

**ACRA**

# **General Principles of Socioeconomic Indicators Forecasting**

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# Table of contents

1	General provisions .....	4
1.1.	Goals and approaches .....	4
1.2.	Forecasting tools.....	5
1.2.1.	Description of models .....	5
1.2.2.	Source data .....	6
1.2.3.	System of equations.....	6
1.2.4.	Verification of applicability and maintenance of quality .....	7
2	Macroeconomic indicators.....	8
2.1.	External indicators .....	8
2.1.1.	Determinants of the external environment.....	8
2.1.2.	Usage of external forecasts .....	8
2.2.	Demographic indicators.....	10
2.3.	Aggregate demand and supply, GDP .....	10
2.4.	Components of aggregate demand in equilibrium .....	11
2.4.1.	Household consumption .....	12
2.4.2.	Investments.....	12
2.4.3.	Government expenditure on final consumption.....	13
2.4.4.	Net export .....	13
2.5.	Aggregate market prices .....	15
2.5.1.	Consumer price index and inflation .....	15
2.5.2.	Interest rate.....	16
2.5.3.	National currency exchange rate .....	17
2.5.4.	Wages .....	17
3	Industry-specific indicators .....	18
3.1.	Approaches and algorithm .....	18
3.2.	External influence on industry-specific markets.....	19
3.2.1.	Local market .....	20
3.2.2.	Market of exporters.....	20
3.2.3.	Market of importers .....	21
3.3.	Demand .....	21
3.3.1.	Business-to-business market.....	22
3.3.1.1.	Intermediate demand.....	22
3.3.1.2.	Investment demand .....	22
3.3.2.	Business-to-consumer market .....	23
3.3.3.	Business-to-government market .....	25
3.3.4.	Business-to-all market.....	25
3.3.4.1.	Power industry .....	25
3.3.4.2.	Transport .....	25
3.4.	Supply.....	26
3.4.1.	Investments.....	27
3.4.2.	Competitive power .....	27
3.5.	Industry-specific government policy.....	28
3.5.1.	Support for domestic producers .....	28

3.5.1.1.	Demand support .....	28
3.5.1.2.	Supply support.....	29
3.5.2.	Energy policy.....	30
3.5.3.	Agricultural policy .....	31
3.6.	Prices.....	32
3.6.1.	Cost-based approach.....	32
3.6.2.	Value-based approach .....	33
4	Glossary.....	34
5	Main forecast indicators.....	37

# 1 General provisions

## 1.1. Goals and approaches

This document shall define the general principles of socioeconomic indicators forecasting used by the Analytical Credit Rating Agency (hereinafter referred to as ACRA, the Agency). These indicators shall be employed as one of data sources in the course of assigning credit ratings. A credit rating assigned by ACRA to a rated entity is the Agency's subjective opinion about the current and future creditworthiness of a rated entity, which is expressed by a rating category on the national rating scale. Forecasting of key economic and social processes is an integral part of assessing the credit quality of borrowers (banks, financial and non-financial corporations and regional authorities).

The baseline forecast implies the use of what ACRA believes to be the most probable assumptions of future socioeconomic trends. Scenario-based forecasting employs both moderately conservative assumptions commonly applied in baseline scenarios of rating assessments and moderately optimistic or, conversely, stress assumptions.

The document shall describe approaches to forecasting of countries' and regions' socioeconomic indicators and shall define basic analytical tools for socioeconomic forecasting to be used for ACRA purposes.

ACRA's system of forecast models describes socioeconomic regularities. The system's basic principle is the presence of universal socioeconomic regularities based mainly on the unidirectional nature of scientific and technological progress.

The following may serve as examples of universal development trends:

- Technological development in accordance with the criteria for scientific and technological progress (e.g. faster, stronger, more accurate);
- Economic development toward welfare growth (profits, ROI, efficiency);
- Demographic development towards longer lifespan and better quality of life.

Universal trends make socioeconomic processes stadial, which means change of structural economic development models, demographic transition (shift between types of population reproduction), urbanization, etc. Universality and directionality of socioeconomic patterns help to model future socioeconomic trends on the basis of generalizations and assumptions.

However, interrelation between time and space categories determines that in a general case universal laws work along the time axis, whereas along space axis the laws are unique. The general socioeconomic pattern applied to a specific projectandum is always unique. High quality of a forecast can be achieved only through an in-depth analysis of the specifics of a phenomenon in the context of a country, region, industry or enterprise. This determines a key approach to ACRA's forecasting practices, where both theoretical and empirical knowledge about the object of interest are equally essential and inherent. Socioeconomic regularities are stable in the long term while in the short term they are exposed to the effects of business cycles, government regulation and various irregular events.

Forecasting principles are based on the practical aspects of macroeconomic forecasting and analysis of industry-specific markets by using models.

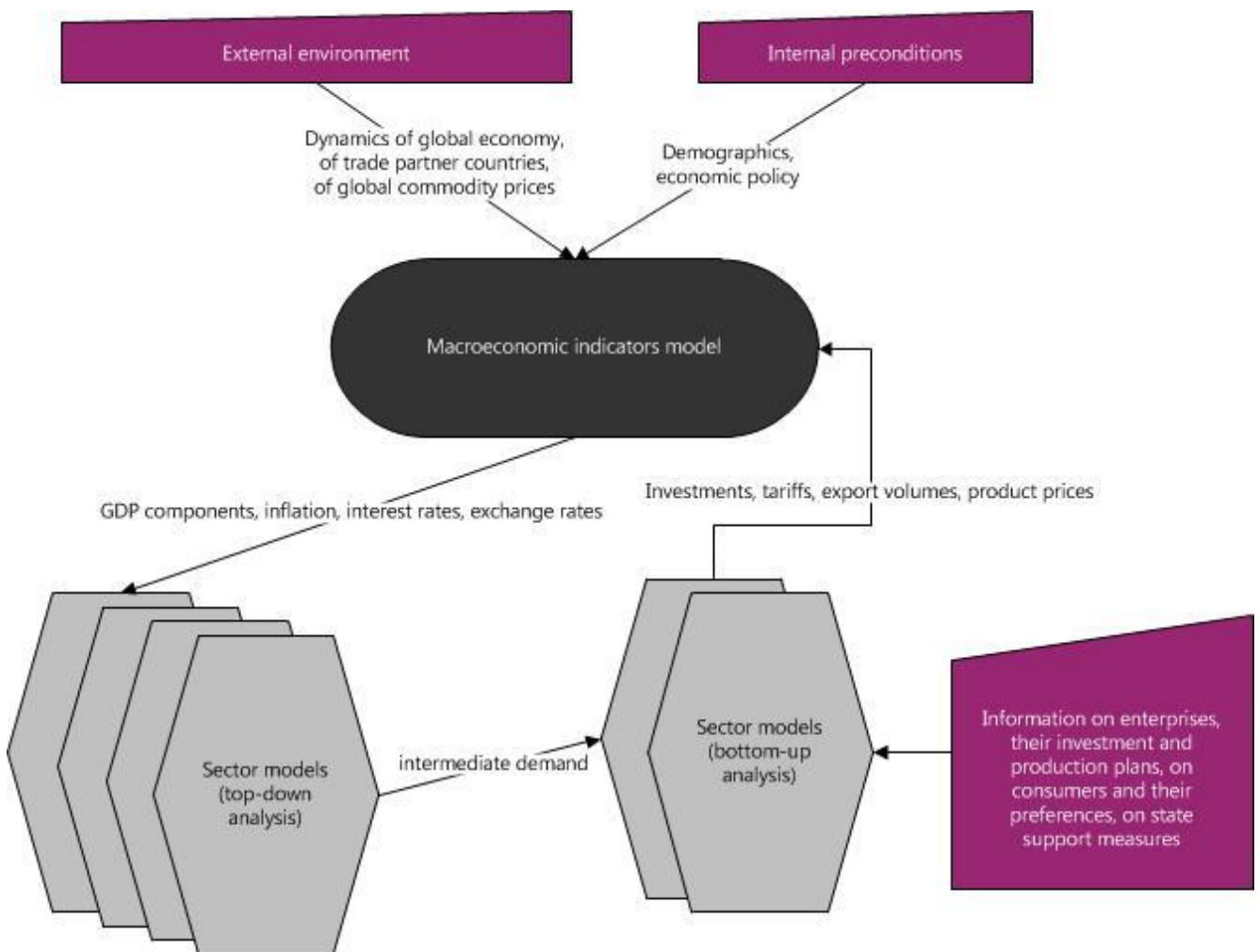
Regular verification of forecast indicators' deviation from actual values, subsequent error analysis and adjustments are the tools of models' quality assessment.

## 1.2. Forecasting tools

### 1.2.1. Description of models

The main forecasting tool is the system of interrelated macroeconomic and industry-specific models created for medium- and long-term (over 1 and 3 years respectively) forecasting of socioeconomic indicators of country's development and for performing scenario-based analysis. Model creation and calibration employ annual and quarterly data for at least 15-year period, which makes it possible to ensure sufficient generality of identified empirical relations and their relevance in describing different operating principles of the economy. Figure 1 shows the fundamental diagram of the system.

Figure 1. Fundamental diagram of models' system



Source: ACRA

Physically each model consists of a set of balance and stochastic equations and rules of their revision applied when new data emerge or historical data are refined. Equations connect the dynamics of endogenous indicators with those of other endogenous and exogenous indicators.

### 1.2.2. Source data

The indicators used in the forecasting should reflect processes and phenomena comparable with the main data sources (data of the national statistical office, statistics of the Central Bank, customs service, industry-specific ministries, services and agencies). This allows control over the quality of models and comparability of forecast results.

The priority is to use public official data as sustainable access to data is of vital importance.

### 1.2.3. System of equations

A model is based on two types of equations: balance and stochastic. Balance equations represent objective structural relations between indicators or functional connections between various performances of one and the same indicator. Balance equations stay unchanged when new data emerge.

