

The System of Macroeconomic Accounts Statistics by the Modelling Indicators for the Financial Corporations Sector

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Abstract—The article deals with the development of models for analysing and forecasting the indicators of the Financial Corporation sector by the System of National Accounts (SNA), and with the possibilities of including it in forecasts based on the integrated SNA model. A listing of endogenous indicators of sector accounts for their modelling and of exogenous indicators, which are factors of influence on the prognostic indicator, has been substantiated. The modelling tool suggested provides a basis for developing an integrated SNA model. It embraces all sector accounts and their links, and is suitable from the viewpoint of available statistical data. It also allows formalising and assessing the macroeconomic policy to develop possible future options (conditions) of sector development.

Keywords—forecasting, modelling, Financial Corporation sector, system of national accounts

I. INTRODUCTION

The Ministry of Economic Development and Trade of Ukraine hosted a discussion on macroeconomic analysis and forecasting among leading specialists in the field of macroeconomic forecast of the government and non-government sectors. Following the outcomes of the discussion, the Ministry of Economic Development and Trade released the regular issue «Ukraine: Prospects for Development. Consensus-Forecast» (September 2018).

It is a known fact that consensus forecast is the averaged value of the main forecast indicators of development of Ukraine's economy, which is calculated as the median basing on expert assessments drawn by the participants of the survey conducted among leading specialists in the field of macroeconomic analysis and forecasting.

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Thus, experts who participated in the discussion of the macroeconomic forecast expect GDP growth at 3.1% in 2018, 3% in 2019, 3.1% in 2020 and 3.9% in 2021.

Experts also project a decline in consumer prices (in the period from December to December of the previous year) at 9.5% in 2018, 7.4% in 2019, 6% in 2020 and 5% in 2021.

Among the main risks for the Ukrainian economy during the forecast period, experts have identified:

- external risks: failure to receive the planned IMF financing, lack of external financing and reduced access to international capital markets, increasing hybrid threats to Ukraine's national security, in particular, active military confrontation in the eastern part of the country.

- internal risks: an increase in devaluation trends in the foreign exchange market, insufficient speed of implementation of reforms, and the preserved low credit activity of commercial banks.

The realisation of economic policies requires determining key macroeconomic indicators and long-term proportions, and national accounts indicators, which reflect reproduction processes at the macro level. Reinforcement of the institutional component in sustainable economic development processes requires refining the forecast calculations of the indicators in the system of national accounts (SNA) in sectorial terms, and merging model forecasting blocks into an integrated model.

A feature of modern approaches embodied in methods of short-term forecast calculations is, firstly, that they include mainly consolidated estimates without reference to structures based on the kinds of economic activities. Secondly, they are based on the principles of accounting for trends in place in the pre-forecast period, and the target values of macroeconomic indicators and proportions, which will be backed by appropriate actions of the economic policy of executive agencies. These actions are shown in the forecasting documents for the next year: the Consolidated Budget of Ukraine, the Balance of Payments Statement, public money income and expenditures, price and foreign exchange rate indicators, etc.

The integrated model for forecasting SNA indicators by economy sectors allows representing the national economy by both gross value-added proportions taken as a whole and balance proportions for each institutional economy sector, though realised according to the «bottom-up» principle.



The model allows analysing the processes of generating financial resources as capital investments, income, their flow according to state-established regulators, and the effect of other factors related to the necessity of GDP reproduction regardless of sufficiency of resource provisioning for each economy sector.

Hence, it is necessary to calculate national accounts indicators by sectors, including the Financial Corporations sector based on modelling sector accounts with adjustment for external and internal assumptions.

II. LITERATURE REVIEW

Presently, socio-economic development forecasts are being developed by research teams in many R&D institutes and consultancy agencies. For instance, integrated models of economic development are being built by the following institutions: the V.M. Glushkov Institute of Cybernetics, the Institute for Economic Forecasting NASU, the R&D Economics Institute with the Ministry of Economics (NDEI), the International Centre for Policy Studies, the Institute for Economic Research and Policy Consulting, and experts in the Ministry of Economics. However, along with the various models and indicators, which form them, obtaining a macroeconomic forecast based on accounts of sectors, including the Financial Corporations one, is a challenge.

