EXTENDED VERSION OF ECONOMETRIC MACROMODEL FOR FORECASTING OF THE MAIN PARAMETERS OF SOCIO-ECONOMIC DEVELOPMENT OF THE REPUBLIC OF BELARUS

M.K. KRAVTSOV, N.M. BAREIKA, A.K. NIKITSINA
Economic Research Institute of the Ministry of Economy of the Republic of Belarus
Minsk, BELARUS
e-mail: anestezia.n@gmail.com

Abstract

Refined version of econometric quarterly macromodel is proposed for analysis and short-term forecasting of the key economic indicators of the Republic of Belarus. The model was adapted to the new classification of economic activities and extended by including financial and regional equations.

Econometric quarterly macromodel for analysis and short-term forecasting of the Belarusian economy has been developed in the Economic Research Institute of the Ministry of Economy of the Republic of Belarus and presented in [1, 2].

The improved version of the model is constructed as a system of 119 econometric equations and 7 identities grouped in 8 blocks: price, foreign trade, households, investment, industry, government revenues and expenditures, the calculation of GDP and regional block. There are 125 endogenous and 43 exogenous variables in the macromodel.

This model allows estimating GDP of Belarus in a two ways: 1) demand-side (based on Keynesian identity where GDP is equal to the sum of final consumption of households and non-profit institutions serving households, final consumption of government institutions, gross capital formation and net exports of goods and services); 2) supply-side (by summation of the gross value added (GVA) of the main sectors (industry, agriculture and forestry, construction, transport and communications, trade and catering, other sectors) and net taxes on products.

The main directions of improving the macromodel are following.

Firstly, block of the government revenues and expenditures was supplemented by new equation for the budget revenues (in the form of error correction model depending on tax revenues). And nonstructural equation for the final consumption of government institutions was replaced by the regression one (depending on budget revenue and nominal first class wage rate).

Secondly, block of the foreign trade\(^1\) was modified in the following way: 1) equations for debit, credit, and income balance of the current account were excluded; 2) equations for the assets and liabilities of direct, portfolio and other investments were replaced by equations for the financial account of the balance of payments and its indicators (direct, portfolio and other investments) due to changes in presentation of statistical

\(^1\)This block was developed by M.M. Burdyka and N.Y. Bezrukova.
information; 3) equation for the reserve assets was added. All new equations were estimated as error correction models (ECM): for financial account - depending on GDP, foreign trade balance of goods and services, exchange rate of the Belarusian ruble relative to the U.S. dollar, refinancing rate of the National Bank, external debt and Russia’s GDP; for direct and portfolio investments - on refinancing rate of the National Bank and exchange rate of the Belarusian ruble relative to the U.S. dollar; for other investment - on foreign trade balance of goods and services; for reserve assets - on exchange rate of the Belarusian ruble relative to the U.S. dollar and external debt.

Thirdly, industry block\(^2\) was adapted to the All-State classification of the Republic of Belarus ”Kinds of economic activity” due to the recalculation of data on indicators which were previously published according to All-Union classification of the branches of the economy, and extended by adding new equations for GVA of mining and manufacturing. According to them GVA of mining depends on the lagged (t-3) difference of investment and lagged (t-1 and t-2) dependent variable. GVA of manufacturing depends on industry output, lagged (t-3) investment in industry and lagged (t-1) dependent variable.

And finally, regional block was developed. It consists of 49 recursive equations for 7 indicators (industry output, exports and imports of goods and services, real average monthly wage, retail turnover of trade) by 6 regions of the Republic of Belarus and Minsk City. Most of equations were estimated as ECM.

Regional industry output depends on exports of goods of the region and industry output of the Republic of Belarus. Including national variable in this case allows taking into account interdependency of the regional reproduction processes.

