

TOP-ECONOMICS.

Socioeconomic safety management

Abstract. This paper suggests and develops a new scientific discipline "Top-economics" and introduces invalidity in economy by analogy with failure in reliability in engineering. We adduce definitions of top-economics and invalidity in economics. We call advantages and features of top-economics.

The paper describes the components of top-economics: methods, models, technologies, problems, objects and special software. New types of Boolean events-propositions are introduced and new types of logical and probabilistic risk models for management of socioeconomic safety of social and economic systems are proposed. The synthesis method of events probabilities in logical and probabilistic risk models is discussed. An example of managing of socioeconomic safety in Russia is provided. It illustrates the methods of risk analysis and management, as well as the management of the economic war with sanctions.

Keywords: top-economics, management, socioeconomic safety, events-propositions, logic, probability; hybrid, conceptual, indicative, invalidity risk model; social and economic systems.

Introduction

Academic discipline "Reliability" is studied in engineering, but it does not exist in economy, although failures, bankruptcies and crises happen not infrequently. Let's give a name to this discipline for economy "socioeconomic safety management of social and economic systems (SES)" and assign to it, similar to "microeconomics" and "macroeconomics" a short name – "top-economics".

The safety of a country depends not only on its military, energy and information safety [1], but also on socioeconomic safety – the sustainable development of SES systems: anti-corruption and drug addiction in a country, the management innovation system and others. We have adopted as the basis the concept of a Chinese leader Li Keqiang according to which technological innovations are viewed as equal to innovations in management, including state management.

At present, management of socioeconomic safety is considered "on concepts". Management on concepts is the management on the basis of different generated images that have different subjects of different and often changing. It is proposed to manage the socioeconomic safety on a common understanding of the rules on the basis of logical and probabilistic (LP) risk models. The LP-models of SES invalidity are built. To make the correction of the probabilities of initiating events in SES risk LP-models one can use the data of the monitoring of SES indexes and signal events concerning the changes in economy, politics, law, innovations, etc. The LP-models are used to conduct SES risk assessment, analysis and forecasting. Risk is managed by making decisions concerning the allocation of resources for the changes of initiating events probabilities in SES.

We propose to manage the state of a country and its SES by risk and efficiency criteria. Logical and probabilistic (LP) risk models are built. The success of a state as an event has a certain probability. Invalid events are considered. They mean the deviation of SES parameters from certain requirements and norms. SES have common initiating events (IP), which ensure their connection. LP-risk models of different SES can be easily combined into one model.

Priority fundamental scientific directions of the Russian Government and Academy of Sciences do not include any research on socioeconomic safety management.

Nobel laureates James Buchanan [1] and James Heckman [2] studied the relationship of economics and politics in the development of a state on the basis of game theory, simulation and statistical data analysis.

We consider the interconnection of economy and politics from a broader perspective [3]. We have to assess the opportunities of the subjects (state, business, society) to solve the SES problem and bear in mind the signal events concerning the changes in economy, politics, law, innovations, as

well as natural disasters and wars and the changes in the world market so as to correct the probabilities of initiating events in the SES risk LP-model.

We choose the following concepts, principles and models for socioeconomic safety management of SES:

- 1) The principle of management by the risk criterion with an estimation of possible losses;
- 2) The concept of social justice in society by Nobel's principle. In fact, by Nobel's principle, significant portion of the profits they are spending on workers: Nobel's pay decent wages, built homes, kindergartens and schools, provide free medical services, increase qualification of workers, invest in science and innovation;
- 3) The concept of the Chinese leadership (Li Keqiang), consists in the fact, technological innovations and innovations in management, especially in state management, must be treated on the equal basis.
- 4) The principle of system development management system as a complex object control with the motion on the program trajectory and correction in case of deviation.
- 5) The management principle by signal events with correction of probabilities of initiating events of the risk LP-models of SES.
- 6) The postulate. Socioeconomic problems are not solved without scientists and public opinion.
- 7) The concept of American Lawyers: everyone can make actions fraudulent in a difficult life situation and if this fraud can be concealed, at least, temporarily.

Principles are realized in mathematical models of socioeconomic safety management, concepts are realized in technologies of safety management of socioeconomic systems. The postulate is proved by modeling and experience.

1. Components of top-economics

Discipline "top-economics" or "management of socioeconomic safety" in SES includes the following components:

1. **Methods:** definitions of top-economics and invalidity in economics; LP-calculus with Boolean "events-propositions";
2. **Models:** hybrid risk LP-models of difficult problems solution failure, invalid LP-models of SES state, conceptual LP-models of development forecasting, indicative models of SES state danger;
3. **Technologies** of risk management in SES [4];
4. **The problems:** assessment, analysis, forecasting and management of risk in SES [5];
5. **Objects of management:** SES of groups SES-1, SES-2, SES-3;
6. **Special Software** [6, 7].

2. Invalidity and top-economics

1. Invalidity in economy is introduced by analogy with **failure** in reliability in technology. It has not two values (failure / non-failure), but a set (multi-state) of values to $[0, 1]$.
2. International standard ISO 9000–2001 uses the term invalidity for assessing the quality of works, rendered services, products and systems of management.
3. The invalidity of a system or a parameter is a deviation of its states from the states given by technical requirements and specifications.
4. An invalid state is considered as an event-proposition. The degree of invalidity has different values in the range $[0, 1]$ and is considered a risk.
5. Invalidity of a system as an event is calculated by the invalidity of its events-parameters.
6. If a parameter is const, then it is not an event in the system state.
7. Risk LP-models of SES can be combined by operations AND, OR, NOT.

8. The number of indicators initiating risk is substantially less than the number of parameters describing a state of a system.

Subjective and objective in invalidity. The central concept of the top-economics is the invalidity of socioeconomic system. Let us give a philosophical explanation of this concept by analogy with concept of safety in the engineering [6].

Invalidity is an event that occurrence causes system perform a given purpose, but with the loss of quality. In practice, there can be difficulties in invalidity assessing which one person represents as deviation from the specified requirements, and the other person -- no. Why the same fact may have different opinions about the validity and invalidity of the system? What is objective and what is subjective?

Every system (object) can be describe in various ways. One way is to describe the preparation of the final set of requirements to be satisfied by the object. If the object satisfies all requirements then it is valid.

Drawing up a set of requirements to the system we associate with the activities of some people. Therefore it is a subjective act, depending on the completeness of the knowledge on system, experience and other facts. In this it is possible an error in the appointment of certain requirements, and omissions of some of them. Moreover, these requirements can change at the will of developers, i.e. they are dynamic.

Despite on all the completeness of the system requirements, and the subjective nature of establishing, at any time one should be allocated and fixed some certain set of requirements (standards), in relation to which it is possible to objectively assume on validity or invalidity of the system. This is the dialectic of subjective and objective in the assessment of invalidity: we subjective set system requirements to the system and objective we consider its status with respect to these requirements.

Events-statements of invalidity - a proposition rejecting the figure of zero or a predetermined value. Indicators and normalized values are in the range $[0, 1]$. The proposal that the value of the index $q_i > 0$, there is an event-proposition. The probability of event-statements equal to the value of the index. For normalized parameters will be used in the calculations one of two characteristics:

1) parameter is invalid $q_i > 0$, if 0 is the lowest allowable value; then considered invalid and the risk parameter;

2) a valid parameter $q_i > 0$, if 0 is the nominal value; then examines the efficiency and effectiveness of the probability parameter.

Events of invalidity and events on efficiency parameters are logically connected in accordance with the structure of SES risk scheme. The system should be constructed as a monotonous in respect of the statements of events.

3. The scientific and practical significance of the top-economics

The scientific and practical significance of the top-economics determine its following features and benefits:

1. Top-economy has interdisciplinary character, as it deals with economic, social, organizational, legal, information logical-probabilistic aspects.

2. A system invalidity, unlike the reliability theory in technology, where there are only two states of system elements (failure and non-failure), has multi-states. The probability of invalidity as a event is calculated by values of states of invalidity of the system elements.