Stochastic equations make it possible to model such complex objects and phenomena that we are unable to describe the behavior of each component. However, we understand their connection with other objects and phenomena "on average", *ceteris paribus*. Stochastic equations reflect empirically identified interrelations between dependent and explanatory variables (by construction they are conditional mathematical expectation of dependent variables with fixed explanatory variables). A set of explanatory variables in each stochastic equation should be formed on the basis of the economic theory and empirical observations. A functional form of the equations is determined by the modern econometric tools, mathematical statistics as well as the economic theory.

Econometric estimation of stochastic equations in most cases should be carried out by employing time series transformed to a stationary form. The need to use stationary series to estimate equations is caused by a well-known problem of *spurious* regressions. Time series are transformed to stationary series either by differencing or normalizing with respect to the indicator that reflects the variable scale of the economy or a process in time.

Stochastic equations for non-stationary variables may take form of an error correction model. Such model allows for short-term dynamics of the modeled process to be represented as the total of two components: reaction to a short-term dynamics of explanatory factors and gradual return of the indicator to a long-term equilibrium with variables cointegrated<sup>1</sup> with it (this component corrects the error).

In special cases stochastic equations may link non-stationary variables in levels. This is possible when the presence of co-integration of variables is justified (for instance, through the Johansen<sup>2</sup> test and on the basis of the economic theory).

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<sup>1</sup> With a common stochastic trend. For details, see Engle, R.F. and C.W.J. Granger (1987), «Co-integration and error-correction: representation, estimation, and testing», *Econometrica* 55, 251–76.

<sup>2</sup> Further on testing, see Johansen, S. (1991), "Estimation and Hypothesis Testing of Cointegration Vectors in Gaussian Vector Autoregressive Models", *Econometrica* 59, 1551–1580.

In certain stochastic equations, coefficient related to the explanatory variable cannot always be interpreted as the value of the effect rendered on a dependent variable due to the probability of existence of an effect set through other equations. Impulse response functions provide full estimate of the effect.

#### **1.2.4. Verification of applicability and maintenance of quality**

With the course of time and emergence of new data it is necessary to update time series of all indicators within a model (not only new periods, but also revised historical data). Emergence of new data should result in re-specifying the functional form of empirically identified relations in stochastic equations. They should be re-estimated on expanded samples. Backtesting and evaluation of model applicability shall be carried out at two levels:

a. Equation level. Equation that poorly explains the observed dynamics of an endogenous indicator both inside and outside a sample should not be used for forecasting. Equations with influence effects that cannot be interpreted in terms of the economic theory should not be used in a scenario-based analysis. In order to track if the used equations meet the stated requirements or not, three groups of auxiliary indicators are calculated:

i. The value of in-sample errors: adjusted determination coefficient, root mean square error (RMSE), etc. Their dynamics are traced with the emergence of new data.

ii. Relative value of out-of-sample errors. The equation estimated on a subsample of available data (training sample) is used to forecast an endogenous variable on the unused subsample (control sample). The values of dependent variables are set at the actual levels. Average errors (RMSE; mean absolute error, MAE) are compared with the average errors of "naive" forecast<sup>3</sup>. If the first ones exceed the second, it is a signal of potential inapplicability of the equation.

iii. Signs and values of influence effects of explanatory variables on dependent ones. They must meet the current status of the economic theory.

b. Model level. In the course of interaction within a model individually acceptable equation errors, having been propagated across all indicators, may lead to excessively large errors in the final forecast. In order to avoid this situation additional auxiliary indicators shall be calculated:

i. Relative value of out-of-sample errors with propagation. Values of exogenous variables are set at the actual level. Equations are estimated on the training subsample. Model solution is done for all endogenous indicators on the control subsample. Average errors (RMSE, MAE) are compared with average errors of a "naive" forecast. The excess of the first ones over the second ones is a signal of the model's insufficient quality.

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<sup>3</sup> "Naive" forecast is the expectation of such an indicator value in the forecast year, which equals the actual of the previous year, or grows at the previous year's rate (for indicators with a trend).

## 2 Macroeconomic indicators

### 2.1. External indicators

Globalization, development of the world trade, transport and communications steadily lead to the strengthening of economies' interconnectedness and to the increase of influence the world markets make on domestic economic indicators. This process is universal and is related to the scientific and technological progress. The result of this process is that the vast majority of countries can be considered as small open economies (their share of global GDP is markedly less than 5% and their foreign trade turnover steadily exceeds 40% of GDP).

For open small-sized economies, the influence of the external economic environment on domestic goods and financial markets is great and can be viewed as exogenous (i.e. modelling of the feedback effect can be ignored in the general case). Feedback effects should be modeled for economies producing and consuming over 5-7% of global GDP or those having market power on one the global goods markets (e.g. having high share in trade or production).

#### 2.1.1. Determinants of the external environment

Typically, for open economies it is possible to select a small set of external indicators which make a particularly significant impact and drive most short-term and some long-term changes in production, consumption, earnings, prices and other macroeconomic indicators. These external indicators include: growth of global economy and trade, economic condition of major trade partners, demand, supply and global prices of main export and import items of a country.

#### 2.1.2. Usage of external forecasts

The Agency reserves the right to use any information sources and forecasts with due consideration of own adjustments and interpretations.

The World Bank and the International Monetary Fund are examples of information sources providing global socioeconomic outlook. Trust in external forecasts may be based on acceptable assessment results of forecast deviations from actual values (See Table 1, column 5).

When using several external sources, ACRA conducts its own analysis of compatibility of stated assumptions and their compliance with forecasted socioeconomic trends. If it is impossible to select a scenario with appropriate assumptions, forecasts of external indicators shall be adjusted by experts.

Exogenous nature of external indicators (see Subparagraph 2.1) makes it possible not to worry about the consistency of external forecasts with internal ones, i.e. a change in the forecast of an internal indicator does not necessarily entail a change in the forecast of exogenous external indicators.



**Table 1. Indicators specifying external environment for most open economies and analysis of forecasts made by external organizations**

	<b>Indicator</b>	<b>Source of actual data</b>	<b>Source of forecasted indicators</b>	<b>Forecast advantage against "naïve" forecast<sup>4</sup>, pp</b>
1	2	3	4	5
A	GDP dynamics			
1	World	The World Bank	The World Bank	0.36
2	EU	Eurostat	The World Bank	0.79
3	China	National Bureau of Statistics of China	The World Bank	0.64
4	USA	BEA	The World Bank	0.50
B	Global commodity prices: crude oil, metals	Specialized sources		

Source: ACRA

Forecasts of economic growth rates on average are characterized by a good quality. This is related to the low volatility of physical growth indicators and to the large amount of relevant statistical information. In turn, complexity of forecasting price indicators and especially oil prices is related to the unobservability or noncoverage by actual statistics of factors that affect these indicators, as well as their high volatility. It is viable to perceive the most volatile indicators of the external environment as set by a scenario rather than as forecasted.

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<sup>4</sup> The table shows the difference between the average module of a relative error of an organisation's forecast (a forecast a year ahead is averaged from 2008 to 2014) and the average module of a relative error of a "naïve" forecast. For example, in its forecast of the world GDP growth rate, the World Bank's error is 0.36 pp lower on average than that of a "forecaster" who uses inertia assumptions. If the advantage had been negative or zero, the sources should have been recognised as not credible.

## **2.2. Demographic indicators**

Forecasting of demographic indicators is based on a universal concept of demographic transition. The size of population is one of the basic macroeconomic indicators defining the size of the economy. Forecast of the size of age-sex groups is required as a basis for determining trends in the markets of consumer goods and social services (education, healthcare, etc.), as well as in the labor market and in pension fund scheme. Forecasting of socioeconomic indicators in ACRA is based on a cohort-component method. Dynamics of the size of each cohort is regarded as a result of interaction between the following processes: mortality, fertility (directly affects only the size of the lower cohort of "0 years"), international migration.

Basic demographic rates — age-specific fertility rates, gender birth rates and mortality rates are exogenous for forecasting. Values of such indicators are built on scenario-based assumptions or on the extrapolation of observed dynamics. This approach is possible because demographic rates within the forecast periods of 3 to 5 years are mostly inertial and highly predictable.

Forecast of the number of births are calculated based on the number of women in a cohort and their age-specific birth rates.

To calculate forecasted numbers of the deceased, the age-shift method is used: the expected number of the deceased per year is calculated with the use of age-specific mortality rate for the number of those alive in each age.

## **2.3. Aggregate demand and supply, GDP**

Economic activity observed in various markets is typically represented as the result of interaction between demand and supply. The macro level of a country's economy description makes it possible to employ the largest categories — aggregate supply and aggregate demand, which cover the markets of all goods and services. Their interaction results in the volume of GDP for the specified time period, prices in markets of goods and services as well as labor and capital markets.

In the long-term, supply function determines production volumes which may be potentially produced in the economy that uses labor, capital and available technologies almost to the full. Thus, dynamics in this part of supply should be forecasted considering demographic trends (workforce, migration), depletion and replacement of capital stock as well as the pace and direction of technological progress. In the short term, the supply function describes optimum production volumes at any prices (with fixed capital stock, employed labor and available technologies) and responds mainly to changes in prices of goods and services — production factors (raw materials, wages, interest rates).

Aggregate demand shows what volume of final goods and services the economy would use at any set prices (with fixed volume of money supply). Aggregate demand may be shown as the sum of 4 main components: consumption, investments (total accumulation), government consumption and net export<sup>5</sup>. The basic criteria for the components differentiation – the agent providing demand for goods and services produced in the economy. These agents are households, enterprises, the government and the external world<sup>6</sup>.

ACRA’s model is based (see Figure 2Figure 2) on joint use of the factors of aggregate demand and supply to explain the observed dynamics of aggregate demand components in real terms and prices on the aggregate markets of goods and services, capital, labor and foreign currency (complex of partial equilibrium models).