Equations for foreign trade have various specifications reflecting some differences in product and geographical structure of regional exports and imports. The main factors determining exports of goods by regions are following: for Brest region - Russia’s GDP and real exchange rate of Belarusian ruble relative to Russian ruble; for Vitebsk and Gomel regions - EU GDP, real exchange rate of Belarusian ruble relative to euro and export price of oil products; for Grodno region - Russia’s GDP, EU GDP, real exchange rate of Belarusian ruble relative to euro and import price of crude oil; for Minsk City and Minsk region - EU GDP, real exchange rate of Belarusian ruble relative to euro and export price of oil products, as well as export price of potash fertilizer (for Minsk region); for Mogilev region - Russia’s GDP, real exchange rate of Belarusian ruble relative to Russian ruble and import price of crude oil.

Imports of goods for Brest, Grodno, Minsk, Mogilev regions and Minsk City depend on exports of goods, fixed capital investments and real average monthly wage in the region; for Vitebsk region - on import price of crude oil and industry output; for Gomel region - on import price of crude oil, industry output and fixed capital investments.

Exports of services of Brest, Vitebsk, Grodno and Mogilev regions are affected by Russia’s GDP and real exchange rate of Belarusian ruble relative to Russian ruble, Gomel region - real exchange rate of Belarusian ruble relative to Russian ruble and import price of crude oil, Minsk region - EU GDP and import price of crude oil, Minsk City - Russia’s GDP (in the current period and lagged (t-2)) and lagged (t-1) dependent

\(^2\)This block was developed by N.M. Bareika and V.I. Burdyka.
variable.

Imports of services in Brest, Vitebsk, Gomel, Grodno and Mogilev regions is a function of imports of goods, in Minsk City - of real average monthly wage, in Minsk region - of real average monthly wage and import price of crude oil.

Unlike of ECM for industry and foreign trade, equations for wage and retail turnover of trade by regions were estimated as ordinary regression (in first differences if necessary). Real average monthly wage in all regions depends on the first class wage rate (in real terms) and number of unemployed, and in turn has an impact on retail turnover of trade (as well as refinancing rate of the National Bank and lagged dependent variable).

New version of the macromodel was used for forecasting of the main parameters of Belarusian economy for 2013: GDP; final consumption of households and non-profit institutions serving households; final consumption of government institutions; gross capital formation, including gross fixed capital formation; foreign trade in goods and services; exports of goods and services; imports of goods and services; foreign trade balance; money incomes of population; compensation of employees; fixed capital investments; retail turnover of trade; paid services for population; budget revenues, tax revenues; GVA of industry, mining, manufacturing, agriculture, hunting and forestry, construction, transport and communications, trade and catering, other sectors; net taxes on products; industry output; agriculture output; commissioning of housing for all funding sources; fuel-energy resource consumption; financial account of the balance of payments (direct, portfolio and other investments, reserve assets); regional indicators (industry output, exports and imports of goods and services, real average monthly wage, retail turnover of trade). The forecasts were made in two scenarios: baseline and alternative (with 1 percentage point decrease of Russia’s and EU GDP growth and 10 percent decrease of the import price of crude oil compared with baseline one).

Refined version of econometric quarterly macromodel is scientifically valid, provides acceptable prediction accuracy and can be used for the short-term forecasting of socio-economic development of the Republic of Belarus.

References


Figure 1: Block scheme of the econometric quarterly macromodel

Exogenous variables (external):
- import price of natural gas;
- import price of crude oil;
- Russia’s CPI;
- Russia’s GDP;
- nominal exchange rate of the U.S. dollar relative to euro;
- nominal exchange rate of the U.S. dollar relative to Russian rouble;
- EU CPI;
- EU GDP;
- U.S. CPI;
- U.S. GDP;
- export price of oil products;
- export price of potash fertilizer.

Exogenous variables (internal):
- nominal exchange rate of Belarusian rouble relative to the U.S. dollar;
- nominal first class wage rate;
- nominal average monthly wage;
- nominal refinancing rate of the National Bank of the Republic of Belarus;
- budget expenditures;
- interest rate on new loans;
- price index for services;
- the volume of goods (works, services), net of taxes and fees from the proceeds of;
- population;
- external debt;
- research intensity of GDP;
- increased damping (depreciation) of fixed assets;
- cost of sales and services in industry and agriculture;
- productivity in agriculture;
- number of unemployed in a region;
- fixed capital investments in a region, etc.