3. SES economic safety management has integrated nature, as it depends on several department RAS and ministries. Due to this integrated nature there exist certain difficulties of SES socioeconomic safety management.

4. The connection of different SES is performed by repeated initial events that occur in a different LP-model.

5. LP-models dynamics of SES is provided by the correction of probabilities of initiating events: the emergence of new statistical data about system states; the appearance of new signal events related to the changes in economics, politics, law and innovations; the change of the situation in the world market; reforms in education, science and economy.

6. Risk management technologies with logical-probabilistic models are employed. Those technologies have information, intellectual and innovative nature [4, 5].

7. We can build the invalidity LP-model of the system, using parameters of one state of the system.

8. Transparency of methods, models, technologies and tasks in top-economy.

9. We use the risk LP-model of SES to assess, analyze, predict and manage risk by allocating resources to reduce the risk of events.

10. Management of economics can be expanded and improved, if in addition to the tasks of micro-economics and macro-economics such problems as the management of economic safety of systems SES-1, SES-2, SES-3 will be solved.

4. Objects of top-economics

Group SES-1 contains *SES* of the highest importance for the state, aimed at reducing the loss of funds and increasing revenues:

- 1) Management of the innovations system state of a country,
- 2) Counteraction to corruption,
- 3) Counteraction to drug addiction in a country,
- 4) Management of the banks risk and capital reservation by Basel,
- 5) Systems and products quality management by WTO,
- 6) Monitoring and management of credit provision to banks.

Group SES-2 contains complex *SES* for the state and the regions that depend on several ministries, agencies and legislative bodies, for example, the following: the risk LP-model of fertility status in the country, LP-model of risk of failure solving the problems of education, LP-model of risk of failure solve the problem of information and others.

Group SES-3 contains local *SES* for companies and firms whose success depends mainly on their desires and capabilities, for example, the following: the risk LP-management of the restaurant "Prestige"; LP-models of failure risk management company ZAO "Transas"; risk LP-model of "Logwin Road + Rail Rus" and others.

Note that micro- and macroeconomics do not solve the problem of the socioeconomic safety management of socioeconomic systems of groups *SES-1*, *SES-2*, *SES-3*.

5. New types Boolean events-propositions in socioeconomic safety

We extend the concept of a Boolean "event-proposition", introducing new types of "events-propositions": events of subjects' failure, signaling events, invalid events, conceptual events, indicative events, etc. In the socioeconomic safety management of SES instead of the probabilities of true/false events we use the probabilities of success/failure and hazardous/non-hazardous events.

I. Ryabinin evaluated the contribution of outstanding scientists G. Boole, P. Poretsky, S. Bernstein, A. Kolmogorov and V. Glivenko in LP-calculus [6, 7]. P. Poretsky [8] discovered LP analysis. The probabilities of events-propositions are essentially fuzzy logic elements used in logical deduction machines [9].

1) *Events-propositions about the non-success of subjects*. An event-subject is the failure of solving a difficult problem by a subject: the government, business, banks, academics, public opinion.

2) *Signal events-propositions*. We use only the fact of their occurrence in economics, politics, rules and laws, innovations, natural disasters and changes in the global market for the correction of probabilities of initiating events (IE) by non-numerical, inaccurate and incomplete expert information [10].

3) *Event-proposition about invalidity* is a proposition about the deviation of a parameter from zero or a given value. Parameters are normalized and have values within the range [0, 1]. Event-proposition about invalidity has the risk equal to the parameter value (the indicator).

4) *Conceptual events-propositions* predict the system evolution. The probabilities of the truth of events-propositions are evaluated by expert information.

5) *Indicative events-propositions* are considered as invalid events. Their measure of danger is the deviation of the parameter value from the given one.

6) *Events-propositions about latency*. Probabilities of events-propositions are estimated by interviews and the data from social networks.

7) *Groups of incompatible events (GIE)* in LP-risk models of SES are entered for gradations of parameters.

6. New types of risk LP-models in SES

We introduce the following new types of SES LP-risk models of:

1. Hybrid LP-models of failure risk of solving difficult social and economic problems. They are built on the basis of risk scenarios for the subjects involved in solving the problem, and risk scenarios for objects-tasks that are the essence of the problem;
2. Invalid LP- risk models. They are built on the basis of invalid events;
3. Conceptual LP-models of predicting a system evolution. They are built on the basis of the descriptions of the professionals who understand the essence of the problem;
4. Indicative LP-models of the system dangerous condition, built by indicative indicators.

Hybrid LP- risk model is considered as an example of SES combating drug addiction (Fig. 1) [13]. The subjects, involved in solving the problem, are: President S_1 , Government S_2 , Duma S_3 , the Federation Council S_4 , Prosecutor's Office S_5 , the Federal Service for Drug Control S_6 , Federal Customs Service of S_7 , the Federal Security Service S_8 , Healthcare and Social Security Authorities S_9 , Scientists S_{10} and Public opinion S_{11} . Each subject as a complex event brings together the events: "wish" W and "opportunity" O_i .

Objects-tasks are T_{nar} components: the system of monitoring the drug situation TN_1 , the conceptual LP-model for forecasting the evolution of drug addiction TN_2 , the indicative LP-model of drug addiction danger state TN_3 , models of LP-analysis and LP-management of risk TN_4 . The tasks Z_{kor} of the model of failure risk of combating drug addiction are: the monitoring system of corruption in subjects ZK_1 , fighting corruption in institution ZK_2 , fighting officials' frauds ZK_3 , and bribes ZK_4 .

Events-subjects are considered as events-propositions about the failure of subjects and corresponding L-variables. In one LP-model the events, connected with subjects and objects, are logically combined.

Failure events-propositions and L-variables, connected with the objects-events and subjects-events (Fig. 1), will be denoted by the same identifiers. A scenario of the failure to solve a difficult problem DP_{nar} : failure of event DP_{nar} is due to the failure of events $S_{nar}, T_{nar}, Z_{kor}$.

Logic functions of events failure:

$$\begin{aligned} DP_{nar} &= S_{nar} \wedge T_{nar} \wedge Z_{kor}; S_{nar} = S_1 \vee S_2 \vee \dots \vee S_{11}; \\ T_{nar} &= TN_1 \vee TN_2 \vee \dots \vee TN_6; Z_{kor} = ZK_1 \vee ZK_2 \vee \dots \vee ZK_4 \end{aligned} \quad (1)$$

L-functions are converted into B- risk functions. For the evaluation, analysis and managing of risk of an outcome event we use the probabilities of events $S_1, \dots, S_{11}, TN_1, \dots, TN_6, ZK_1, \dots, ZK_4$. The subjects scenarios take into account their wishes and possibilities. Let us consider the subjects:

State $S_1 - S_4$. These are the President, the Government, the State Duma, the Federation Council;

Block $S_5 - S_9$. These are the Prosecutor's Office, the Federal Drug Control Service, etc.;

Scientists S_{10} have created LP-models for combating drug addiction and corruption in the regions;

Public opinion S_{11} has wishes W_{11} to solve the drug addiction problem.

It realizes its possibilities O_{11} through opposition, media, demonstrations, etc. LP- risk models correspond to the tasks of the hybrid risk LP-model TN_1, \dots, TN_6 . For each i-task we build the scenario SC_i , the logical model LM_i and the probabilistic risk model PM_i . Next we write the L-function of risk, make its orthogonalization and record the P-model of failure risk.