## 2.4. Components of aggregate demand in equilibrium

Each component of demand is described by an empirical non-structural equation, which reflects both dependence on fluctuations of the agent’s current income and the effect of stimuli to redistribution of current income among the areas of their use and over time (see Table 2). A compact model makes the use of the full system of the agents’ nominal balances unviable (balance of sources and areas of use of cash flows).

Table 2. Components of aggregate demand

Determinant agent	Component of aggregate demand	Current income from core business activities (resource)	Basic tools for intertemporal resource redistribution
Households	Consumption, investments	Wages, pensions and allowances, rake-offs, income from assets net of taxes	Bank loan/deposit, investments in securities, real estate and currency
Enterprises	Investments (gross accumulation)	Gross profit and mixed income net of taxes	Bank loan/deposit, transactions with securities, investments in securities, real estate
Government	Government expenditure on final consumption, investments	Taxes and charges, customs duties	Internal debt, external debt, reserve funds, investments in assets
External world	Net export	World GDP (excluding the country under review)	The country’s net external liabilities

Source: ACRA

<sup>5</sup> Complies with GDP statistics of final consumption.

<sup>6</sup> Significant deviations from this discriminatory criterion: government investments and purchase of durable goods by households.

Consumption and investments can be modelled in real terms (in prices of a selected base year). In this case deflators of these flows shall be forecasted separately. Main factors which must be taken in account when forecasting components of aggregate demand are listed below.

### **2.4.1. Household consumption**

Consumption of goods and services within a specified time period<sup>7</sup> is a result of a household's decision to use larger or smaller part of its disposable resources (disposable income and accumulated wealth) as well as credit resources or, conversely, to save up. This decision is an intertemporal choice between current and deferred consumption.

The choice of the volume of current consumption is affected by both the volume of current disposable income (from labor activity and transfers net of taxes) and accumulated wealth, and by the cost of resource redistribution to other periods via use of financial and non-financial assets (real interest rate, expected return on currency investment, etc.). In developing countries fluctuations of the stock of wealth affect consumption dynamics to a smaller extent by far than in developed countries.

### **2.4.2. Investments**

It is viable to divide investments into three heterogeneous flows arising from the influence of various economic stimuli: in fixed capital (including intangible assets but excluding buildings and structures), in construction and in reserves.

Investments in fixed capital are particularly important as they affect aggregate supply by maintaining or increasing capital stock in the economy (which leads to the growth of potential production), as well as by updating technologies used in production (by increasing performance level or enabling production of a new product)<sup>8</sup>.

Economic theory and empirical research show that enterprises increase investments when they anticipate or see growth of the economy and demand (both domestic and external). Increase of investments can be possible subject to the availability of resources — own or borrowed funds. Basic determinants of investments in fixed capital are factors that set expectations of future income, current income (demand, cost of production), own funds of an enterprise and cost of external resources (interest rates, accumulated debt burden). Capital-intensive industries typically form long-term investment plans; infrastructure industries have public investment programs in addition to long-term investment plans. In such cases they may be used for forecasting or adjusting the aggregate figure.

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<sup>7</sup> Due to the specifics of the national accounting system, purchases of durable goods (household appliances, means of transport, real estate) may be attributed to investments rather than consumption.

<sup>8</sup> The effect on aggregated supply becomes apparent mainly in the long-term, although some studies show that unit costs of the sector get lower as early as in a quarter following the investments. This document sees this effect as negligible against the horizon of forecasting for most industries and periods.

Investments in reserves (both positive and negative) serve as a buffer that smooths out the situations of short-term glut or shortage in periods when markets are finding new balance after the shocks of demand or supply while producers fail to respond to such new equilibrium in an optimal way. Besides, investments are made outside a shock in order to maintain reserves at a level required to secure the producer against any force-majeure at own facility or risks of breaching contracts by suppliers of raw materials. During periods of economic meltdown, the effect of reserve accumulation may be observed up to several months when overstock of warehouses supports a positive trend in the output while the external demand for goods shrinks. Investments in reserves shall be regarded as one of the indicators of economic activity.

Housing and commercial sectors shall be regarded separately when forecasting construction volumes. Demand in the first sector is affected by the size of the housing stock per person, by all factors affecting consumption by households, as well as by government programs that define the volumes of housing construction. Demand in the second sector is qualitatively affected by the same factors as with investments in fixed capital as well as by government programs.

### **2.4.3. Government expenditures on final consumption**

This component of aggregate demand occurs as a result of state-provided non-market services for collective consumption and government operations related to redistribution of national income and wealth. It represents a part of government spending other than investments and transfers.

Government spending on the whole is a very predictable flow because decisions on its amount are made in advance (a year ahead as a minimum) and, as a rule, tend to be based on explicitly formulated rules or on an implicit but simple approach. Potential rules and approaches include: limitation of the maximum deficit amount when forecasting spending, limitation of deficit net of cyclical revenues from the current economic situation (e.g. generated by export of commodities), limitation of the size of government debt (to GDP), direct limitation of the size of spending (to GDP) or rates of its growth, etc. Budget planning enshrines the amount of government spending in legislation for a year or more, and this plan must be fulfilled. Depending on the role of government in the economy the share of spending on final consumption in total government spending may vary. The structure of government spending (consumption, investments, transfers) is rather prone to inertia, but it changes when the priorities of the federal policy are reconsidered.

When forecasting the volume of spending, forecasts of actual income and deficit financing potential should be assumed taking into account the absence of clear rules of deficit volume limitation. Mandatory tax payments and non-tax budget revenues are an income-generating resource for government spending.

### **2.4.4. Net exports**

This component reflects the demand of the external market for domestically manufactured products net of domestic demand for the production of the external producers. Prices for export goods are determined at global markets (see Subparagraph 2.1). In ACRA forecasting of export volumes is performed at the industry-specific level (see Section 3).

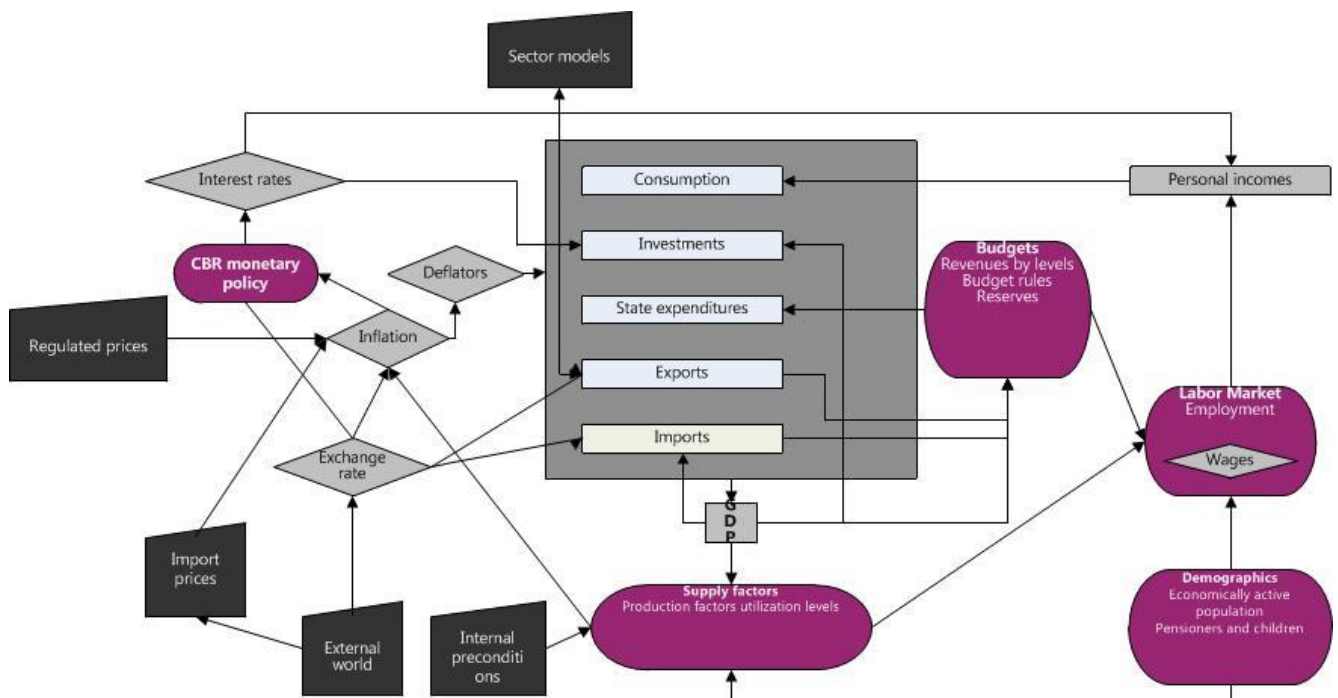
While services may be exported in lots of service categories (transport, consulting, finance, information services, tourism, etc.), in many countries export volume is primarily connected with goods turnover.

Goods and services are typically imported by categories of products that are difficult to replace (domestically) in the short-term. Therefore, import dynamics depend on the volume of the income-generating resource of households and enterprises. Planned changes in taxation of external trade and trade restrictions (embargo, limits, quotas) shall also be taken into account in the process of forecasting.

Prices for export and import goods are mostly defined in foreign currency (USD, euro). Therefore, domestic agents receiving income in national currency and accumulating wealth in the form of internal assets, respond to fluctuations of the national currency exchange rate (substitution effect). Import or export substitution may also be encouraged by the government's economic policy (duties, quotas, etc.) and be more or less explicit.

Contribution of net export to real economic growth may be negative, which occurs in case of outstripping growth in the imports of goods and services. The share of this component within aggregate demand in most countries fluctuates within the range of +/-20% of GDP and in the long term depends on the country's specialization in global manufacturing and in the global financial market.

