Activity
The justice system and constitutional justice
Maintaining public order
Defense and state security
Social expenditures:
Science and Innovation
Economic expenditures
Public Debt services
Other areas
Prices Block:
GDP Deflator
Fixed Capital Investments deflator
Consumer Price Index
Agricultural production deflator
Export Price of food and beverages
Export Price of other products
Imports price of mineral products
Imports price of other products
Wages and Employment Block:
Monthly Average Wage
Remuneration Fund
Unit Labor Cost
Economically Active Population
Employment
Unemployment rate

Exogenous variables in the 6th block. Forecasting of exogenous variables can be split into two categories:

- Domestic exogenous variables, such as Monetary base, M2, exchange rate against USD, etc.;
- Foreign exogenous variables, such as oil price, world demand, etc.

Forecasts of these variables rely on an expert analysis. Indeed, model users will need to make their own hypotheses on the forecasts of these variables.

Usually, foreign exogenous variables can rely on international organisations forecasts such as IMF. The WEO[8] database contains forecasts on world commodities prices, on foreign countries' real GDP.

Domestic exogenous variables rely on the National Monetary Policy conducted by the National Bank of Moldova.

4. An example of modelling framework

An Armington[9] model was used as the basic set-up in the export and import modelling. In this approach, exports and imports are generally modelled as demand

[8] IMF, World Economic Outlook, April 2010

functions: the demand function for exports corresponds to the demand of foreign countries for Moldovan products, and the demand function for imports corresponds to the demand of Moldova for foreign products.

Modelling remittances Also, am attempt at modelling remittances was made following a simple econometric model whose specification was taken from Erik Lueth & Marta Ruiz-Arranz (2007)[10]. Remittances are explained by domestic GDP, World GDP and domestic prices:

$$\log(WREMIT) = \alpha_0 + \alpha_1 \log(GDP) + \alpha_2 WORLD\_GDP + \alpha_3 \log(CPI) + u_t$$

Domestic GDP is measured by the real GDP figure at cost factor and domestic prices by the Consumer Price Index. We choose to apply as foreign GDP the world GDP variable constructed in order to model trade equation[11]. Indeed, this world GDP variable is a weighted average of the following countries: Belarus, Russia, Ukraine, Romania, the Euro Zone and the United States. This group of countries is the essential destination of the majority of Moldovan migrants in the world. Unfortunately, the work was not completed.

Modelling Private Fixed Capital Investments A neoclassical investment function can be estimated by the following specification:

$$\ln\left(I_{I,t}^{\Pr ivate}\right) = \alpha_0 + \alpha_1 \ln Y_t - \alpha_2 \ln ck_t + \varepsilon_t$$

where: Y is the real GDP at cost factor; Ck is the real user cost of capital;

And in this case, we expect that $\alpha_1 = 1$ and the coefficient ratio $\frac{\alpha_2}{\alpha_1} = \frac{1}{1-\sigma}$ identifies the long-run elasticity of capital with respect to the user cost. With Cobb-Douglas production, $\alpha_1 = 1$ [12], and the long-run elasticity of investment with respect to the GDP is unity. If $\frac{\alpha_1}{\alpha_2} < 1$, then $\sigma < 0$, implying that capital and labour are less substitutable than in the Cobb-Douglas case. By contrast, if $\frac{\alpha_1}{\alpha_2} > 1$, then $\sigma > 0$, implying greater substitutability of capital and labour as compared to the Cobb-Douglas production function. In the time-series context, the empirical implementation generally includes lags of the dependent variable, lags of the output, and lags of the user cost as additional regressors.

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[9] Loyd P. J. and Xiao-guang Zhang (2006), "The Armington Model" Department of Economics, University Melbourne.

[10] *Lueth, E. and Marta Ruiz-Arranz (2007) "Are workers' remittances a hedge against macroeconomic shocks? The case of Sri-Lanka",* IMF Working Paper *no. 07/22, Washington: International Monetary Fund.*

[11] El Sakka, M. and R. McNabb (1999) "The Macroeconomic Determinants of Emigrant Remittances", *World Development*, Vol. 27, No. 8, pp. 1493–1502.