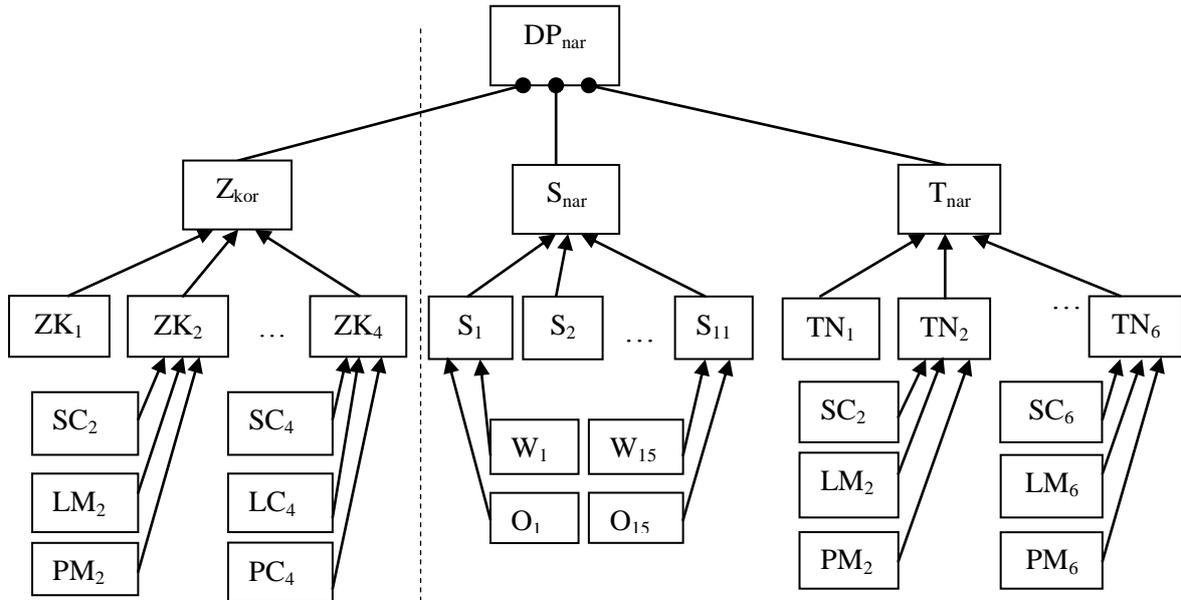


Fig. 1. Structural risk model of the failure to solve the drug addiction problem

The conceptual LP development forecast model is considered through the example of the LP-model forecasting the development of drug addiction [14]. The general conceptual LP-development forecast model includes six processes (LP-models). The conceptual LP-model of forecasting each of development processes is the L-combination of IP-propositions. Their risks are evaluated by expert information.

The indicative LP-model of dangerous SES condition. SES conditions are described by a set of indicators. For example, the state of the innovations system is described by 84 indicators, the state of drug addiction in a country – by 40 indicators [15]. The sets of indicators allow us to compare different countries and establish their ratings. Not all system parameters can be danger indicators, but indicative danger indicators are built on their basis.

The indicative LP-model of the dangerous condition of the innovations system of Russia is built on the basis of the analysis and development of innovation "Risk management technologies in structurally complex systems". We have highlighted indicative events-propositions about the failure of the innovations system (Table. 1). A list of these events-propositions may change through the example of other innovations.

Indicative danger L-model of the innovations system condition:

$$Y = Z_1 \vee \dots \vee Z_n. \quad (2)$$

Indicative danger P-model of the innovations system condition:

$$R_n = Z_n \wedge \dots \wedge Z_n. \quad (3)$$

where R_n are the probabilities of events-propositions $Z_n, n = 1, 2, \dots, 11$.

Table 1. Events-propositions about the dangerous state of the innovations system

№	Events-propositions about the dangerous state of the innovations system	Identifier
1	Communication with foreign scientists	Z_1
2	Selecting fundamental and applied research of top priority	Z_2
3	Selecting the concept of socio-economic systems and the country	Z_3

4	Involvement of scientists and public opinion in the solution of difficult socio-economic problems	Z_4
5	Development of innovative projects at the intersection of sciences	Z_5
6	Borrowing Western methods, programs and technologies	Z_6
7	Analysis of the desires and possibilities of subjects	Z_7
8	Loan management	Z_8
9	Financing of sciences and innovation projects	Z_9
10	Creating an order bank for fundamental and applied projects and research from companies and ministries	Z_{10}
11	The share of the gross output of a country, transferred to the fund of investments, innovations and science	Z_{11}

Risk LP-model of SES state invalidity. Consider the construction of SES invalidity risk LP-models invalidity through an example of system Y , which can have dangerous states Y_1, \dots, Y_6 . Let's denote dangerous states as events and L-variables with the same identifiers [4, 5]. Events probabilities have values in the interval $[0, 1]$. States are caused by invalid parameters Z_1, \dots, Z_{11} , which have allowable values, can be unacceptable or dangerous. We consider them as the initiating events for the emergence of invalid states Y_1, \dots, Y_6 . Invalid states Y_1, Y_2, \dots, Y_6 are called (\leftarrow) invalid parameters: $Y_1 \leftarrow Z_3, Z_8, Z_9, Z_{10}$; $Y_2 \leftarrow Z_1, Z_5, Z_6, Z_{11}$; $Y_3 \leftarrow Z_1, Z_4, Z_5, Z_{10}$; $Y_4 \leftarrow Z_2, Z_3, Z_8, Z_5, Z_{11}$; $Y_5 \leftarrow Z_4, Z_7, Z_9, Z_{10}$; $Y_6 \leftarrow Z_2, Z_6, Z_8, Z_{11}$. For example, a scenario of the invalid state Y_1 looks as follows: the emergence of the invalid state Y_1 depends on $Z_3 \wedge Z_8 \wedge Z_9 \wedge Z_{10}$.

The connection of system invalid states with invalid parameters is presented in Table. 2, where 1 stands for connection and 0 - lack of connection.

Table 2. Connection of system states and initiating events

States	Initiating events										
	Z_1	Z_2	Z_3	Z_4	Z_5	Z_6	Z_7	Z_8	Z_9	Z_{10}	Z_{11}
Y_1	0	0	1	0	0	0	0	1	1	1	
Y_2	1	0	0	0	1	1	0	0	0	0	1
Y_3	1	0	0	1	1	0	0	0	0	1	0
Y_4	0	1	1	0	1	0	0	0	0	0	0
Y_5	0	0	0	1	0	0	1	0	1	1	0
Y_6	0	1	0	0	0	1	0	1	0	0	1

L-model of the SES invalid state risk:

$$Y = Y_1 \vee Y_2 \vee Y_3 \vee Y_4 \vee Y_5 \vee Y_6. \quad (4)$$

P-model of the SES invalid state risk+:

$$P\{Y\} = R_1 + R_2(1 - R_1) + R_3(1 - R_2)(1 - R_1) + \dots, \quad (5)$$

where R_n are the risks (probabilities) of events-propositions Y_n , $n=1, 2, \dots, 6$.

7. Risk management technologies in SES

Risk Management Technologies in structural and complex SES are a set of LP-models, technologies, procedures, special software and examples of risk estimation and analysis. RMTs use informational, intellectual and innovative approach. Systems and processes are described as structural and complex with casual events. We introduce events of occurrence and failure of system's states, events for parameters and their grades, invalid events. In RMTs SCS risk and efficiency are considered as a whole.

RMTs components include [4,5]:

1. LP-calculus,
2. Classes of LP-risk and efficiency models,

3. Procedures for the classes of LP-models,
4. Special LP-software for the classes of LP-models,
5. Applications examples,
6. The training course.

LP-calculus is a mathematical tool of RMTs. In risk management technologies the events have not two, but a finite set of values, statistical data contain events about the occurrence and failure of system states; the expanded definition of an event is considered. *RMTs* use the extended definition of an event and deal with 20 types of events-propositions.

Classes of LP-risk and efficiency models:

1. LP-modeling,
2. LP-classification,
3. LP-efficiency,
4. LP-forecasting,
5. Hybrid LP-risk models.

Procedures for the classes of LP-risk models:

1. Construction and orthogonalisation of L-risk models,
2. Identification of LP-risk models by statistical data,
3. LP-risk analysis by the scores of initiating events (IE),
4. LP-risk management,
5. LP-risk forecasting in the time and space of states,
6. Synthesis of events probabilities in LP-models.