Figure 2. Flowchart of forecasting macroeconomic indicators



Source: ACRA

## 2.5. Aggregate market prices

General equilibrium in the national economy is achieved by means of balancing demand and supply in aggregate markets (of consumer goods, borrowed funds, foreign currency, labor) by appropriate market adjustment of indicators (of consumer prices, interest rate, exchange rate of national currency, wages). Equations for their forecasting describe the process of finding "partial equilibrium". Presence of these indicators in the model is essential for sufficiently complete modelling of economic stimuli and response of the major economic agents to these stimuli.

### 2.5.1. Consumer price index and inflation

Consumer price index (CPI) is calculated on the basis of the cost of the basket of goods and services purchased by the population. A sufficiently stable structure of the basket allows forecasting the CPI dynamics (inflation) by applying empirical approach without distinguishing effects of each component of the basket.

Goods and services with fully or partially regulated prices — housing and public utility services, transport, education, alcohol, etc. — may form a significant part of the consumer goods basket. Administrative decisions on indexation of prices (published in advance or evaluated by experts on the basis of their expectations) on such goods and services must be included in the forecast considering their impact on the dynamics of unit costs and prices of intermediate goods.

Monetary inflation<sup>9</sup> and inflation expectations are the most predictable factors of consumer prices dynamics. These two factors significantly lag (about one year) behind the observed inflation and the dynamics of monetary aggregates and create the so-called inflation inertia. The basic mechanism of influence of expectations on future inflation is loan agreements and long-term sale-and-purchase agreements (example of "self-fulfilling expectations"). In the long term inflation expectations may be represented by inflation targets.

Dynamics of consumer prices must be predicted taking into account the share of imported goods (and goods produced from imported raw materials) in the consumer basket. The more open the consumption is to imports, the stronger the impact of external prices will be on domestic prices (directly through the goods within the basket or through consumption of intermediate goods) and the more significant the effect of transfer of exchange rate to domestic prices.

Legislation may regulate the extent of exposure to imports via duties, quotas, norms and trade barriers. Imposing an embargo on food imports is an example of limiting imports transferred to consumer goods prices through supply shrinkage on domestic market.

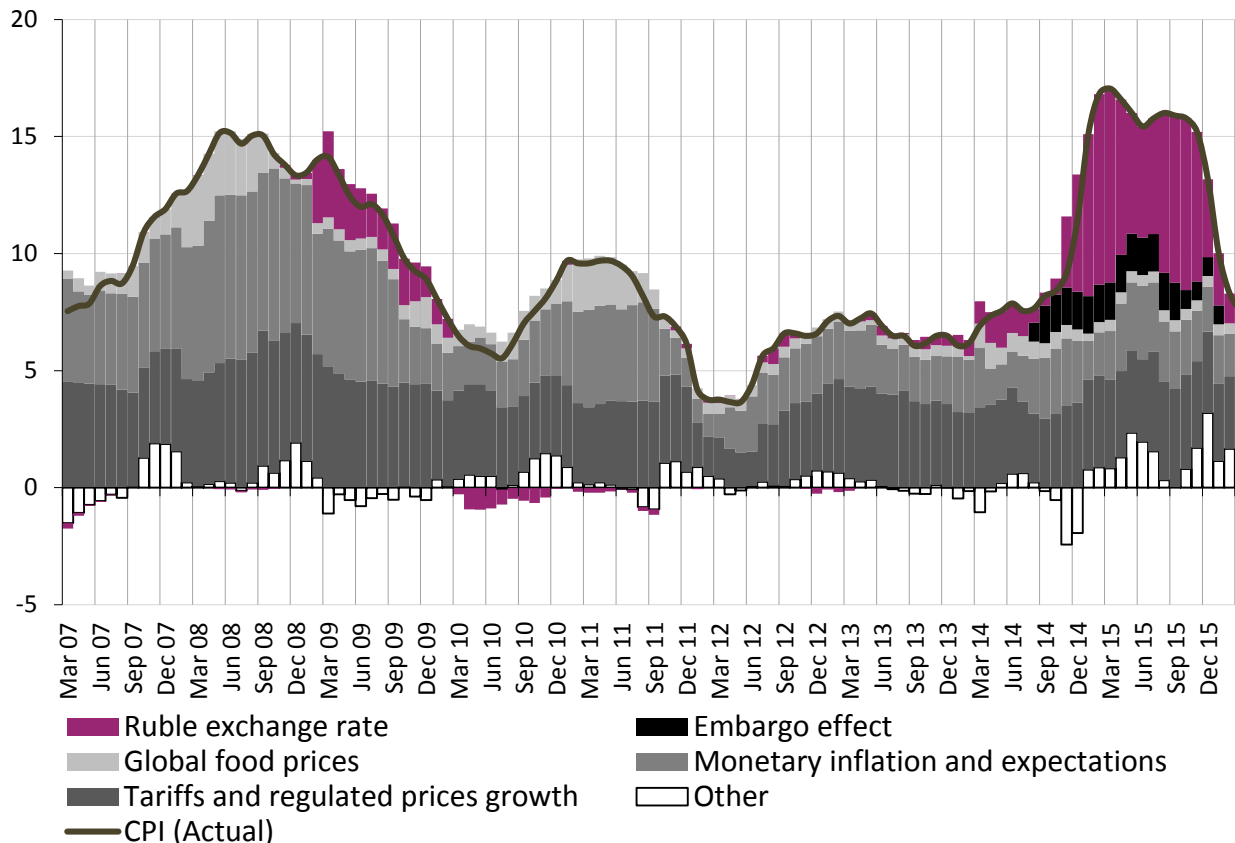
The lower the socio-economic development of a country is, the higher is the share of food products in the consumer basket (in developing countries up to 60%) whereby their domestic prices may be rather volatile. Therefore, this category should be represented by a separate factor. If a national food market is not local (see Subparagraph 3.2), there should be a correlation between domestic and world prices.

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<sup>9</sup> Monetary inflation is related to change in the relative volume of money stock and real money balances. For the purposes of their forecasting it is essential to model dynamics of monetary aggregates and credit expansion mechanism.

Inflation breakdown by components in accordance with the specified general principles of forecasting is shown using the example of Russia (see Picture 3). Historically, the most significant inflation outbursts in Russia, similarly to other raw material exporting countries, may be related to the effect of transfer of currency exchange rate to domestic prices.

**Picture 3. Breakdown of CPI dynamics in Russia (2007-2015) by major factors**



Source: ACRA

### 2.5.2. Interest rate

ACRA uses the average value between a lending rate provided by commercial banks for nonfinancial sector companies and a deposit rate for individuals as a base rate for modelling the cost of intertemporal redistribution of financial resources. Such approach allows using this indicator simultaneously for forecasting stimuli for lending to organizations and for households' propensity to consume/save as well as partially for analyzing the attractiveness of external investments with regard to the level of external rates and sovereign risk.

Forecasting of the interest rate shall take into account the anticipated dynamics of the cost of banking system resource provided to/absorbed by the Central Bank and other state authorities as well as borrowing rates at external capital markets. Besides, dynamics of the interest rate should be affected by such factors as the size of credit risk in the economy, change of the margin level of the banking system and inflation expectations.

Dynamics of rates of Central Bank instruments should be forecasted considering pursued monetary policy, its goals and instrumental options for their achievement.



### **2.5.3. National currency exchange rate**

National currency exchange rate is the critical nominal indicator for an open economy that balances trade and financial flows arising as a result of interaction of residents with external markets. Its forecast is based on the understanding of dominant behavior stimuli of major agents creating demand and supply on domestic currency market (drastically vary by country). Presence of relatively stable stimuli frequently leads to institutionalization of: mechanisms of using revenues by exporters, import financing specifics, non-residents' investment behavior at internal financial markets, residents' saving in external assets, state policy related to creation and use of currency reserves and government debt.

For most countries that and have floating exchange rates and capital movements (including natural resource exporters), the most volatile (and therefore explaining the majority of exchange rate fluctuations) are the following 6 factors.

On the supply side:

1. Exporters' foreign currency earnings, converted for payment of taxes and duties and for covering costs in rubles arising from business operations. Fluctuations of export products prices.
2. Non-residents' demand for portfolio investments on local markets (and transaction costs arising from such investments, legislative barriers). Observed and anticipated difference between domestic and external market rates.

On the demand side:

3. Residents' cash earnings and potential demand for imported consumer goods and services (including tourism).
4. Opportunities to refinance external debt. Debt repayment schedule (in case of problems with access to refinancing).
5. Schedule of external debt servicing.
6. Propensity of population and companies to make short-term savings in foreign currency during periods of economic shocks.

Dominance of various factors in explanation of short-term and medium-term dynamics of the domestic currency exchange rate makes it possible to record the forecast model in the form of error correction (see Subparagraph 1.2.3).

### **2.5.4. Wages**

Wages is a nominal indicator that balances out demand and supply on the labor market. The degree of its contribution to the balancing process (as opposed to the employment volume indicator) is determined by institutional factors: labor laws, the traditional structure of labor agreements and informal norms that regulate employee-employer relations, and the government's role in the economy.

All other things being equal, a more rigorous legislative protection of laborers' rights stimulates employers to revert to flexible mechanisms of advocating their own interests: using variable working hours, increasing the share of remuneration that depends on the company bottom

line, and moving out wages portions into the shadow zone (by formalizing only the minimum wages in employment agreements). Higher inflation levels help ensure the necessary degree of flexibility by making real average wage cuts easier, while nominal wages formalized in employment agreements remain constant. When adjusting to new conditions, the labor market does fluctuate, but only slightly.

In reverse cases, i.e. under the conditions of institutionally flexible employment, average wages play a limited role in market balancing. As a rule, these reverse cases are fraught with ample stimuli for the emergence of trade unions and other collective forms of defending employee interests, as well as for state-run employment insurance programs (unemployment benefits, re-education, etc.).

In the short and medium terms, wage dynamics is determined by institutional employment flexibility and aggregate demand behavior. In the long term, average real wages correlate with labor productivity both in the on- and off-the-books employment sectors. Deviations from long-term correlation may be linked to qualitative changes of labor market supply, including migratory inflow/outflow and workforce age structure dynamics.