[12] The fact that the long term elasticity is equal to 1 comes from the constant returns to scale hypothesis. If there are increasing returns, the elasticity will be less than 1 and the elasticity will be higher than 1 if the returns to scale are decreasing.

We start by estimating a dynamical neoclassical function, but this specification is rejected by the data. The user cost of capital is not significant and the coefficient of lagged investment has the wrong sign. A static neoclassical equation was also rejected by the data. Even if the coefficient of real user cost of capital is negative, as expected, it is no longer significant even at the 10% level[13]. The best model seems to be a simple accelerator model, where private capital investment (FCI_PRI) is explained by the real GDP at cost factor: an increase in GDP by 1% will raise the private investment by 2.92%.

We have also tried to estimate the impact of imports on private capital investments. We introduced as additional explanatory variables either the real total imports of goods or the real imports of non-mineral goods. None of these variables were significant.

5. Forecasting Moldovan Macroeconomic Indicators

Forecasts of GDP and other macroeconomic indicators obtained with the actual version of the macroeconomic model are displayed in Table 2. Some comments can be derived from these results:

- After a drop in 2009, the real GDP (at market prices) growth rate is expected to recover sooner than it was anticipated. It would reach 5.4% in 2010, 6.5% in 2011 and 7% in 2012. This evolution can be explained mainly by the capital formation growth, consumption growth and also a relative limited growth inimports relative to exports.
- Consumption growth rate, after the drop in 2009, should reach its past level of around 6%. This trend is mainly due to a level of remittances which should recover and remain high and to the disposable income growth rate, which should be driven by wages increase.

Table 2

Forecasts of main macroeconomic indicators of Moldovan economy (A-actual, F-forecasted)

		2006	2007	2008	2009		2010		2011	2012	2013
Indicator	Unit	A	A	A	A	F	A	F	F	F	F
GDP nominal	billion lei	44.8	53.4	62.9	60.4	71.4	71.9	80.2	81.4	90.8	100.2
Real growth	*%*	*104.8*	*103*	*107.8*	*93.5*	*92*	*106.9*	*107*	*106.5*	*107.06*	*106.77*
CPI annual average	%	112.7	112.3	112.7	100	101.5	107.4	105.0	106.6	105.6	105.4
Exchange Rate	lei/USD	13.13	12.14	10.4	11.11	11.2	12.3	13.3	11.6	11.3	11.2
Exports	Billion USD	1052	1342	1591.2	1297.7	1348.1	1582.1	1830	1646	2013.4	2453.9

[13] These results could be driven by the fact that private capital investment was explained by total GDP, which includes the agricultural sector. We tried to improve the fit of the estimation by taking off the agricultural fluctuations from the GDP variable used. Again, the neoclassical model was rejected. The user cost of capital was not significant.