The management of state and evaluation of systems includes the following steps:

1. Development of the scenario, L-model and P-model of the system risk,
2. Assessment and synthesis of the probabilities of initiating events,
3. Calculating the risk of the final event,
4. Risk analysis by the importance and contributions of IE,
5. System state risk management,
6. System evaluation risk management.

7.1. Classes of risk LP-models in Risk Management Technologies

There are five classes of risk models with regard to statistical data application, ways of calculating system risk, initial events probabilities and efficiency parameter, final Y and initial Z event links in RMT [4, 5].

Unlike scoring models, these models not only fit statistical data, but also explain them. One can find up to 40 definitions of risk in different publications. They might be of some interest to philosophers dealing with poorly understood problems. The task of risk definition can be solved quite simply, if we try to answer the question: for which class of *LP-models* is risk viewed and to which event in the system does it refer to?

It should be noted that in the classes of *LP-efficiency* and *LP-forecasting LP-risk models* are used indirectly for building the functions of the system efficiency parameter distribution and definitions of allowed values of risk and efficiency.

LP-modeling class. Statistical data are not used. One final system state-event is considered (for example, company management failure risk, difficult problems solution failure risk, euro exchange rate fall risk, risk of the economic crisis in a country, etc.). Experts give the probabilities of initial events by experimental or statistical data. Risk and efficiency of an event are calculated.

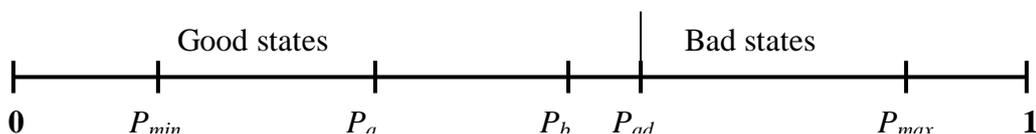


Fig. 2. Risk scheme for the *LP-classification* class

Risk scenario is formulated and L- and P-functions of failure risk are built for the final event. Failure risk (probability) P of the final event takes only two values: 1 and 0 with probabilities P_i and $Q_i = 1 - P_i$.

Efficiency is calculated by the formula $E = P \cdot S$, where S is damage range for a system when it fails completely. Structural and probabilistic contributions of initial events into the risk and efficiency system are calculated.

LP-classification class. We use statistical data from a set of system objects or states (for example, bank credits, banks ratings, system states, etc.).

Events failure states are considered. For each state the efficiency parameter is known, which equals 1 for good events and 0 for bad states. The statistical tabular database is transformed into a tabular knowledge base by inputting events-gradations for parameters, describing the state. L- and P-functions systems of a system failure risk are written down, which are databases. Events-gradations probabilities are determined by solving the identification task for the P-functions system by statistical data.

Then the risk of each system state P_i is calculated, admissible risk P_{ad} is given, average risk P_m is calculated (Fig. 2). Condition $P_i \leq P_{ad}$ divides the states into good ones (1) and bad ones (0). For all new states the values of risk and efficiency parameter 1 or 0 are calculated. Frequency and probabilistic contributions of events-gradations into risk states, average system risk and accuracy of *LP-risk models* are calculated.

LP-efficiency class includes *LP-risk models*, which use statistical data in which either the optimal efficiency parameter value (investments portfolio returns) is calculated, or the efficiency parameter is known from statistical data (a restaurant or a shop daily sales volume, etc.). For these *LP-models* frequency risk analysis is performed by contributions of initial events-gradations into the left or the right tail of the efficiency parameter distribution.

For example, investment portfolio states using stock prices data are calculated. For each state returns on equities Z_1, Z_2, \dots, Z_n in the portfolio are well-known. The events of the states occurrence are considered. A statistical tabular database is transformed into a tabular knowledge base by introducing events-gradations for the returns on equities and portfolio.

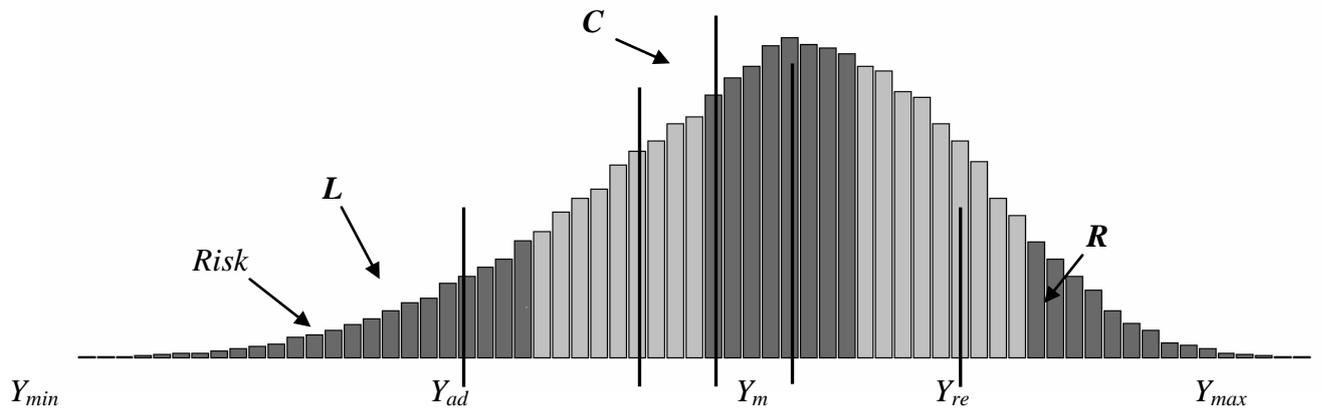


Fig. 3. Risk scheme for the *LP-efficiency class*

The system of L- and P-functions for the occurrence of states, which are databases, is written down. Portfolio return Y is calculated for each state as a function from returns on equities Z_1, Z_2, \dots, Z_n and capital shares x_1, x_2, \dots, x_n , invested in equities, and the portfolio return discrete distribution is built (Fig. 3).

State Y_i occurrence probabilities are calculated either (1) by the frequencies of events-gradations parameters, or (2) by the efficiency parameter frequency — by building a distribution bar graph. The frequency of events-gradations contributions into the risk and efficiency of the

distribution tail is calculated. Contributions are used for managing the portfolio—taking a decision of excluding the shares from the portfolio or including new shares.

LP-forecasting class includes *LP-risk models*, using statistical data for forecasting failure risk. This is performed by the transition from *the LP-model of LP-efficiency class* to the *LP-model of LP-classification class* and by solving the identification task for defining the probabilities of events-gradations leading to a failure.

For example, the statistics of a restaurant's daily sales is considered. Each state is described by influencing parameters Z_1, Z_2, \dots, Z_n (day, month, menu type, etc.). State occurrence events are considered. Statistical tabular data are transferred into a tabular database by inputting events-gradations for initial parameters and the efficiency parameter. The efficiency parameter Y for each state is known. L- and P-functions systems for the occurrence of states which are knowledge bases are written down. The distribution for efficiency parameter Y is built. The probabilities of states Y_i occurrence are calculated either (1) by the frequencies of parameters events-gradations, or (2) by the frequencies of the efficiency parameter — by building a distribution bar graph.

Forecasting is performed in the system states space. For forecasting purposes admissible risk P_{ad} of the efficiency parameter is selected. For the left or the right distribution tail of efficiency parameter risk as the tail area is calculated.

Then a transition from the *LP-forecasting model* to the *LP-classification model* is performed (Fig. 2 and 3). In order to do this, for example, states $Y_i \geq Y_{ad}$ are considered as good, and states $Y_i \leq Y_{ad}$ — bad. The identification task is solved, and the probabilities P_{jr} of events-gradations of initial parameters are determined. Now one can forecast the risk and efficiency of those states in a system which were absent from the statistical data.