### **3 Industry-specific indicators**

#### **3.1. Approaches and algorithm**

Industry-specific forecasting is based on approaches described in Section 3. However, typically it has access to more detailed statistical and analytical data on the object of forecasting. The more detailed the forecasting level (micro level) is, the more often deviations from general macroeconomic trends are observed and the more important role accounting of individual factors plays. This explains the dominant role of balance models for supply and demand functions in industry-specific forecasting.

ACRA in its practice employs the method of "general-to-specific" (from analyzing general trends to more specific industry indicators) for forecasting demand, while for forecasting supply the method of "specific-to-general" (from analyzing micro factors to more general industry indicators) is used.

Modelling economic equilibrium allows forecasting industry and company key indicators: production and investment volumes, prices, financial indicators.

The algorithm of forecasting industry-specific indicators includes five stages:

1. Determining the influence of external demand and supply on local market. External influence determines the nature of market competition.
2. Determining the type of consumer which helps to identify the key factor of demand forecasting.
3. Determining competitive advantages for modelling supply curves.
4. Modelling price dynamics as behavior of market equilibrium taking into account the influence of non-market factors.

5. Forecasting industry and company financial indicators basing on projected prices, expenses, market and production volumes.

### 3.2. External influence on industry-specific markets

Depending on involvement of a product or service in foreign trade operations, industry-specific markets may be divided into three types: local markets, markets of importers and markets of exporters (see Table 3).

Involvement of domestic producers in foreign trade determines the nature of competition and the type of pricing in the domestic market.

External influence on an industry-specific market reflects competitive abilities of domestic manufacturers. The share of import goods and services in the market is an indicator of weak competitive abilities of national economic industries. The share of export goods and services shows that domestic manufacturers are competitive as competition for external markets is always higher than that for the domestic one and vice versa. This regularity may be distorted by non-market factors (dumping, etc.).

Division of markets into the above three groups is not permanent — it can be changed by shifts in the curve of supply and economic equilibrium.

**Table 3. Types of industry-specific markets according to external influence**

1. Algorithm of market classification			
Is this an exporting industry?	No	No	Yes
Is this an importing industry?	No	Yes	
Determining the market type	Local market	Market of exporters	Market of importers
2. Market specifics taken into account in the process of building projection models			
Competition	Competition for domestic market. Volumes of domestic production and domestic consumption are equal.	Competition for domestic market. External supply for domestic market is not limited.	National manufacturers are global players which take part in global market pricing.
Price	Local equilibrium (price is set under the influence of local factors of supply and demand).	Import parity (domestic market price is equal to the total of the global market price, customs duties and transportation costs).	Export parity (domestic market price is equal to the export price net of customs duties and transportation costs).

Source: ACRA

### **3.2.1. Local market**

Lack of import and export of goods serves as a sign of natural (transportation makes no economic sense or impossible) or artificial (protective state policy, national security policy) market access barriers.

Natural limitations are typical for goods with low added value and high unit transportation costs as well as for service industries. As for natural resources, long-distance haulage is typically unfeasible for such fuel and energy resources as lignite and peat as well as for all ore minerals except for iron ore and bauxites. Transportation entails loss of quality for lots of food products, e.g. milk, eggs, bread.

Local markets may be created artificially — a government can limit access to its national market in order to protect local manufacturers or for national security purposes. Protection of local manufacturers from external competition is illustrative for industries that are important to the economy in terms of employment or industry-specific ties. For national security purposes, access to markets may be limited for production of the military industrial complex (MIC), industries of social and strategic significance. Frequently for the purposes of food and energy security, the policy of self-sufficiency in the production of food staples, electric power, etc. is pursued.

Modelling of demand and supply in local markets does not take into account a direct influence from external markets. In this case internal production is equal to internal consumption while pricing does not depend on global market.

### **3.2.2. Market of exporters**

If an industry is exporting, it means that national producers are able to meet competition in the domestic market, so they compete for external consumers. As a rule, the level of competition for external markets is higher and the presence of an industry on the global market speaks for its competitiveness.

For the purposes of this document external demand is considered to be unlimited if there is a global market for a specified product or service, except for markets where national manufacturers have market power (see Subparagraph 2.1.1). There are global markets for the major part of commodities (crude oil, metals, food staples). If there is no global market, external demand should be considered quasi-unlimited. Thus, infrastructural limitations and transportation specifics divide the global gas market into quasi-markets geographically (Asian, European, American) and technologically (pipeline gas, LNG), but in the future technological development may lead to creation of a unified global gas market. State industry-specific policy related to provision of support to domestic producers may also result in market localization (see Paragraph 3.5 "Industry-specific government policy").

Pricing on export markets is performed on the basis of a net back parity, i.e. of equality of domestic market prices and external market prices net of customs duties and transportation costs. Non-market factors (artificial limitation of competition, state policy) may affect pricing based on this principle.

### 3.2.3. Market of importers

If an industry-specific market is importing, it means that national producers compete with foreign producers for the domestic market. Producers' ability to meet competition is always higher on their own market than on the external market due to lower transportation, logistical and marketing costs.

When modelling the import market, external market supply generally is considered to be unlimited. Import markets typically are the main objects of the state policy, which strongly affects the formation of market equilibrium.

Market pricing depends on world supply prices set by importers with due regard to imbalances imposed by customs and tariff policies, transportation costs, etc.

### 3.3. Demand

Demand behavior is determined by consumers of goods and services which may be represented by other producers, households or government. Depending on the type of a consuming agent (by analogy to Paragraph 2.4), markets may be divided into 4 types: business-to-business (b2b), business-to-consumer (b2c), business-to-government (b2g) and business-to-all, when goods and services are supplied to all types of consumers and are technologically interconnected. The size of a consumer group and their income are the key factors of market demand behavior (see Table 4).

**Table 4. Factors of market demand behavior**

	Factors of demand behavior
Business-to-business, b2b	Income and output of consuming industries
Business-to-consumer, b2c	Income and size of population
Business-to-government, b2g	Income and budget priorities
Business-to-all (infrastructure)	Dynamics of GDP and population

Source: ACRA

Consumption on all markets may be divided into current (operating costs of enterprises, fast-moving consumer goods, current government procurement) and investment (investments of enterprises, durable goods and investment government procurement).

Current consumption is characterized by relatively stable volumes and frequently by low price elasticity of demand. Low elasticity of demand for some goods in this group is one of the factors of high price volatility on their markets (commodities).

Conversely, dynamics of investment consumption is exposed to high volatility and closely connected to economic and business cycles. Investment consumption rapidly responds to changes of economic situation. High price elasticity of demand for investment goods is one of the factors of low price volatility on their markets.

### **3.3.1. Business-to-business market**

Demand from other producers may be intermediate (for use in current operations) or investment (for maintenance of current production or development of new production facilities).

#### **3.3.1.1. Intermediate demand**

Modelling of intermediate demand for a product (service) is based on movement of output indices in industries that consume this product (service). Intermediate demand is typically characterized by low volatility of volumes, which is one of the factors of high price volatility on the markets of such goods. Intermediate demand markets are commodity markets ("primary sector"), industries of the primary sector of the economy (metals industry, chemical industry) and services to business not related to investments (insurance, audit, etc.).

Competition between products is present on commodity markets. Thus, within total demand for energy there is competition between various types of fuel affected by a difference in energy prices, government policy and infrastructure limitations.

One and the same product may be involved in competition with various product groups. Thus, energy products may be used either as fuel or as an industrial commodity. For instance, crude oil is used as an initial product in petrochemical industry and as fuel in the form of petrol, diesel oil, fuel oil; gas is an initial product for fertilizer manufacturing and fuel for the power industry. Forecasting demand for the products of the FEC as for initial products and as fuel should be methodologically different. Demand for fuel is divided into two types:

- Demand for transport fuels. Competition between different types of fuel in transportation sector is observed between the dominant use of petroleum products and use of gas fuel, biofuel and electricity.
- Demand for fuels for electricity and heat production. Long-term forecasting of competition between different types of fuel is performed on the basis of the method of calculating a levelized cost of energy (average estimated cost of power production over the entire lifecycle of a power station including operating and investment costs).

It is similarly important to forecast simultaneously the entire combination of competing markets for other primary sectors of the economy.

#### **3.3.1.2. Investment demand**

Investment demand shall be modelled taking into account investment plans of consuming industries. Specific features of investment demand are volatility and exposure to the influence of business cycles.

Investment demand of the entire economy is an indicator for such industries as construction and production of construction materials. Forecasting of investments is generally addressed in the section "Macroeconomic indicators" (see Subparagraph 2.4.2).

Investment demand of separate industries is an indicator for investment engineering industries (industrial machinery manufacturing, power plant engineering, rolling stock manufacturing, aircraft industry and shipbuilding industry) and metals industry (production of pipes and rails).

Approaches to forecasting investments by separate industries are addressed in Subparagraph 3.4.1. It is important to take into account a time lag between making an investment and ordering new equipment when performing forecasts for the above industries.

### 3.3.2. Business-to-consumer market

The level of consumer demand is the product of three components: size of a target group of consumers of a certain product or service, level of penetration of a product or service among consumers as percentage of a target group size and consumption rate expressed by the number of consumed goods or services per time unit.

A target consumer group may include all population of a country (region) or its separate groups by one of socio-demographic or other criteria. Dynamics of a target consumer group depends on dynamics of demographic indicators (sex and age structure of the population, migration flows, income) or takes into account other differentiating features (e.g. occupational composition, special physical features and other similar criteria). Forecasting of the size of a target group tends to be based on socio-demographic projections.

Level of penetration is the share of consumers of a certain product or service in relation to the total size of the target group of consumers. This indicator for a certain product or service changes over their lifecycle and typically shows an increase at first and then decreases at a different rate for various groups of goods/services. Dynamics of the level of penetration is determined by qualitative changes of the information and technological environments.