		2006	2007	2008	2009		2010		2011	2012	2013
Indicator	Unit	A	A	A	A	F	A	F	F	F	F
Real growth	*%*	*110.8*	*96.4*	*118.6*	*81.6*	*83.7*	*122.9*	*110.0*	*114.8*	*115.6*	*115.6*
Imports	Billion USD	2693	3690	4898.8	3278.3	3636	3855.3	5264	4508.6	5035.4	5667
Real growth	*%*	*129.6*	*117.5*	*137*	*66.9*	*74.2*	*117.6*	*109*	*105.8*	*106.5*	*107.4*
Trade Balance	Billion USD	-1642	-2348	-3308	-1981	-2287.9	-2273.2	-3434	-2863	-3022	-3213
Industrial Production	Billion lei	27.4	31.5	36.2	32.7	24.7	27.1	44.1	42.7	47.5	51.9
Real growth	*%*	*95.2*	*98.7*	*101.2*	*79.8*	*86.8*	*107.0*	*107*	*105.9*	*105.5*	*104.5*
Agricultural Production	Billion lei	13.7	12.8	16.5	13.2	14.8	19.1	26.2	15.5	16.2	16.9
Real growth	*%*	*98.9*	*76.9*	*132.1*	*90.1*	*95.2*	*107.9*	*105.0*	*102.7*	*102.8*	*103.1*
Fixed Capital Investments	Billion lei	11	15.3	18.1	10.82	15.06	12.9	32.7	20.7	23.6	25.7
Real growth	*%*	*125.5*	*122.3*	*104.1*	*64.9*	*83.8*	*116.7*	*116*	*129.2*	*113.5*	*106.5*
Average Wage	lei	1697	2065	2529.7	2747.6	2921.9	2972.2	3350	3563.7	4105.2	4628
Nominal growth	%	128.7	121.7	122.5	108.6	115.5	108.2	116	115.4	115.2	112.7
Real growth	*%*	*114.2*	*108.4*	*108.7*	*108.6*	*113.8*	*100.7*	*110*	*108.3*	*109.1*	*107.0*

- Export growth rate should recover after the Russian ban in 2006 and the crisis decline in 2009, at a growth rate of 14.1% in 2009. This growth rate should slightly increase and reach 15.4% in 2011 and 2012, although the Moldovan currency is expected to appreciate. Exports should benefit from the growth of foreign demand; Moldovan exports will reach the level of 2008 only in 2012.
- Imports should keep increasing, but at a slower pace, their growth rate should range from 17.2% in 2010 to around 5-6% in 2013. This trend is explained by the domestic demand, which is expected to remain high, but with more investment and structural reforms in the national economy in the coming years, a part of the national absorption would be addressed to national products.
- Industrial and Agricultural Output will increase due to incoming foreign investments and support from international community, although the 2008 levels will not yet be reached.

In the case of the agricultural production, the Moldovan economy is extremely affected by natural calamities, making it difficult to forecast.

- CPI growth rate would remain high. Two main factors explain such a feature. Firstly, foreign prices are expected to increase due to high commodities prices (mainly oil and gas). Secondly, the high level of domestic demand would push up wages and salaries. Moreover, it is worth noticing that this result was obtained on the unchanged monetary policy hypothesis. Specifically, the model does not take into account the future path of the monetary policy to inflation targeting.
- Fixed Capital Formation will have an extraordinary boost, but it still fails to cover the drop in investments in 2009. The increase is more than 40% in 2010, in reality, in real terms will not exceed the level of 2007 (62.3 billion in 2007, 64.84 billion in 2008, 42.08 billion in 2009 and 59.4 billion in 2010, at the 2000 prices).

Finally, we can conclude that the outcome of the forecast is a little optimistic. But, we consider that this scenario is possible in case of political stability and structural reforms that will allow for attracting more investments and boosting exports in the near future.

6. Validation of the Model[14]

Analysing the reliability of the forecasted indicators for the last three years we can conclude the following. Except for 2009, affected by global economic and financial crisis, the forecasted indicators do not essentially differ from the actual results.

Thus, for 2008, out of 11 key macroeconomic indicators, four indicators were forecasted with "high accuracy" (90%), 5 indicators with "good accuracy" (80%) and 2 indicators with "satisfactory accuracy" (over 70%). In 2010, in the first category we have included two indicators, in the second 3, in the third and fourth 5 indicators and (not satisfactory) one indicator.

The forecasted indicators for 2009 should not be taken into account, because at the time of the forecasting there were no signs that could have predicted the global crisis. But even with the inclusion of 2009 in the calculation, we see that the errors are not so great.

Applying the method of determining the average percentage error using the formula:

$$\bar{\xi} = \frac{1}{n}\sum_{t=1}^{n}\frac{\left|y_t - y_t^*\right|}{y_t} * 100\%$$

where: y_t - actual value, y_t^* - forecasted value, *n* – number of forecasted values, the behaviour of the model could be checked. Thus, the measurement $\bar{\xi}$ will determine the degree of precision based on the following scale.