7.2. Procedures of Risks Management Technologies

Let's describe the procedures of technologies for classes of LP-risk models in risk management [6, 7].

Building an LP-system risk model. Risk scenario is formulated, the structural risk model is built, L-risk model is written down, L-risk model (polynomial) is obtained. *LP-risk model* can be always written down as a full disjunctive normal form, the most complete and lengthy in designation and calculations. In particular cases *LP-risk models* are built with the limited number of events from (DNF) or as the shortest functioning ways or by the risk scenario.

An risk LP-model can be associative and be given by the table of derivatives and initial events connections.

An risk LP-model can be complex, when separate risk models are joined by *AND, OR, NOT* operations and cycles. Structurally complex economic systems include several subsystems, which may have several common events. *An LP-failure risk model* is built, taking into account repeated events by special algorithms of the orthogonalization of logical functions. A complex *LP-risk model* can be so complicated, that L- and P-risk functions cannot be stored in a computer's memory or the items in P-functions contain a great number of factors (with probabilities from 0 to 1), so that the result becomes imprecise. In this case one should apply the decomposition of models and fold the initial events into nodes like *AND* and *OR*.

LP-identification of LP-risk models by statistical data consists in defining the allowed risk and failure probabilities from initial events-gradations. An integer value function serves as an identification criterion: the number of correctly recognized good or bad system states should be maximum. Identification is a reverse optimization task, which is solved by algorithm iterative random search methods of gradients. During the identification process the asymmetry of recognizing good and bad states is given in order to optimize the training and testing of *an LP-risk model*. The suggested methods provide the solutions when the number of system states is high (more than 1000), as well as the number of parameters and gradations in L-model parameters and the model itself has any degree of complexity during the acceptable time.

LP-analysis of the system risk and efficiency is done on P-risk model. Quantitative risk analysis consists in determining the contributions, influencing events-parameters and their events-gradations into risk and system states efficiency and the system on the whole. Risk analysis may be performed for the process on the whole, left and right “tails” and the distribution center of the efficiency parameter. Statistical and LP-methods of analysis have been suggested. Statistical analysis turns out to be the simplest in calculation. *LP-analysis* has the greatest possibilities for detailed analysis of risk and efficiency. Structural relevance depends on the place of an event in the risk graph-model. P-relevance takes into account both the place and the relevance of the event probability. Dangerous events and their combinations are revealed by changing the system risk when they are excluded. In the classes LP-modeling and LP-classification the quantitative analysis of system risk is performed by significances and distributions of initiating events (IE) in a probability of final and derivative events.

Structural significance takes into account a number of various ways with i -events that lead to the final event; structural significance is determined by the probabilistic risk function:

$$\Delta P_i = P_y |_{P_i=1} - P_y |_{P_i=0}, i = 1, 2, \dots, n, \quad (6)$$

where P_y is the probability of the final event, P_i are probabilities of IE and the values of the probabilities of other initiating events are $P_1 = P_2 = \dots = P_n = 0,5$.

The probabilistic importance of i -event takes into account its place in the structure (risk scenario) and its probability. Probabilistic importance and contributions are computed by the probabilities of initiating events. The contributions of events in “minus” and “plus” in the probability of the final event are determined by assigning values 0 and 1 to IE probabilities in the probabilistic risk function:

The importance of i -event:

$$\Delta P_i = P_y |_{P_i=1} - P_y |_{P_i=0}, i = 1, 2, \dots, n, \quad (7)$$

Contribution of i -event in “minus”:

$$\Delta P_i^- = P_y |_{P_i} - P_y |_{P_i=0}, i = 1, 2, \dots, n, \quad (8)$$

Contribution of i -event in “plus”:

$$\Delta P_i^+ = P_y |_{P_i} - P_y |_{P_i=1}, i = 1, 2, \dots, n. \quad (9)$$

LP-management of system risk and efficiency. In social and economic systems we distinguish between day-to-day and strategic risk and efficiency management. Day-to-day management is performed after analyzing risk and efficiency in the following manner: evaluations of events-gradations and events-parameters contributions, the choice of the most important contributions, resources distribution for the change of probabilities of the most important events-gradations. Strategic management of the system development by risk and efficiency criteria consists in managing the movement along the chosen trajectory and correcting near deviation from it.

LP-forecasting of risk and crisis. Forecasts are made by statistical data in the states space and in time. On the one hand, *LP-management* predicts risk and efficiency of system states, which cannot be found in statistical data, that is in the system states space. On the other hand, *LP-management* predicts risk and efficiency of a system in the time function; it is considered that the probabilities of initial events change in time.

One evaluates risk and efficiency of system states, which cannot be found in statistical data. For example, having identified the *LP-model* of credit risk by statistical data of a bank, one can predict the risk and efficiency of new credit requests. The beginning and causes of system failure, crisis and recession are predicted only several days after they started. A discrete distribution of the efficiency parameter is built. (For example, portfolio returns, a shop’s sales, etc.) Both the left and the right “tail” of the efficiency parameter distribution can be considered.

Left and right tails correspondingly determine the efficiency parameter Y_{ad} or Y_{re} values. The right tail corresponds to the failure or recession area. The left tail corresponds to the area of unacceptable risk and bankruptcy. The frequencies of events-gradations in the “tail” and the

probabilities of events-gradations are calculated. For the purposes of *LP-forecasting* one has to move from the model of *LP-efficiency* class to the model of *LP-classification* class.

For the purposes of *LP-forecasting* of the economic system crisis the dynamics of changes of events-gradations contributions into the “tails” of the efficiency parameter distribution is studied. Calculations are made for the preset number of last states. Contributions as differential characteristics best of all explain the beginning of a system crisis.

LP-management of system state and evaluation. Management of risk and efficiency of system state by statistical data is conducted [4, 5]. At first the quantitative risk analysis is performed, using formulae (7–9), then the decision is taken concerning the change of probabilities of the most significant parameters and events, influencing risk and efficiency, and after that resources are allocated for changing the parameters, including personnel advanced training. The quantitative analysis of risk and efficiency is conducted on the basis of calculating the amount and contributions of events Z into event Y .

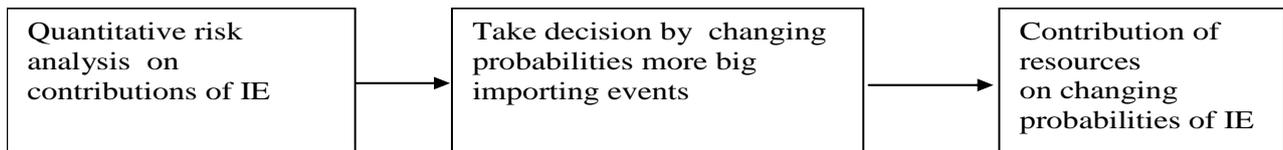


Fig. 4. Scheme of system state risk and efficiency management

Systematic identification of an *LP-risk and efficiency model* by statistical monitoring data makes an *LP-model* virtually a dynamic one. The technology of systematic retraining of an *LP-risk model* with subsequent analysis of system risk and efficiency can reveal the beginning of a crisis or a default. After several stages of retraining with subsequent analysis of system risk and efficiency the trend can be revealed not only of the efficiency parameter, but also of the contributions of events-parameters and events-gradations into the system risk and efficiency. These data can be used to take a decision concerning management.

Management of risk and efficiency of system evaluation. For the purposes of strategic management of development we should use the scheme of managing a system as a complex object. Such management presupposes the control of movement along the chosen trajectory and correcting deviations from it (Fig. 5). Here: Y — controlled parameters, U — managing impacts, W — correcting impacts, N — stages. Risk and efficiency are the parameters defining the trajectory.