The objective of the article is developing a model for short-term forecasts of indicators in the Financial Corporations sector.

III. METHODOLOGY

The Financial Corporations sector comprises institutional resident units involved mainly in financial intermediation, i.e. production (as assumed in SNA) when a unit undertakes to buy financial assets by participating in financial operations in the market. Financial enterprises take money from some units with certain commitments and then use them in the financial market with greater efficiency, allowing them to meet their own obligations and gain profit.

According to the Classification of Institutional Sectors of the Ukrainian economy, financial corporations (institutions) include all corporations, specializing in financial services or collateral financial activities:

- the National Bank of Ukraine;
- other depository corporations;
- other financial intermediaries, apart from insurance corporations and non-state pension funds;
- subsidiary financial organisations; and
- insurance corporations and non-state pension funds.

The functions of financial corporations (institutions) determine their sectorial allocation, as well as the income and expenses items, which form subsectors and current account positions and the capital of this economy sector.

IV. RESULTS

The National Bank of Ukraine is the central bank, a specific central body of state administration whose main function is to ensure stability of Ukraine's monetary unit.

Other Depository corporations include all financial corporations (apart from the National Bank) whose core business is financial intermediation and liabilities in the form

of deposits or financial instruments such as short-term deposit certificates. They are close substitutes for deposits when mobilizing financial resources and are included in the metric of money broadly. Thus, the subsector includes banks, branches of foreign banks, clearing agencies, housing development support funds, etc.

Other financial intermediaries, except for insurance corporations and non-state pension funds, embrace all corporations, whose core business is financial intermediation, i.e. activities involving receipt and reallocation of financial assets, excluding depository corporations, insurance corporations and non-state pension funds. This subsector includes corporations who raise funds on the financial markets, though not in the form of deposits, and use these funds for buying other financial assets, including mortgage (land) banks, credit unions, trust companies, leasing companies, mutual funds, and pawnshops.

Subsidiary financial organisations include all corporations involved in financial intermediation, but do not act as a mediator themselves. They include corporations whose basic function is providing guarantees by endorsement (a special inscription on the bill, according to which a holder transfers all or only certain rights to the recipient of the bill) of promissory notes or similar instruments intended for accounting or refinancing by financial corporations, as well as corporations specialising in hedging instruments (a process for reducing the risk of the primary investment). This subsector includes currency, commodity and stock exchanges, etc.

Insurance corporations and non-state pension funds include:

- Insurance companies whose core business is insurance, i.e. protection of property interests of individuals and legal entities in case of certain events (insurance events) specified in the insurance contract or stipulated in the applicable law and covered by cash funds accumulated when physical and legal persons make insurance payments (insurance premiums) and from income yielded by allocation of such funds;
- Non-state pension fund – a resident legal entity with the status of a non-profit organisation (a non-entrepreneurial society). It operates and conducts activities to accumulate pension contributions in favour of pension fund members, with subsequent management of pension assets and makes pension payments to Fund members.

Hence, financial intermediation is defined in the SNA as a production activity when an institutional unit undertakes to acquire financial assets by taking part in financial transactions in the market.

The specific feature of the activities of financial institutions is that financial institutions (intermediaries) assume obligations on financial markets by borrowing funds. They act as intermediaries between lenders and borrowers by channelling funds between the said parties. The question is how to assess the issue (products) of intermediation, for which no explicit payments and sales receipts exist.

On this basis, payment for services provided by financial intermediaries to their clients is not considered as actually received interest, but rather as the difference between interest received from clients and the interest actually paid by financial intermediaries. This is the conventional value of services provided by financial intermediaries.