$\bar{\xi_t}, \%$	Interpretation
<10	High precision
10-20	Good precision
20-50	Satisfactory precision
>50	Non-satisfactory precision

Based on the mentioned formula, we could calculate the precision of the GDP forecasts for the last three years as follows:

((62.9-62.4): 62.9 x 100 + (60.4-71.4): 60.4 x 100 + (71.8-80.2): 71.8 x 100)): 3 = 10.2. Summarising, the calculated error for forecasting GDP (2008-2010) was 10.2%, which could be considered a high precision forecast.

[14] *Following the approach used in "Elaboration of the forecasting model for national economy of Moldova", thesis, Zinovia Toaca, Chisinau, 2011.*

Appendix

Main blocks and estimated equations of the model

Specifications of the Real Sector Block

gdpreal = gdpr_agr + gdpr_ind + gdpr_trade + gdpr_trans + gdpr_oth + gdpr_tax

gdpreal_va = gdpr_agr + gdpr_ind + gdpr_trade + gdpr_trans + gdpr_oth

where: gdpr_oth - is the value added of activities that were not listed above, gdpr_tax - indirect taxes.

All components of real GDP were computed with regard to the economic factors that influence these indicators. All the GDP components were expressed in logarithms, as presented below.

Value Added in Agriculture is determined on the basis of agricultural production and prices in agriculture.

D(LOG(GDPR_AGR)) = -0.003 + 1.11*D(LOG(PROD_AGR)) + 0.038*D(LOG(P_PROD_AGR))- 0.10*D07 + 0.13*D96

Price indices of agricultural products are determined by agricultural production and a lagged variable.

LOG(P_PROD_AGR) = 10.00 - 1.08*LOG(PROD_AGR) + 0.98*LOG(P_PROD_AGR(- 1)) + 0.33*D99

Volume of agricultural production is determined on the basis of a proxy of the external demand for national agricultural production – exports of agricultural and food products and a trend variable.

LOG(PROD_AGR) = 7.68 + 0.15*LOG(EXP_FOOD$R*12.43) + 0.020*@TREND - 0.25*D07 - 0.14*D03

Volume of industrial production is determined by real fixed capital investments, lagged variable of fixed investments and exports of agricultural products, since the main part of industrial production is based on production of food and beverages.

LOG(PROD_INDR) = 2.44 + 0.25*LOG(FCI/DEF_GCF*100) + 0.19*LOG(FCI(- 1)/DEF_GCF(- 1)*100) + 0.42*LOG(EXP_FOOD$R*12.43) + 0.10*D04

Value Added in Industry

DLOG(GDPR_IND) = -28.12 + 0.185*DLOG(PROD_INDR) + 688.93*D96

Value Added in Trade is defined as a variable dependent of total consumption, private and public, and a lagged variable of AV in Trade.

LOG(GDPR_TRADE) = -1.95+ 0.50*LOG(CONS_PRIVR + CONS_PUB/DEF_GDP*100) + 0.60*LOG(GDPR_TRADE(- 1)) + 0.49*D99 + 0.26*D96

Value Added in Transports is defined as a variable dependent on imports, which are multiplied by the US dollar exchange rate – 12.45, and a lagged variable of AV in Transports.

LOG(GDPR_TRANS) = 0.032 + 0.32*LOG((IMP_MIN$R + IMP_OTHER$R)*12.43) + 0.59*LOG(GDPR_TRANS(- 1)) - 0.15*D98

Value Added in the rest of the sectors is defined as a variable dependent on public expenditure and deflated with CPI remittances.

LOG(GDPR_OTH) = 6.67 + 0.34*LOG(PUBEXP/DEF_GDP) + 0.12*LOG(REMIT$/CPI*X$A)

Net taxes on products dependent on Gross Value Added a lagged variable and imports of goods and services, since VAT on imports represents a big share in all net taxes.