Consumption rate of goods and services reflects an average per capita consumption per time unit. Dynamics of this indicator for consumer markets is determined by the availability of a product or service and by qualitative demand trends.

Table 5 shows main consumer markets and their key drivers of consumption.

**Table 5. Examples of forecasting factors for consumer markets**

	Size of a target group		Penetration level		Consumption rate	
	Dynamics	Example of a factor	Dynamics	Example of a factor / trend	Dynamics	Example of a factor / trend
Product category						
fast-moving consumer goods	changing	change of the entire population size	slightly changing	penetration level — almost 100%	changing	fashion for healthy lifestyle, increase of animal protein consumption
clothing, footwear	changing	change of the entire population size	slightly changing	penetration level — almost 100%	slightly changing	climate changes, fashion changes
household appliances and electronics	changing	change of the entire population size	changing	robotization of household chores	changing	digitalization of society

	Size of a target group		Penetration level		Consumption rate	
	Dynamics	Example of a factor	Dynamics	Example of a factor / trend	Dynamics	Example of a factor / trend
goods for kids and babies	changing	number of children of different ages	slightly changing	penetration level — almost 100%	slightly changing	almost 100%
pharmaceuticals	changing	change of the entire population size	slightly changing	penetration level — almost 100%	changing	fashion for healthy lifestyle
vehicles	changing	number of holders of driving licenses	profoundly changing	automobilization	slightly changing	population mobility
luxury goods	changing	change of the entire population size	changing	increase of wealth divide; number of population with highest income	slightly changing	slightly changing
Service category						
domestic	changing	change of the entire population size	slightly changing	change of the number of working women	changing	increase of the amount of free time
touristic	changing	number of travel passport holders	changing	trend for travelling	profoundly changing	increase of the amount of free time
medical	changing	reproportion of different age groups	profoundly changing	deterioration of free medical services quality	profoundly changing	fashion for healthy lifestyle, epidemics, wars
educational	changing	re-proportion of different age groups	profoundly changing	growth of the tertiary sector of the economy, increase of demand for intellectual and scientific professions	profoundly changing	changes of industry-specific structure of economy
telecommunication	changing	change of the entire population	changing	digitalization of life	profoundly changing	digitalization of society
entertainment	changing	change of the entire population size	changing	increase of the amount of free time	profoundly changing	increase of the amount of free time
transport	changing	change of the entire population size, of the urban population	changing	mobility growth, trend for travelling	changing	mobility growth, trend for travelling



	Size of a target group		Penetration level		Consumption rate	
	Dynamics	Example of a factor	Dynamics	Example of a factor / trend	Dynamics	Example of a factor / trend
public catering	changing	change of the entire population size	profoundly changing	trend for high cuisine	profoundly changing	increase of the amount of free time
financial	changing	change of the entire population size	profoundly changing	growth of income and savings	profoundly changing	growth of income and savings

Source: ACRA

### 3.3.3. Business-to-government market

Demand for the government is determined by government spending of the budget and priorities of government policy. Approaches to the budget forecasting are addressed in Subparagraph 2.4.3. The government is a key customer for the products of MIC, space industry, etc.

### 3.3.4. Business-to-all market

There are industries producing goods and services, which are used in manufacturing of any product and service and which are the important components of a quality of living. Such industries are core for the national economy. Demand for goods and services provided by these industries depends on fundamental social and economic trends. The above industries include power industry and transport.

#### 3.3.4.1. Power industry

Power industry is a core industry of the economy. Final consumption of energy resources is observed both in material and non-material production, as well as in everyday life. Forecasting of the energy consumption level is performed by modelling extensive and intensive factors of energy consumption growth. Extensive factors of energy consumption growth are related to the growth of economy (GDP) while intensive ones — with substitution of manual labor by machine labor, greater technological conversion and increase of quality of living. Considering positive GDP and population dynamics, the factor which can lead to decrease of the energy consumption level is growth of energy consumption efficiency which, in its turn, can be related to the scientific and technological progress and growth of energy prices.

#### 3.3.4.2. Transport

Transport is the second core industry of the economy. Its services are used in the process of manufacturing any product, while the level of its development is a component of the quality of living. Forecasting of the demand for transport services, by analogy with power consumption services, is based on modelling extensive (economic and population growth) and intensive factors (development of integrated logistics, increase of population mobility). Retarded development of the transportation infrastructure may limit demand for transportation services while rapid development, by contrast, may boost economic activity and extra demand. There is a competition between various types of transport for cargo and passengers within an overall demand for transportation services. Marine, pipeline and railway types of transport are typically

more competitive from the standpoint of low price, aviation — from the standpoint of speed, automobile transport — from the standpoint of convenience for consumers and transport which utilizes electricity and gas fuel is the best as far as environmental performance is concerned. This trend may be distorted by infrastructure deficit and state policy.

It is obligatory to take into account certain specific features when forecasting indicators of separate types of transport. Pipeline and railway transport tend to hold a monopoly in the industries they serve. Pipeline transport is a special-purpose type of transport. When it is compared with other types of transport by a specific route and commodity type, as a rule it proves to be the cheapest and the most convenient. The example of competition between pipeline transport and other types of transport can be rivalry on the gas transportation market (gas-transmission pipelines and LNG tankers). For the purposes of forecasting operating indicators for pipeline transport, it is more feasible to employ the specific-to-general method and to take into account development forecasts for the industries they provide services to by specific directions of transportation in order to model transportation volumes.

Demand for rail freight services is generated mostly by bulk cargo (commodities) and long distance haulage. In these segments demand is of low price elasticity, however, tariff imbalances, infrastructure deficit and other problems with quality of service may lead to competition with other types of transport even in the segment of bulk cargo. Demand for rail transport in non-bulk cargo segments, car load shipments and in short distances is price elastic and competes with other types of transport. Demand for passenger railway transport is price elastic and competes with air transport in the long haulage, and with automobile transport in short distances.

Considering the trend for development of integrated logistics, automobile transport is characterized by outperforming dynamics from the standpoint of transportation volumes together with reduction of transportation distance. Usage of automobile transport in the segments of long-distance passenger and cargo transportation tends to show insufficiency of transportation industry. As a result, within the long-term development there will be a trend on its optimization.

### **3.4. Supply**

Future dynamics of supply provided by an industry or enterprise is modelled on the basis of forecasting supply volumes and competitive position of market players.

Supply dynamics of an industry or enterprise in the future depends on production expansion, retirement of equipment, change of capacity utilization as a result of modernization or, conversely, obsolescence of assets. Key indicator for forecasting supply volumes are investments made by enterprises. Weather factors may also affect supply in some industries (agriculture, inland water transport, etc.), however, long-term weather forecasts are impossible to make, and it is feasible to consider weather effects only for phenomena anticipated in the short term.

Competitive position of an enterprise on the domestic and external markets is determined by a combination of competitive edges, i.e. relative competitiveness.

### **3.4.1. Investments**

The main approach to forecasting investments is the count-up method based on gathering information about investment plans of rated entities and other companies within an industry. Limitations of this approach can include the absence of data or unreliability of public data for specific companies.

Investments shall be divided into:

- Investments in property, plant and equipment (PP&E) maintenance;
- Investments in PP&E expansion.

Investments in PP&E maintenance are typically mandatory and refusal to make them results in deterioration of PP&E quality. When there is no information about company's plans, forecasting of the amount of investments in technical upgrade and reconstruction should be based on historic investment performance and actual depreciation with due account for anticipated financial condition of a company or industry as well as analytical adjustments. During periods of economic turmoil, when companies are short of funds, they may refuse even from mandatory investments which may lead to upsurge of production assets depreciation (e.g. this situation was seen in economies of all post-soviet states in the 1990s). At the time of economic recovery, depreciation of fixed assets tends to be significant and, with improvement of financial position of companies, investments in technical upgrade and reconstruction shall build up.

Forecasting new investments shall be based on modelling anticipated return on investment depending on expected market growth, increase of prices for manufactured goods, cost of capital, etc. Investments in PP&E expansion should take into account announced plans of companies, their financial condition and options for raising debt financing, industry business cycles and measures of government support for investments. Forecasting new investments relies, among other things, on assessment of competitive power of companies operating in an industry-specific market.

### **3.4.2. Competitive power**

Assessment of competitive power affects forecast of supply dynamics for a certain company in comparison with other companies within an industry. Competitive advantages are divided into cost-based and market.

Cost-based competitive advantages define competitive position of a producer in terms of costs. Supply curve for markets of standardized goods shall be built on the basis of modelling costs of various producers. This characterizes markets of goods provided by primary sectors of economy and those of the non-high-tech industries of the secondary economic sector and other sectors, where production is standardized for consumers.

Competitive power in terms of costs may be achieved due to:

- Resources (access to cheaper resources or resources of higher quality);
- Scale effect;
- Operating efficiency (technologies, management, logistics) etc.

For non-standardized products market advantages play the leading role in determining competitive power. Assessment of market advantages helps to compare producers in such markets. Market advantages include:

- Brand;
- Access to technologies and R&D;
- Diversification of customers, including geographical diversification, etc.

The key factor which affects the supply curve in the future is scientific and technological progress in markets of a product or service or in markets of substitution goods.

### **3.5. Industry-specific government policy**

Industry-specific government policy is one of the key factors affecting supply and demand curves. Their common regularity is a trend which envisages weakening of the industry-specific government policy on the back of growth of social and economic development of a country (except for those industries that are related to national security (military, energy, food)).

#### **3.5.1. Support for domestic producers**

Government policy of production support, except for tariff and customs policy, is related to the expenditure of the state budget. Government policy mechanisms aimed at increasing production can support demand for industry production or supply (additional investments and innovations).

Government policy of support for producers is basically aimed at industries of the import market in order to transfer them to a local market or export market.