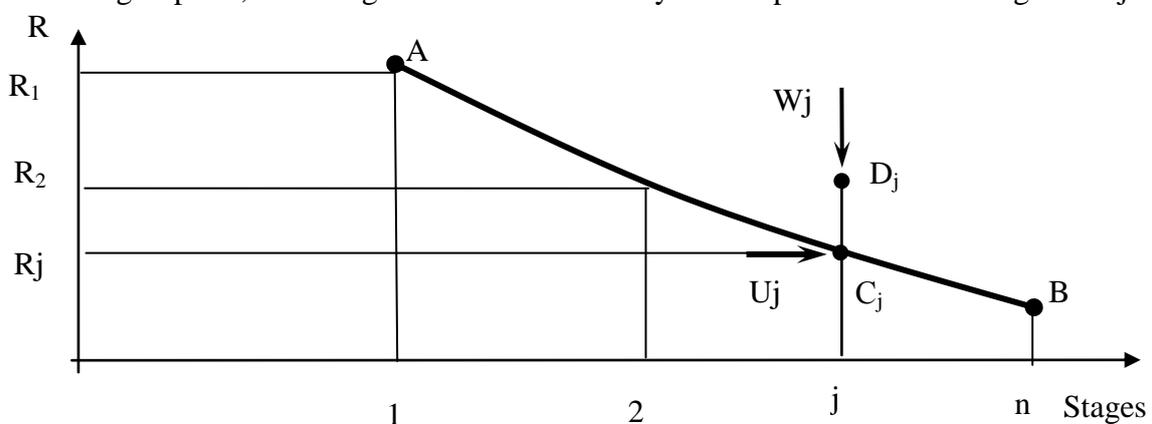


Fig. 5. The scheme of system evaluation management

A probabilistic risk model of the state of the economic safety of a country. Software ASM-2001 automatically replaced L-variables with their probabilities in the orthogonalized L-model. During orthogonalization the denials of L-variables appeared. The probabilities of L-variables with

negation are $Q = 1 - P$. The system is transferred from the initial state A into the given final state B along the chosen program trajectory $A-B$ during several stages: $1, 2, \dots, n$. In case of system aberration from the program trajectory a correction is made.

Using this interpretation we have introduced the following concepts: $Y(Y_1, Y_2, \dots)$ — controlled parameters (risk); $H(H_1, H_2, \dots)$ — stages; $U(U_1, U_2, \dots)$ — managing impacts for performing the stage; $W(W_1, W_2, \dots)$ — correcting impacts at stages.

Controlled parameters Y are measured or risk and efficiency parameters are calculated, which are used to assess system performance. The first stage (point A is chosen as a gentle one so as not to damage the system, the last stage (point n) is conducted in the nominal conditions of system performance. The system is transformed from the initial state into the final state during the discrete number of stages with gradually improving factors.

When the management program is developed one tries to avoid troubles by envisaging corrections W , which represent certain variants of structural solutions and resources. When the strategic management program is developed one determines values Y, W, U at stages H .

Realization of Y, W, U can require a lot of resources. For the optimum choice of Y, W, U, H we should know the corresponding costs: $Q_y(Q_{y1}, \dots)$ — measurement and control; $Q_u(Q_{u1}, \dots)$ — control actions; $Q_w(Q_{w1}, \dots)$ — correcting impacts; $Q_h(Q_{h1}, \dots)$ — stages.

Possible damages, if there are no such costs: $R_y(R_{y1}, \dots)$ — when there are no measurements and control; $R_u(R_{u1}, \dots)$ — control actions; $R_w(R_{w1}, \dots)$ — correcting impacts; $R_h(R_{h1}, \dots)$ — stages.

The composite L- risk model of failure for all stages:

$$\overline{Y_1} \overline{Y_2} \dots \overline{Y_n} \quad (10)$$

Where $\overline{Y_1}, \overline{Y_2}, \dots, \overline{Y_n}$ are L-functions of failure (risk) of evaluation of system at stages.

The composite risk P-model of failure for all stages

$$P\{Y = 0\} = P_1 + P_2(1 - P_1) + P_3(1 - P_2)(1 - P_3) + \dots, \quad (11)$$

where $P_1, P_2, P_3, \dots, P_n$ is system failure risk at stages.

LP Risk Models Dynamics. LP risk models dynamics is provided by the correction of probabilities of initiating events under statistical data and expert information by the change or occurrence of new events in economics, politics, rights and laws and innovations. IE probabilities are changed in the following cases [3]:

- In technical systems with time over wear, corrosion, ageing, repair, components replacement, training personnel, etc.;
- In economic and social systems by occurrence of new events in economics, politics, rights and laws, innovations;
- In regular re-identification of LP-model by statistics and monitoring data.

В случае отсутствия статистических данных синтез вероятностей иницирующих событий выполняется по нечисловой, неточной и неполной экспертной информации по методу сводных рандомизированных показателей Н. В. Хованова.

8. Synthesis of probabilities of events—propositions

The modeling of a system evolution is equal to forecasting in uncertainty conditions. Therefore, in technology of LP management of risk of state and evolution in social and economic systems when there are no other data, the probabilities of events are estimated by non-numerical, inaccurate and incomplete (NII) expert information [10, 12].

The synthesis of IE probabilities is performed by the method of summarized indexes by NII information. Experts cannot provide an accurate estimation of the probability of one event. An expert will make it more exact and objective if he (she) estimates 2-4 alternative hypotheses and takes into account their “weights” (the expert’s opinion “sways”).

Hypotheses A_1, A_2, \dots, A_n are formulated. Weight coefficients of hypotheses w_1, w_2, \dots, w_n are counted discretely with step $h = 1/n$, where n is the number of grades of weights of hypotheses (for example, $n = 50$). That is, the weights take values from the set

$$\{0, 1/n, 2/n, \dots, (n-1)/n, 1\}. \quad (12)$$

Set $W(m,n)$ is all possible vectors of weight coefficients and equals to:

$$W(m,n) = N_1 N_2 \dots N_m, \quad (13)$$

where N_1, N_2, \dots, N_m are the numbers of grades in weight coefficients.

Expert information about weights is given as ordinal information and interval information.

Ordinal expert information:

$$OI = \{w_i > w_j, w_r = w_s; i, j, r, s \in \{1, \dots, m\}\}. \quad (14)$$

Interval expert information:

$$II = \{a_i \leq w_i \leq b_i; i \in \{1, \dots, m\}\} \quad (15)$$

United expert information is called non-numerical, inaccurate and incomplete information. Naturally, the condition is valid:

$$w_1 + w_2 + \dots + w_m = 1. \quad (16)$$

Conditions (14–16) determine the region of admissible values for weight coefficients w_1, w_2, \dots, w_m . Mathematical expectations of randomized weight coefficients are used as numerical estimations of weight coefficients, but the accuracy of these estimations is calculated by means of standard deviations.

Calculations are repeated for two and more experts. The table of estimations of weight coefficients of hypotheses from all experts is formed. Summarized estimations of weight coefficients $w_1^*, w_2^*, \dots, w_n^*$ of hypotheses A_1, A_2, \dots, A_m under tabular data and weights of experts, established by a super-expert with the use of above-described technology, are calculated. The hypothesis with the largest estimation of summarized weight coefficient is selected.

9. An example of socioeconomic safety management of Russia

Economic safety management, considered by SES, belonging to the group of complex SES-2, is aimed at improving the welfare of the population, the power a country and its rating.

SES LP-risk model "Management of economic safety of Russia" is based on the Nobels' concept of social justice. Three generations of the Nobels worked in Russia in the 19th and early 20th century. Their idea was to spend a significant share of their profits to support their employees: to pay them decent salaries, to build houses, to invest in innovation, etc.

LP-risk model of a country's economic health. The core of an integrated SES contains a combination of two complex SES or LP-risk models [15]. The integrated model consists of 33 initiating and derivative events linked by L-connections OR, AND, NOT. An LP-risk model of economic health can logically include other models, such as the model of combating bribery, corruption and drug addiction, the management of innovations system.