LOG(GDPR_TAX) = -9.96 + 1.48*LOG(GDPREAL_VA) - 0.26*D99 - 0.11*D04 + 0.31*LOG(GDPR_TAX(- 1)) + 0.12*LOG(IMP_GOOD_SERV$*12.45/DEF_GDP*100)

Fixed Capital Investments depends on real interest rates and a lagged variable.

LOG(FCI/DEF_GCF*100) = 5.23 - 0.49*LOG(INT1/CPI*100) + 0.59*LOG(FCI(- 1)/DEF_GCF(- 1)*100) - 0.50*D09

Other investments depend on interest rates and remittances.

FCI_OTHER = 1533.22 - 10.49*INT1/CPI*100 + 0.18*REMIT$*X$A - 958.21*D06 - 596.05*D05

Gross fixed capital formation

gfcf = fci + fci_other

Gross capital formation

gcf = gfcf + dstoch

Specifications of the External block:

Exports of food products (thousands USD, 2000=100)

LOG(EXP_FOOD$R) = -17.44 + 4.84*LOG(RussiaGDP)+0.73LOG(EXP_FOOD$R(-1)) – 1.4* - 0.24@TREND

Exports of other products (thousands USD, 2000=100), depends on world demand for national products (a weight of GDP of main trade partners) and a lagged variable.

LOG(EXP_OTHER$R) = -13.35 + 1.59*LOG(WGDPGL) + 0.47*LOG(EXP_OTHER$R(- 1)) - 0.32*D98 - 0.55*D09

Exports of services (thousands USD)

LOG(EXP_SERV$) = 4.09 + 0.17*@TREND + 0.52*D97

Price indices of exported food products. (thousands USD), dependent on world food prices and a lagged variable.

LOG(PXFOOD$) = -1.28 + 0.72*LOG(WPFOOD) - 0.13*LOG(X$A) + 0.61*LOG(PXFOOD$(- 1)) - 0.21*D09

Price indices of other exported products. (thousands USD), dependent on the lagged value, exchange rate and world CPI

PXOTHER$ = 40.39 + 0.56*PXOTHER$(- 1) + 0.27*WCPI - 2.27*X$A + 22.25*D08 - 15.10*D99

Exports of goods (thousands USD)

exp_good$ = exp_food$r * pxfood$ / 100 + exp_other$r * pxother$ / 100

Total Exports

EXP_GOOD_SERV = (exp_good$ + exp_serv$) * x$a

Imports of mineral products (thousands USD, 2000=100), dependent on exchange rates and GDP in US dollars.

LOG(IMP_MIN$R) = 1.65 - 0.39*LOG(X$A) + 0.69*LOG(GDPREAL/12.43) - 0.41*D09

Imports of other products (thousands USD, 2000=100), dependent on real remittances

LOG(IMP_OTHER$R) = 5.95 + 0.91*LOG(REMIT$1/CPI) + 0.24*D03 - 0.36*D99

Price indices of mineral products imported (thousands USD), depend on gas prices and a lagged variable.

LOG(PM_MINERAL$) = 0.25 + 0.45*LOG(WPGAZ) + 0.51*LOG(PM_MINERAL$(-1))

Price indices of other imported products (thousands USD), dependent on world prices and a lag of price indices.

LOG(PM_OTHER$) = -0.40+ 0.44*LOG(WCPI) + 0.63*LOG(PM_OTHER$(- 1))

Imports of services (thousands USD), dependent on real Gross Value Added.