The basic information used for building current transaction accounts and accumulation in the financial corporations sector in the long term is contained in the reports of the State Statistics Committee, the National Bank of Ukraine and the Ministry of Finance of Ukraine, the National Commission for Regulation of the Financial Services Market, the National Commission on Securities and the Stock Market, the Statistical Yearbook of Ukraine, statistical compilations, the National accounts of Ukraine, etc.

The forecast is done in Excel format (the Financial Corporations file) where each separate sheet contains reports

(2001-2012) and forecast data (2013) for a respective sector account, general economic assumptions and specific assumptions for the given sector. They are the exogenous indicators for the given model block. Fig. 1 shows the sector accounts modelling diagram.

Each account shows the following:

- listing of indicators (in rows) making up the resource part and the used part of the appropriate account;
- the dynamics for 2001 through 2012 (in columns). In addition, the reporting year 2011 is indicated to compare predicted values with actual data for this year;
- the end of each row has a formula for calculating the forecast value;
- if an indicator is forecasted by trend dynamics, the relevant row dynamics graph is shown together with the trend line along with the formula and the determination factor obtained (R2).

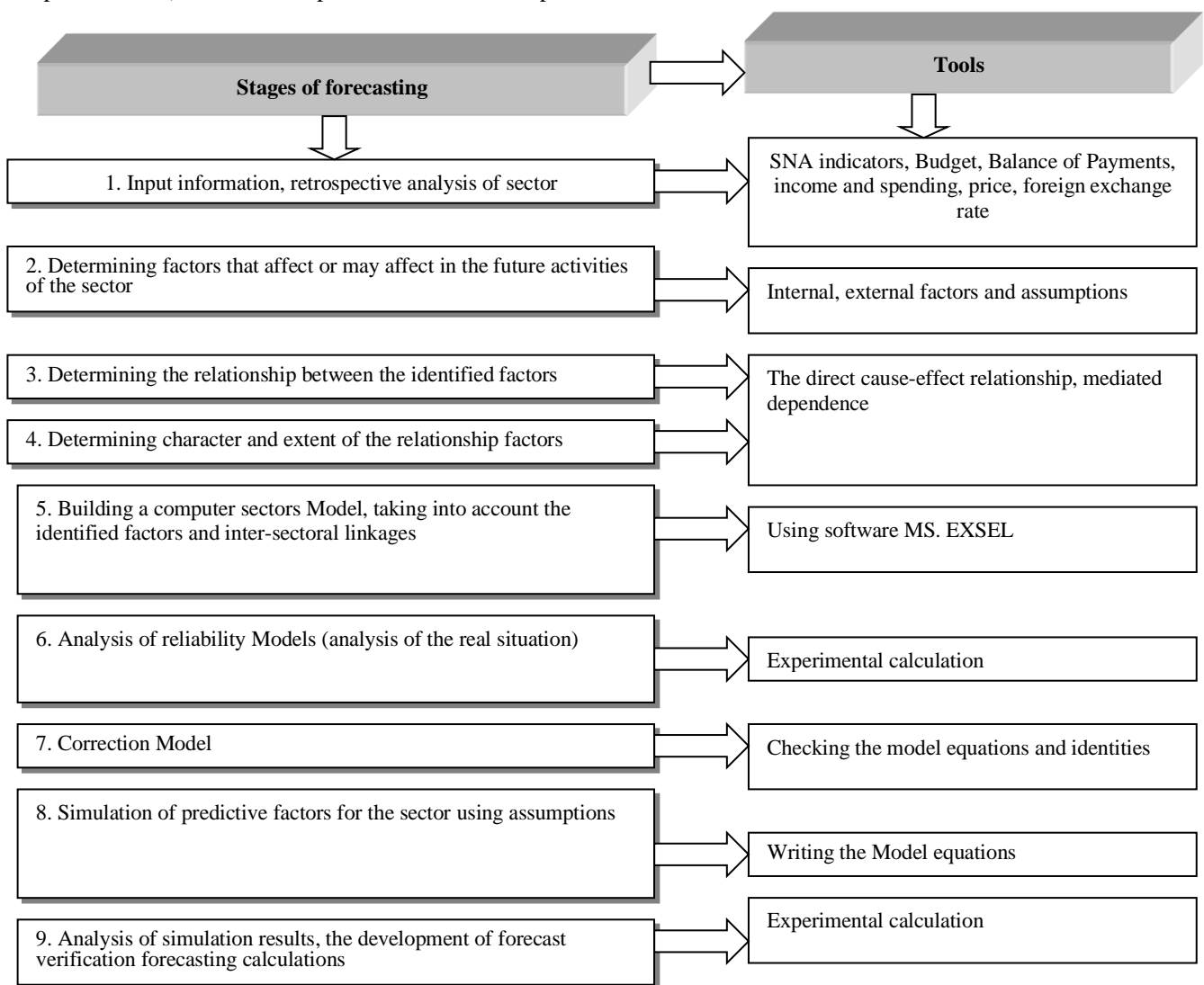


Fig. 1 Flow diagram for forecasting the indicators of national accounts of the Financial Corporations sector
Source: built by the author

The forecast values of the indicators for the Financial Corporations sector are calculated based on the provisions set forth in the Guidelines for Compilation of Accounts of Financial Corporations by Subsectors (approved by the State Statistics Committee of Ukraine on 01.12.2007 № 579).