##### **3.5.1.1. Demand support**

Demand stimulation is a measure aimed at boosting demand for goods. This measure is targeted at getting immediate results and usually is anti-recessionary. The lower competitive power of an industry and/or the more significant its influence on related sectors are, the more likely demand stimulation measures are used. Construction and mechanical engineering have the highest multiplier effects on the economy. Thus, these industries usually get support for demand from the government in case of declining production dynamics. As competitive power of the national economy increases and integration processes expand, measures aimed at supporting demand are applied on a smaller scale.

Mechanisms for supporting demand are divided into measures of direct influence and measures of indirect influence.

Measures of direct influence include direct purchase of products for government needs or consumers' commitment to buy domestic products. Application of such measures ensures achievement of results in planned volume.

Measures of indirect influence include those that make products more available to consumers due to subsidies to consumers of goods (direct subsidies, subsidized loans or leases). Forecasting effect of additional production volumes from anticipated measures of indirect influence should take into account changes in competitive power of an industry since a measure of supporting demand does not necessarily give additional effects (e.g. subsidies granted to consumers may not produce any effect in case of lack of demand for domestic products).

**Table 6. Examples of demand support measures**

	<b>Local market</b>	<b>Market of importers</b>	<b>Market of exporters</b>
b2b (intermediary)	Encouragement of higher level of raw material conversion	Political support for trade relations development	
b2b (investments)	Subsidized loans for consumers (construction, agricultural machinery)	Subsidized loans and leases for consumers (transport machinery, aircraft industry)	Preferential loans to foreign consumers, political support for projects (power plant industry)
b2c	Establishing obligatory usage of goods/services by the government (obligatory insurance, purchase of milk for schools)	Subsidized loans for consumers, vehicle scrappage program (automotive industry)	Support for humanitarian aid (FMCGs)
b2g	Direct purchases for government needs	Limitation of access to state procurement for international companies	Political support for MIC projects
Infrastructure	Concessionary fares for consumers of transport services, creation of priority development areas		

Source: ACRA

### **3.5.1.2. Supply support**

In addition to supporting demand, production can be stimulated by supporting supply. Current production is supported by the government through customs and tariff regulation (protectionism in relation to duties, quotas), as well as via tariff policy for natural monopolies, while prospective production is being helped by state support of investment and innovation.

Customs and tariff policy improves competitiveness of domestic producers through import restrictions, usually at the expense of consumer interests. Such measures may affect production volume in an industry in the short-term and are often used to curb a crisis. As competitiveness of the national economy grows together with integration processes, measures of customs and tariff policies tend to wane. Customs and tariff policies are taken into account in modelling as a factor influencing the supply curve.

Research and development (R&D) support is usually spread across the board in an economy and is rarely differentiated by sectors. The effectiveness of R&D support (via tax incentives and subsidies) is related to other economic and institutional factors. Unlike other measures aimed at encouraging production, R&D support is not limited in the course of socioeconomic development of a country. Moreover, it tends to increase both, in terms of financing and from the perspective of an array of tools used.

Steps aimed to stimulate investment generally apply to capital-intensive industries (infrastructure) or to sectors whose development is a priority for the government. Stimulating investments gives short-term effects for production in supplying industries and medium-to-long-term effects for the sector itself. Stimulating measures may include direct public funding or co-financing (typically used for infrastructure, strategic projects), subsidized lending and leasing, tax incentives, mandatory investment programs (on regulated markets) or increasing levels of localization.

**Table 7. Examples of supply support measures**

	Local market	Importers market	Exporters market
b2b (intermediary)	Encouragement of high level of raw material conversion, stiffer regulations on waste treatment (recycled chemical raw materials)		Customs regulations (lowering export duties), export financing
b2b (investments)	Co-financing in realty construction	Subsidies on investment loans, localization obligations, customs and tariff regulation (transport engineering, agriculture)	Export financing
b2c	Developing regional brands, protection of copyright and patent rights		Differentiated tax privileges (VAT refunds)
b2g	Placement of state orders (MIC, space industry)		Export financing
Infrastructure	Direct public financing, subsidies on loans, mandatory investment programs, construction standards		

Source: ACRA

### 3.5.2. Energy policy

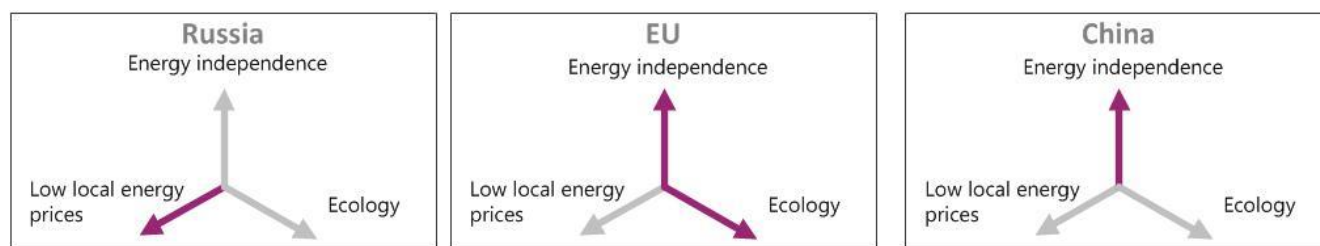
Energy security is part of national security in all countries, which significantly distorts competition on the market as it significantly distorts the energy supply curve compared to the cost curve. An energy policy in any country tends to attain three objectives: reducing energy costs for consumers, ensuring energy independence and pursuing ecological targets. Minimization of energy resource costs is usually the basic goal and one of pillars supporting competitiveness of the national economy. For countries that have their own competitively priced and environmentally friendly energy resources this goal is a priority, as the other two have already been achieved. The lower the level of socioeconomic development in a country, the more likely a government price restriction policy is needed to minimize energy costs.

Energy independence is a priority for a country that has no sufficient energy resources of its own or finds stimulating energy demand from domestic producers more expensive than importing energy. In this situation, local uncompetitive producers may be offered some support, coupled with a wise choice of energy import strategy based on geopolitical goals, etc.

Ecological objectives appear in energy policies of all countries as household incomes grow, as energy sector is the main source of air pollution in the world. Achievement of ecological goals may involve a reduction in the share of environmentally harmful, although cheap types of energy resources used (coal).

Examples of energy policies in various countries are shown in Figure 4.

**Figure 4. Energy policy priorities (early 2010s)**



Source: ACRA

### 3.5.3. Agricultural policy

Agricultural policies have a distorting effect on food markets of most countries. State support of domestic agricultural producers may pursue not only economic goals, but issues of food security and sociocultural development. With socioeconomic growth of a country protectionism that favors domestic producers usually declines giving way instead to a higher support of local food producers. Agricultural policy of any country passes through 3 stages:

1. Elimination of hunger, i.e. ensuring a steady delivery of food to population, regardless of whether this food was produced locally or imported. For example, this goal is vital for some countries in Asia and Africa.
2. Food security, which implies import substitution for key food products, coupled with developing exports.
3. Sustainable agriculture, which involves preservation of agriculture as part of the cultural landscape of the country. This stage is the one to which developed countries are moving where transition to a postindustrial economy has reduced the share of primary sectors in the structure of employment and production.

An agricultural policy is implemented through basic protective measures for domestic production: import and export regulation, subsidization of production and consumption, establishment price minimums and/or maximums, demand support via specific programs targeted at population and state control of product quality. Budgets for supporting agricultural producers are regulated by agreements for country members of the World Trade Organization (WTO), which simplifies the process of forecasting for the agricultural sector.

## 3.6. Prices

Price forecasting is based on prospective analysis of pricing factors — costs, product value, demand and its elasticity, competition, government regulation. Prospective analysis of the pricing factors can be performed using two approaches: cost- and value-based ones. These approaches do not contradict each other, but different types of products require a specific kind of approach. The cost-based approach views the supply curve as the dominant pricing factor, while the value-based one looks at the demand curve.

### 3.6.1. Cost-based approach

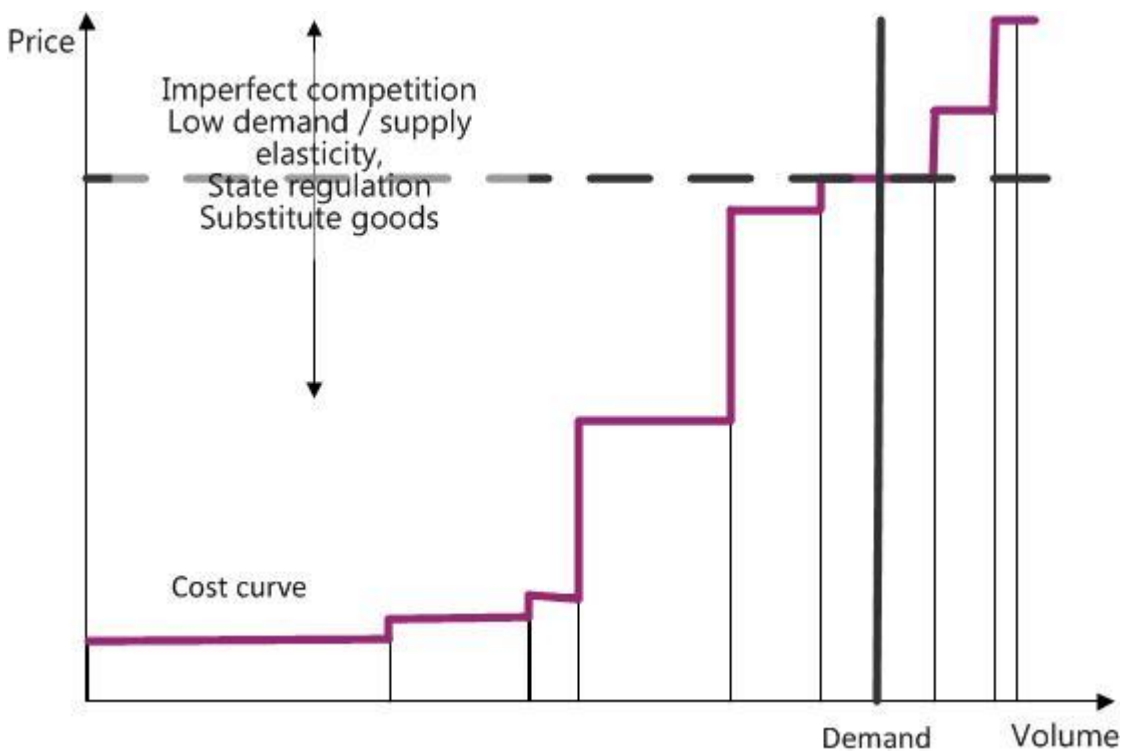
The cost-based approach to price prediction is based on the hypothesis that the dynamics of prices is determined by the marginal supplier (see Figure 5). The cost-based method is intended primarily for products with a dominant share of material costs (raw materials sector, primary processing industries). The forecasting algorithm under the cost-based approach involves the following steps:

1. Building a cost curve. Government regulation can influence domestic prices directly via customs tariffs and excise taxes or indirectly via administrative controls (see Section 3.5). An export duty may suppress the domestic price level versus the global market, and provided that this duty is kept unchanged, the prices in the domestic market are determined by the dynamics of marginal costs incurred by a supplier on the global market. The export duty may be increased in case of budget deficit, export restrictions related to shortage of goods in the domestic market or other reasons (environmental or technical policy requirements). A reduction of export duties may be expected with regard to an integration policy, a policy aimed at financial support for exporters, or an introduction of a new mechanism for removal of excess profits. Import duties or quotas, on the contrary, lead to a rise in domestic prices. An increase in import duties can be expected in order to protect local manufacturers and also as part of steps taken under an import substitution policy. On the other hand, a reduction in import duties is possible in case of increasing competitiveness of local producers or with regard to integration processes in place. Sometimes, a sharp increase in domestic prices may cause a retaliation in the form of administrative pressures on the market by regulatory authorities.
2. Defining a “marginal” supplier. Of all suppliers that satisfy the forecasted demand volume a supplier with the highest costs is picked on the cost curve.
3. Evaluating other factors and their contribution to price dynamics (government regulation, lack of perfect competition in the markets, low elasticity of demand or supply, prices of substitute products).
  - a. Imperfect competition, especially in internal markets, leads to formation of additional margin relative to costs of a marginal supplier. A reduction in this margin may be expected when competition increases (for example, when surplus supply forms in the market).



- b. Low elasticity of supply and demand is typical for raw material sectors and primary processing industries. It complicates the relationship between producer costs, demand and price, although such a relationship usually tends to be stable in time, so forecasting may be based on the past data.
- c. Prices on substitute goods affect the overall price dynamics, a trend especially pronounced in energy and food markets.

Figure 5. Cost-based approach



Source: ACRA

### 3.6.2. Value-based approach

The value-based approach to price forecasting is derived from a hypothesis that price dynamics are determined by changing incomes of consumers of the goods. This approach is the main one to be used for products with high added value (manufacturing industry, services).

The value-based approach can be applied to goods with a high share of material costs and high value for customers. This method is usually applied in parallel with government regulation. For example, the lower is the population income level, the more often natural monopolies, utility services, or prices for gasoline and other basic goods can be subject for direct or indirect regulation based not on the cost-, but value-related principles.

## 4 Glossary

Term	First mention (page number)	Definition
Adjusted determination coefficient	8	A measure of variance proportion of a dependent variable explained in the considered equation, with adjustment for the number of explanatory variables.
Backtesting	8	Testing the quality of a forecasting methodology on historical data to determine its ability to reproduce the observed dynamics of the forecast indicator.
Cohort-component method	11	A method for determining the structure of population by means of distributing the latter by gender and age groups at an initial moment of time with further tracking of birth rates ("0-x years" in the lower cohort), mortality and migration in each group over a certain period.
Cointegrated variables	7	Non-stationary variables (time series) that have a common stochastic trend and a linear combination which is stationary.
Deflator	13	A thread group price index (traditionally calculated as the Paasche index) used to bring cash flows to prices of the base period.
Demographic transition	4	A shift in type of population reproduction characterized by a rapid decline in birth and death rates and driven by a combination of socioeconomic and demographic processes.
Disposable income	13	Gross monetary household income after taxes and transfers. The term reflects the amount funds physically available for consumption or savings. Gross household income includes income from economic activities (wages, income from self-employment), from property and assets (dividends, interest, rents), from social benefits (pensions, unemployment benefits, alimony, etc.) and from other transfers (subsidies for education, medicine, housing, etc.).
Econometrics	7	A set of methods in mathematical statistics and probability theory designed to reveal and empirically justify quantitative relationships between socioeconomic factors in order to build models of complex socioeconomic phenomena.
Endogenous indicator	6	An indicator for which a forecast is generated within the forecasting methodology used.
Error correction model	7	A form of an equation relating time series, in which short-term dynamics is adjusted based on deviations from long-term dependence between (cointegrated) variables.
Exogenous indicator	6	An indicator for which a forecast is generated beyond the model in question (in another model, by an expert, within a scenario, or based on governing documents).
Energy sector	25	A range of industries engaged in production of fuel and energy resources, their processing, conversion, transportation and distribution. Energy sector includes fuel industry (producing and processing oil, coal, gas, shale oil, peat) and electricity industry (producing, transporting and distributing electricity).

Term	First mention (page number)	Definition
Foreign trade turnover	9	An indicator characterizing the volume of foreign trade of a country, a group of countries or an administrative region for a certain period of time. It equals the amount of exports and imports of goods and services.
Household	12	An economic unit of one or more persons (a family, a group of families or individuals not related to each other) living on the same premises or their part and commonly conducting house activities.
Impulse response function	7	A vector function describing a reaction of each of the endogenous indicators in a dynamic system to a short-term shock or a shift of each exogenous indicator.
In-sample errors	8	Errors in forecasting a dependable variable by means of an equation or a model within the selection used for calibration or estimation of parameters. Accordingly, an out-of-sample error is calculated in a similar way, but within the selection that has not been used.
LNG (liquefied natural gas)	23	A natural gas (usually methane, CH <sub>4</sub> ) artificially liquefied by cooling and transported on specialized tanker vessels equipped with cryogenic tanks by sea, or by road on specialized automotive vehicles. After regasification LNG is shipped to end consumers through pipelines.
Marginal supplier	37	A supplier offering the highest price for a product among all other suppliers that cover customer demand in a competitive market. The price offered by a marginal supplier determines the price of a product in a market.
MIC (military industrial complex)	23	A conglomerate of designing, testing and manufacturing facilities involved in development, production, storage and assigning to service of military hardware, special equipment, ammunition, etc. intended primarily for law enforcement agencies and exports.
Model solution	8	A solution to the system of equations representing the model, relative to the endogenous variables for periods representing the forecast horizon, with values of exogenous variables fixed.
Monetary aggregates	17	Structural indicators of broad money (money supply) — types of money and funds that differ in liquidity. Central banks of different countries calculate them applying similar methodologies. The most frequently used indicators (in descending order of liquidity) are: M0, MB, M1, M2, MZM, M4- and M4.
Multiplier effect	33	In terms of production dynamics this is a ratio of the change in aggregate demand in the economy caused by shifts in demand for products of an industry sector (or an enterprise), which also includes a change in demand for products of related industries (enterprises), directly to changes in demand for products of an industry sector (or an enterprise). By analogy, the multiplier effect can also be observed in prices.
Net back parity	23	Equality of domestic prices to exports ones net of customs duties and transportation costs.

<b>Term</b>	<b>First mention (page number)</b>	<b>Definition</b>
Portfolio investments	19	Financial investments in the form of passive holding of securities (e.g. stocks, bonds, etc.) without investor's participation in operational management of the entity that issued the securities.
Price elasticity of demand	24	A change of demand for a product or service in percentage points due to a 1% change in their price.
Regression	7	An equation linking the expected average value of a dependent variable with values of explanatory variables. The functional form is specified a priori, while the parameters in the process of econometric evaluation are adjusted so that on average the dynamics of the dependent variable is approximated in an optimal way (typically, by minimizing the sum of squared errors using the least squares method).
Research and development (R&D)	34	A set of activities aimed at obtaining new knowledge and its practical application while creating a new product or technology.
Root mean square error (RMSE)	8	A square root of the average squared error of the equation.
Stationary series	7	A time series generated by a stochastic process, whose distribution parameters (the average, the variance, etc.) do not change over time.
Stochastic equation	6	An equation containing random variables. In this document, the term refers to an equation that describes an object we do not know completely, but understand its reaction to a change in specified conditions "on average", other things being equal.
Structural equation	6	An equation reflecting all the possible channels of influence by factors, as well as structural elements of a phenomenon or process described. To generate this equation a complete knowledge about the modeling object is required.
Transaction costs	19	Costs incurred in connection with conclusion of contracts (including those made via market mechanisms), the costs that accompany the relationships of economic agents. In particular, transactional are believed to be the costs of collecting and processing information, costs of negotiation and decision-making, cost of control, costs of legal protection of execution of a contract.

## 5 Main forecast indicators

<b>Key parameters of the external environment</b>
Dynamics of GDP in the world and individual countries
Global commodity prices
<b>Russian macroeconomic indicators</b>
GDP
Fixed investments
Industrial output index
Retail turnover
Exports and imports of goods and services
National currency exchange rate
Inflation
PPI
Average wage
Real disposable incomes
Population
Economically active population
Unemployment level
<b>Banking system and financial markets indicators</b>
Banking system assets
Interest rate (depending on terms):
Rates for liquidity provision/absorption by the Central Bank
Bank lending rates
Rates on bank deposits
Rates on government bonds in national currency
<b>Indicators by industry sector</b>
Product prices
Production volumes
Export volumes
Investments
<b>Budget system indicators (by levels)</b>
Revenues
Expenditures

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