LOG(IMP_SERV$) = -0.86 + 0.89*LOG(GDPREAL_VA/X$A*DEF_GDP/100) - 0.46*D96 - 0.41*D97 - 0.29*D98

Imports of goods (thousands USD)

imp_good$ = imp_min$r * pm_mineral$ / 100 + imp_other$r * pm_other$ / 100

Total Imports (thousands USD)

imp_GOOD_SERV$ = imp_good$ + imp_serv$

Total Imports

imp_GOOD_SERV = imp_GOOD_SERV$ * x$a

Net exports

netexp = exp_good_serv - imp_good_serv

Specification of the National Public Budget Sector:

Private Consumption (2000=100) depends on remittances and real disposable income

LOG(CONS_PRIVR) = 5.03 + 0.41*LOG(RDI) + 0.22*LOG(REMIT$1*X$A/CPI) - 0.06*D02

Private Consumption

cons_priv = cons_privr * cpi / 100

Public Consumption depends on public expenditures.

CONS_PUB = -228.99 + 0.54*PUBEXP

Differences in stock.

dstoch = gdpREAL * DEF_GDP / 100 - cons_priv - cons_pub - netexp - gfcf

Public Revenues

PUBREV = PUBREVTAX + PUBREVNT + PUBREVSPFOND + PUBREVSRES + PUBREVGRANT

Public Revenues except grants

PUBREVT = PUBREVTAX + PUBREVNT + PUBREVSPFOND + PUBREVSRES

Non-fiscal revenues

PUBREVNT = PUBREVNT_R * GDPREAL * DEF_GDP / 100

Revenues from special funds

PUBREVSPFOND = PUBREVSPFOND_R * gdpreal * def_gdp / 100

Revenues from special means

PUBREVSRES = PUBREVSRES_R * gdpreal * def_gdp / 100

Fiscal revenues

PUBREVTAX = PUBREVTAXDIR + PUBREVTAXINDIR

Revenues from direct taxation

PUBREVTAXDIR = PUBREVTAXDIR_R * FOND_WAGE

Revenues from indirect taxation

PUBREVTAXINDIR = PUBREVTAC + PUBREVTVA + PUBREVTIM

Excise

PUBREVTAC = PUBREVTAC_R * gdpreal * def_gdp / 100

VAT

PUBREVTVA = PUBREVTVA_R * GDPREAL_VA * def_gdp / 100

PUBREVTIM = PUBREVTIM_R * IMP_good_serv

Revenues

PR = PUBREV / (gdpreal * def_gdp / 100)

Expenditures

PUBEXP = PUBEXP_GENER + PUBEXP_EXT + PUBEXP_JUST + PUBEXP_DEFEN + PUBEXP_SOC + PUBEXP_SCIEN + PUBEXP_ECON + PUBEXP_ECOL + PUBEXP_DEPT + PUBEXP_OTHER + PUBEXP_CREDIT

Social expenditures

PUBEXP_SOC = PUBEXPS_EDU + PUBEXPS_ART + PUBEXPS_HELTH + PUBEXPS_SOC

General Expenditure of state services

PUBEXP_GENER = PUBEXP_GENER_R * gdpreal * def_gdp / 100

Expenditures related to foreign activity

PUBEXP_EXT = PUBEXP_EXT_R * gdpreal * def_gdp / 100

Expenditures of the justice sector

PUBEXP_JUST = PUBEXP_JUST_R * gdpreal * def_gdp / 100

Expenditures of defence and security sector

PUBEXP_DEFEN = PUBEXP_DEFEN_R * gdpreal * def_gdp / 100

Expenditures on education

PUBEXPS_EDU = PUBEXPS_EDU_R * gdpreal * def_gdp / 100

Expenditures on culture, art and sports

PUBEXPS_ART = PUBEXPS_ART_R * gdpreal * def_gdp / 100

Expenditures on public health

PUBEXPS_HELTH = PUBEXPS_HELTH_R * gdpreal * def_gdp / 100

Expenditures on social protection

PUBEXPS_SOC = PUBEXPS_SOC_R * gdpreal * def_gdp / 100

Expenditures on science and innovation

PUBEXP_SCIEN = PUBEXP_SCIEN_R * gdpreal * def_gdp / 100

Economic expenditures

PUBEXP_ECON = PUBEXP_ECON_R * gdpreal * def_gdp / 100

Environment protection and hydro-meteorology expenditures

PUBEXP_ECOL = PUBEXP_ECOL_R * gdpreal * def_gdp / 100

Public debt servicing

PUBEXP_DEPT = PUBEXP_DEPT_R * gdpreal * def_gdp / 100

Other areas expenditures

PUBEXP_OTHER = PUBEXP_OTHER_R * gdpreal * def_gdp / 100

Public Expenditures

PE = PUBEXP / (gdpreal * def_gdp / 100)