Based on the above Guidelines, as well as on reporting statistical information of National accounts, balance equations have been established and economics-mathematical methods have been defined, which will be used in model analysis: trend extrapolation (average increases, linear, logarithmic, polynomial, power, and exponential trends); retrospective and forecasted parts are calculated, and two and multifactor regressions are also built.

Exogenous data, whose rows are shown in Table 1, are used for obtaining forecasted values of sector account indicators.

Further, we will consider the formalisation of constructing the key forecasted indicators of the sector.

The forecasted indicator of gross fixed capital formation (GFC) is found by building the model: $y=f(x_1; x_2; x_3; \dots x_n)$, where the factors are as follows: the price index of machine-building manufacturers (PPI_m), the price index of producers for construction and installation work (PPI_b), the average hryvnia to US dollar exchange rate against the previous year (ER), and the average annual interest rate on credits in national currency (C). Calculations have shown that these are the indicators that define by 68.7 % the change in the resulting indicator GFC ($R^2 = 0.687$). The formula is as

follows:

$$GFC = f(PPI_m; PPI_b; ER; C) \quad (1)$$

Gross savings for the forecast period are found using a power function (with $R^2 = 0.8735$):

$$GS_{(t)} = 2368.3t^{1.2425} \quad (2)$$

To obtain the forecasted value of current taxes (TAX), one can use the factorial approach of dependence of this indicator on overall income – gross profit and mixed income (INC), which is expected in the account of primary income allocation: $TAX = f(INC)$.

Calculation yields the following model ($R^2 = 0.77$):

$$LOG(TAX) = 0.786 * LOG(INC) - 0.412 \quad (3)$$

Social security contributions (SIC) are projected according to changes in their share in disposable income using the formula:

$$SIC_t = NDI_{(t-1)} * \overline{K}_1 \quad (4)$$

Where, $NDI_{(t-1)}$ - net disposable income;

\overline{K}_1 is a coefficient representing the average ratio of social insurance contributions and the net disposable income..