The LP-risk model of economic safety of Russia Y_{33} is built by logical grouping of LP-models. Software ACM-2001 built the L-risk model automatically. In the software record the L-state risk model for derivative event Y_{32} is the following (figures represent the numbers of L-variables "-" – L-multi, «+» – L-addition):

$$Y_{32} = 9.11.14.17.21 + 9.10.14.17.21 + 9.11.13.17.21 + 9.10.13.17.21 + 9.11.12.17.21 + 9.10.12.17.21 + 9.11.14.16.21 + 9.10.14.16.21 + 9.11.13.16.21 + 9.10.13.16.21 + 9.11.12.16.21 + 9.10.12.16.21 + 9.11.14.15.21 + 9.10.14.15.21 + 9.11.13.15.21 + 9.10.13.15.21 + 9.11.12.15.21 + 9.10.12.15.21 + 11.14.17.19.21 + 10.14.17.19.21 + 11.13.17.19.21 + \quad (17)$$

..... (15 lines have been omitted)

In the software record the P- risk model of derivative events Y_{32} looks as follows:

$$P\{Y_{32}\} = P9.P11.P14.P17.P21 + P9.P10.Q11.P14.P17.P21 + P9.P11.P13.Q14.P17.P21 + P9.P10.Q11.P13.Q14.P17.P21 + P9.P11.P12.Q13.Q14.P17.P21 + P9.P10.Q11.P12.Q13.Q14.P17.P21 + P9.P11.P14.P16.Q17.P21 + 9.P10.Q11.P14.P16.Q17.P21 + P9.P11.P13.Q14.P16.Q17.P21 + P9.P10.Q11.P13.Q14.P16.Q17.P21 + P9.P11.P12.Q13.Q14.P16.Q17.P21 + P9.P10.Q11.P12.Q13.Q14.P15.Q16.Q17.P21 + Q9.P11.P14.P17.P19.P21 + Q9.P10.Q11.P14.P17.P19.P21 + \quad (18)$$

..... (36 lines have been omitted)

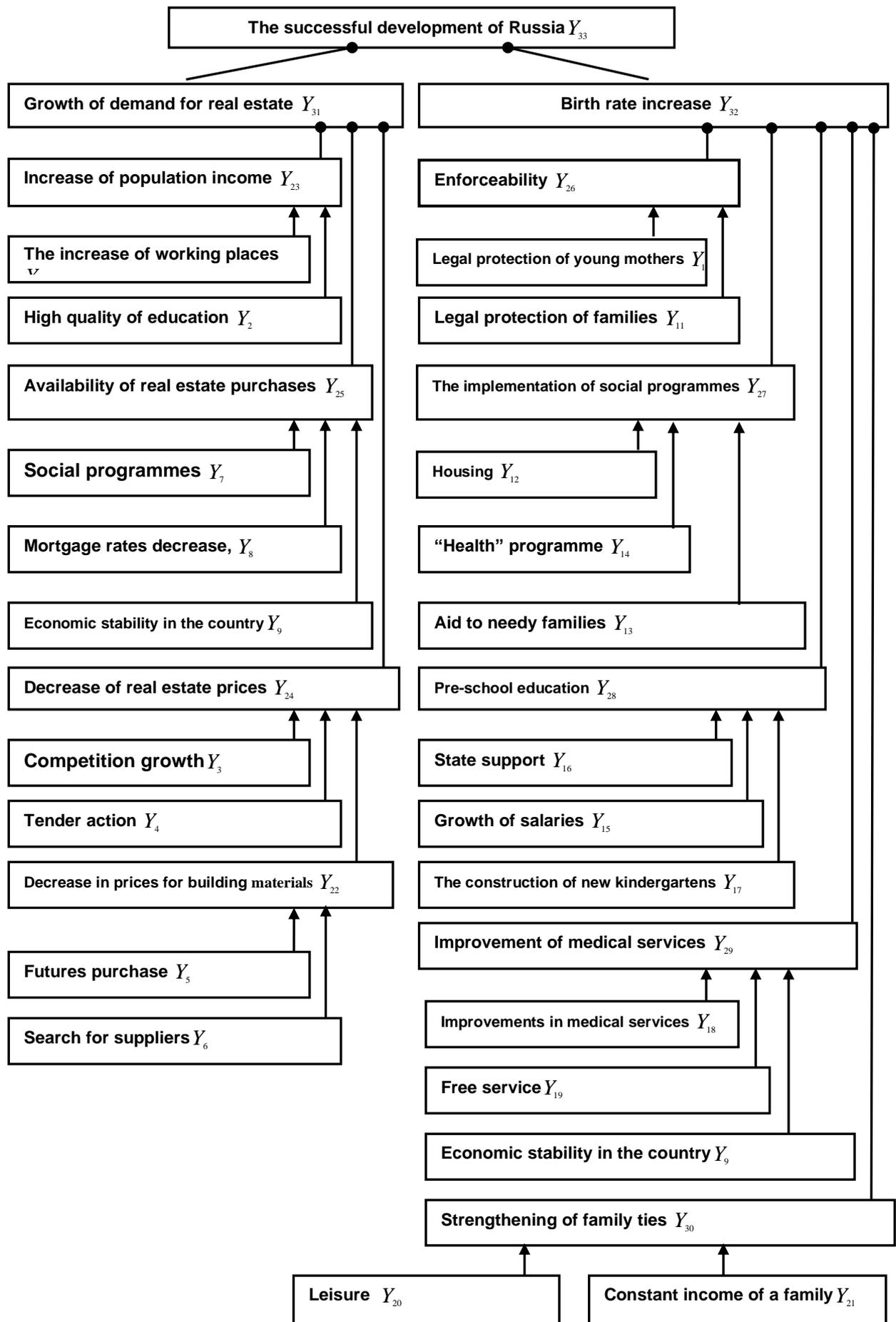


Fig. 6. The structural model of successful development of Russia (the arc with an arrow means OR, the arc with a spot means AND)

Probabilities of IEs $Y_I - Y_{2I}$ are evaluated by expert information by randomized summary indicators methods. Three experts took part in the evaluation (Table 3, column 2).

After completing the calculations we get the following results: $P_{31}=0.3191$ is the probability of an increase in demand for real estate in Russia, $P_{32}=0.0252$ is the probability of the birth rate increase in Russia, $P_{33}=0.0079$ is the probability of successful development of Russia. To analyze the probability of successful evaluation of Russia the software automatically calculated the importance and contributions of IEs in derivative events. For the event Y_{33} we have the machine record of documents by these characteristics (Table 3)

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..... (15 lines have been omitted)

In the software record the P- risk model of derivative events Y_{32} looks as follows:

$$P\{Y_{32}\} = P9.P11.P14.P17.P21 + P9.P10.Q11.P14.P17.P21 + P9.P11.P13.Q14.P17.P21 + P9.P10.Q11.P13.Q14.P17.P21 + P9.P11.P12.Q13.Q14.P17.P21 + P9.P10.Q11.P12.Q13.Q14.P17.P21 + P9.P11.P14.P16.Q17.P21 + 9.P10.Q11.P14.P16.Q17.P21 + P9.P11.P13.Q14.P16.Q17.P21 + P9.P10.Q11.P13.Q14.P16.Q17.P21 + P9.P11.P12.Q13.Q14.P16.Q17.P21 + P9.P10.Q11.P12.Q13.Q14.P15.Q16.Q17.P21 + Q9.P11.P14.P17.P19.P21 + Q9.P10.Q11.P14.P17.P19.P21 + \dots \quad (18)$$

..... (36 lines have been omitted)

Probabilities of IEs $Y_I - Y_{2I}$ are evaluated by expert information by randomized summary indicators methods. Three experts took part in the evaluation (Table 3, column 2).