Primary Balance of the public sector

PUBBAL = PUBREV - PUBEXP

Specifications of the Prices Block

GDP Deflator Its main dependency is on ULC, which is defined as total fund wage divided by Gross Value Added

LOG(DEF_GDP) = 0.06*LOG(FOND_WAGE_TOT/GDPREAL_VA) + 0.66*LOG(PM_OTHER$) + 0.68*LOG(X$A) + 0.52*LOG(DEF_GDP(- 1)) - 2.39 + 0.06*D07

Gross Capital Formation Deflator dependent on GDP deflator and the lagged value of the GCF.

DEF_GCF = -1.87 + 0.41*DEF_GDP + 0.73*DEF_GCF(- 1) - 45.73*D09

Consumer Price Index Factors that could influence CPI are the national production prices, import prices and monetary aggregate M2. Also, a form that would link CPI to GDP deflator and monetary aggregate M2 was introduced.

LOG(CPI) = 4.53 + 1.98*((M2E - M2E(- 1))/(M2E(- 1)*DEF_GDP))*LOG(DEF_GDP) + 0.23*LOG(WPOIL) - 0.09 + [AR(1) = 0.88]

Prices of agricultural products dependent on agricultural production and inertia from one lag period

LOG(P_PROD_AGR) = 10.00 - 1.08*LOG(PROD_AGR) + 0.98*LOG(P_PROD_AGR(- 1)) + 0.33*D99

Prices of exported agricultural products dependent on world food prices, exchange rate and inertia from previous period.

LOG(PXFOOD$) = -1.28 + 0.72*LOG(WPFOOD) - 0.13*LOG(X$A) + 0.61*LOG(PXFOOD$(- 1)) - 0.21*D09

Price indices of other products dependent on world CPI, exchange rates and inertia from previous period.

PXOTHER$ = 40.39 + 0.56*PXOTHER$(- 1) + 0.27*WCPI - 2.27*X$A + 22.25*D08 - 15.10*D99

Price indices of imported mineral products dependent on prices of gaz and inertia from previous period.

LOG(PM_MINERAL$) = 0.25 + 0.45*LOG(WPGAZ) + 0.51*LOG(PM_MINERAL$(-1))

Price indices of other imported products dependent on world CPI and inertia from previous period, LOG(PM_OTHER$) = -0.40+ 0.44*LOG(WCPI) + 0.63*LOG(PM_OTHER$(- 1))

Specifications of the Wages and Employment Block

Number of employed workers in the economy

D(LOG(EMP)) = 0.0035 + 1.23*D(LOG(EC_ACT)) + 0.15*D(LOG(GDPREAL)) - 0.10*D96

Monthly Average Wage

WAGE = -121.99 + 27.87*(GDPREAL_VA*DEF_GDP/100)/EMP - 0.70*CPI + 1124.91*1/UNR + 84.15*D06 + 0.68*WAGE(- 1)

Gross Wages, remuneration fund

LOG(FOND_WAGE_TOT) = -11.66 + 1.06*LOG(GDPREAL) + 0.74*LOG(WAGE*EMP) + 0.10*D03

Economically Active Population

LOG(EC_ACT) = -1.37 + 0.26*LOG(POP(- 1)) + 0.90*LOG(EC_ACT(- 1)) + 0.08*D96

Unemployment rate

unr = (ec_act - emp) / emp * 100

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