Table 1 Exogenous indicators for calculating the Financial Corporations sector

Assumption	Indicators directly affected by assumptions	2012	2013	2014	2015	2016	2017
Consumer Price Index,%	Property income paid, Wage, Purchase excluding disposals of nonfinancial assets unworked	109.1	112.8	125.2	115.9	109.4	108
Producer Price Index for construction and assembly works,%	Gross Fixed Capital	123.5	123.1	135.3	111.3	115.8	119.4
Producer Price Index for mechanical engineering, %	Gross Fixed Capital	104.3	109.9	120.0	111.3	110.7	110.7
Tax rate on profits, %	Gross profit, mixed income	25	25	25	25	25	23
Official Exchange Rate, UAH/ USD	Gross Fixed Capital Property income paid	5.05	5.05	5.2672	7.912	7.9356	7.967
Credit rate (in national currency)	Gross Fixed Capital Property income paid	15.4	14.4	17.8	20.9	15.7	16
Discount rate, average	Gross profit, mixed income	8.80	8.10	11.40	11.10	9.00	7.75
Minimum wage, the average for the year,UAH	Wage	364.4	430.0	532.5	643.2	888.3	963.1
Financial assets of FC, UAH	Capital transfers, paid	3 431.1	4 398.4	65 350.4	94 282.5	83 445.3	84 225.9
Non-financial assets of FC, UAH	Purchase excluding disposals of nonfinancial assets unworked	3 464.4	8 409.1	7 790.0	9 249.3	10 232.9	10 964.8
Gross insurance premiums, milln. UAH	Other current transfers, received	13 829.9	18 008.2	24 008.6	20 442.1	23 081.7	22 693.5
Gross insurance payments, milln. UAH	Other current transfers, paid	2 599.6	4 213	7 050.7	6 737.2	6 104.6	4 864
Interest rates depository corporations (except National Bank) in national currency	Property income received	7.6	8.2	9.9	14	10.3	8.1
Banks' income from investments and liabilities, USD	Property income received	-1 712.0	-4 706.6	-9 344.0	15 738.2	-13 101.7	-11 967.3

Source: Compiled by the author

Property income paid (PI_p) for the forecasted period is determined based on the factorial approach with account of the state's monetary and credit policy, specifically, the change in the inflation index, credit rate (C) and the national unit exchange rate (ER), the values being taken from general economic assumptions ($R^2 = 0.90$):

$$PI_p = 2235,6 * CPI - 546,1 * C + 23374,6 * ER - 344152,4 \quad (5)$$

Where, CPI , is forecasted consumer price index;

C , is credit interest rate;

ER , is UAH to USD currency exchange rate.

Property income received (PI_r), which is shown in the resource part of the account, is determined for the forecast period with account of banking system income, specifically national currency deposits rate (D) and bank income (INC_b) ($R^2 = 0.99$):

$$PI_r = -2278,75 * D - 8,01 * INC_b + 57021,31 \quad (6)$$

The gross profit and mixed income (INC) of financial corporations depends mainly on providing financial services in the form of attracting deposits and crediting other institutional units. Based on this, the indicator that affects the profitability of these operations is the NBU discount rate. This is a monetary instrument, with which the National Bank establishes a benchmark for subjects of the monetary market regarding the value of attracted and allocated funds for a corresponding period. It is the basic interest rate, which depends on the processes in the macroeconomic and budgetary areas, and in the monetary market. Its forecasted value is taken as an assumption for a future period.

Hence, let us investigate the dependence of the (INC) dynamics on changes in the discount rate (DR) and income tax (PT):

$$INC = 7924,545 * DR - 10799,557 * PT + 221370,89 \quad (7)$$

$$R^2 = 0.845$$

Thus, we have investigated the essence and composition of indicators of the Financial Corporations sector with a view to provide their information content and establish forecasting methods. The result was determining a listing of indicators, which are forecasted using SNA methodological approaches. Some indicators are found based on extrapolation of dynamic series, whilst others require using traditional and expert forecasting methods. Based on this, a model block has been developed for this sector with correlation of the following indicators: capital account, income allocation, secondary income allocation, primary income allocation, income generation account and production account, which are based on using autonomous forecasting methods, establishing exogenous variables with regard to the model, and relevant information support.

V. CONCLUSIONS

The model developed will allow analysing such domestic demand indicators as fixed capital formation, the processes of generating financial resources as income, their flow according to state-established regulators and the effect of other factors linked to the necessity of GDP reproduction regardless of the adequacy of providing resources for each economy sector; and to establish the presence of factors that misbalance the system.

Receiving quality forecasting data in the future calls for

developing tools for forming the dependencies of these indicators and their rationale from the viewpoint of economic logic, econometrics and the possibility of medium-term forecasting.

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