Table 3. Characteristics of importance and contributions of initiating events

Number	Proba-	Importance	Contributions	Contributions
	bility		in '-' :	in '+' :
1	0.400	+7.226E-03	-2.890E-03	+4.335E-03
2	0.400	+7.688E-03	-3.075E-03	+4.613E-03
3	0.600	+2.819E-03	-1.691E-03	+1.127E-03
4	0.150	+1.326E-03	-1.990E-04	+1.127E-03
5	0.250	+1.503E-03	-3.759E-04	+1.127E-03
6	0.450	+4.228E-03	-1.902E-03	+2.325E-03
7	0.200	+2.586E-02	-5.173E-03	+2.069E-02
8	0.300	+3.266E-03	-9.800E-04	+2.286E-03
9	0.250	+2.634E-02	-6.586E-03	+1.975E-02
10	0.400	+1.544E-02	-6.177E-03	+9.265E-03
11	0.100	+1.029E-02	-1.029E-03	+9.265E-03
12	0.300	+9.812E-03	-2.943E-03	+6.869E-03
13	0.050	+7.243E-03	-3.626E-04	+6.880E-03
14	0.300	+9.829E-03	-2.940E-03	+6.880E-03
15	0.400	+4.862E-03	-1.944E-03	+2.917E-03
16	0.250	+3.889E-03	-9.724E-04	+2.917E-03
17	0.400	+4.876E-03	-1.950E-03	+2.926E-03
18	0.300	+2.762E-03	-8.286E-04	+1.933E-03
19	0.050	+2.155E-03	-1.077E-04	+2.047E-03
20	0.100	+2.176E-02	-2.176E-03	+1.958E-02
21	0.200	+2.586E-02	-5.173E-03	+2.069E-02

After completing the calculations we get the following results: $P_{31}=0.3191$ is the probability of an increase in demand for real estate in Russia, $P_{32}=0.0252$ is the probability of the birth rate increase in Russia, $P_{33}=0.0079$ is the probability of successful development of Russia. To analyze the probability of successful evaluation of Russia the software automatically calculated the importance and contributions of IEs in derivative events. For the event Y_{33} we have the machine record of documents by these characteristics (Table 3)

The importance of repeated event Y_9 , which is included in the model of Y_{31} and Y_{32} , is much greater than the importance of initiating events Y_5 and Y_{16} with the same probability.

The correction of the LP-risk model of economic health of a country is carried out by changing the probabilities of initiating events Y_1, \dots, Y_{21} , statistics and IUU expert information upon receipt of signaling events.

The application of new LP-risk models with events-propositions for managing the economic safety of SES of SES-1 group, which are top priority for the state, is described in [6, 7, 14 – 18]

10. Management of economic wars with sanctions

Economic wars with using sanctions are the tasks of analysis and management, solved by risk LP-models of SES economic safety. In the world economic system natural competition determines the health of the economies of different countries. But it is possible to influence and manage the economic health of a country through economic sanctions. One example is the economic sanctions of US and EU against Russia and our retaliatory sanctions.

The essence of an economic war with sanctions is that we want to minimize the risk for our SES, and the enemy wants to increase it. On the other hand, the enemy wants to minimize the risk for his SES and we want to increase it. In order to make a quantitative forecast of economic health risk from threats and sanctions of other countries we should build the risk LP-model of the economic health of a country and its SES. Then we should calculate the contribution of initiating events (7–9) using the SES state LP- risk model in order to find the most dangerous IEs and ways to protect them.

If we want to make a quantitative forecast of the antagonist country economic health risk, caused by our sanctions we should build the LP-risk model of the economic health of this country and its SES. After that we should calculate the contributions of IE into "the minus" and "the plus" (7–9) to find the most dangerous IE and choose the most effective sanctions.

The algorithm of search for the most dangerous initiating events and their combinations for the SES state can be described as follows. One should sequentially delete IEs, one by one, from the set of IEs and then -- by two IEs (all combinations of two) and calculate the change of the system risk. By doing that we can establish the most dangerous IEs in the system and their combinations by two, three, etc.....

Thus, the LP-analysis of economic health risk and LP-management of economic health allows us to determine the most dangerous sanctions for our country and to decide which sanctions should be introduced for the antagonist country to lead it to a crisis and economic recession.

11. Special Software for socioeconomic safety problems

Management of socioeconomic safety of SES due to the large calculations. "Top economy" developed a special Software for computational research and laboratory work on the scientific discipline.

Certificate software *Expa* is designed for the synthesis of probability event by experts [12, 21]. Expert synthesizes the probability of an event-proposition A . He offers several alternative hypotheses A_1, A_2, \dots, A_n for events A . We denote hypotheses, as events, logic variables A_1, A_2, \dots, A_n , having a probabilities P_1, P_2, \dots, P_n . The variables A_1, A_2, \dots, A_n form a group of incompatible events. The sum of the probabilities P_1, P_2, \dots, P_n is equal to 1. The problem is reduced to the

evaluation of the probabilities of hypotheses based on the method of randomized aggregates on indexes by expert information. He selects the hypothesis, which has the highest probability.

If the probability of an important event evaluated by several experts, the evaluation combined with the method of randomized aggregates indexes. The problem is solved by super-expert in the following sequence: he enters the list of hypotheses and list of experts, fills the hypothesis probabilities table by all the experts, sets weights of experts, defines the relationship between the weight of experts, sets the simulation accuracy and calculates hypotheses probabilities. The results are displayed on screen.

Certificate software *Arbitrator* is designed for structural and logical modeling [11, 21]. Formulation and formalization of the problem of modeling and probabilistic analysis of the system is to build a structural model (schema) of the studied system. Next, it performs the formal transition to the L- and P-functions of the system safety. To calculate the system performance should be determined numerical values of probabilities of initiating events. L- and P-functions can not be built without the computer because of high labor intensity. Arbitrator automatically decides this task, using the procedure of orthogonalization of L-function. The final stage of the LP-system modeling is the LP-analysis. It is based on the use P-function for system safety risk. It uses characteristics of meaningful elements, as well as contributions to the plus and minus of the risk.

Conclusion

We have got the following theoretical and methodological results:

1. A new scientific discipline "Top-economy" with its own methods, models, technologies, problems, objects and special software is introduced.
2. The notion of invalidity in economics by analogy with reliability in technology is introduced.
3. The definitions of top-economics and invalidity are given.
4. Features and advantages of top-economics are found.
5. Boolean new events-propositions in the management of socioeconomic safety of SES are introduced: subjects failure events, signaling events, invalidity events, conceptual events, indicative events, etc.
6. New LP- risk models for socioeconomic safety management of SES are developed: hybrid, conceptual, invalid and indicative LP-models.
7. A method for the synthesis of events probabilities in LP risk models based on non-numeric, inaccurate and incomplete expert information is proposed.
8. The example managing the socioeconomic safety of Russia are described.
9. The obtained results can help improve the management of a country's economy on the basis of solving the problems of SES economic safety.
10. It was proved that it is impossible to solve difficult social and economic problems without scientists and public opinion.
11. It was shown that reforms in education, science and economics are needed for effective management of a country's innovation system.
12. The government and the Academy of Sciences should include socioeconomic safety management into top priority directions of scientific research.

We have got the following results in assessment of status of implementation of top—economics:

1. The research results of socioeconomic safety management in the real data are published in the following articles of the journal IJ RAM: synthesis of events probabilities for risk LP-models using non-numerical, inexact and incomplete information [12], anesthesia opposition [13], innovation system management [14], safety management of socioeconomic systems [15], management of the bank lending system [16], risk management technology [17]. The results of research of socioeconomic security in the real data are also published in the following works in

Russian: anti-corruption and bribery [18], quality management systems and products by WTO [19], operational risk management of banks and redundant capital by Basel [20], and others.

2. We built the training course "Socioeconomic safety management". It is held over two semesters, uses the textbook [4] and the guidelines for labs [21]. Students perform 10 labs on software *Expa* and *Arbitor* from the list of 100 suggested topics. It achieved more than 10 theses and diploma projects.

3. Examples of applications of the top—economics in SES are established the following:

- The socioeconomic problems can not be solved without scientists and public opinion;
- SES effective management requires reforms in education, science and economics;
- It is needed retraining of managers and teachers of economic faculties of universities.

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