The Management of Socioeconomic Safety

The Management of Socioeconomic Safety

By

Eugene Solozhentsev

Cambridge
Scholars
Publishing

The Management of Socioeconomic Safety

By Eugene Solozhentsev

This book first published 2017

Cambridge Scholars Publishing

Lady Stephenson Library, Newcastle upon Tyne, NE6 2PA, UK

British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN (10): 1-4438-9119-3
ISBN (13): 978-1-4438-9119-6

CONTENTS

ABBREVIATIONS

IE – *initiating events*
LP – *logical and probabilistic (model)*
SES – *socioeconomic systems*
SES-1 – *of paramount importance SES for the State, designed to reduce the loss of funds and increase their income*
SES-2 – *complex SES for the State and regions, depending on the number of ministries and departments*
SES-3 – *local SES for companies and firms, the success of which depends largely on their desires and capabilities*
SSM — *socioeconomic safety management*
RMT SCS — *risk management technologies of structurally complex systems*
Top-economics — *management of economic safety of SES*
WTO — *World Trade Organisation*

ABSTRACT

The book introduces a new academic discipline “Socioeconomic safety management” (SSM) on the basis of logical and probabilistic (LP) risk models. The definitions of invalidity in economics by analogy with reliability in engineering are given. The special features and advantages of the SSM discipline and its components are described: methods, models, technologies, tasks, objects and special software. New types of Boolean “events-propositions” in economics are introduced, as well as the new types of LP-risk models.

SSM has the following research objects — socioeconomic systems SES-1, which are of top priority for the country and are aimed at reducing financial losses and increasing revenues; SES-2 which are complex ones, depending on several ministries and government agencies; SES-3, which are local ones, for companies and firms. The tasks of SSM are discussed: the construction of LP-risk models, LP-analysis, LP-forecasting and LP-management of SES state risk.

The applications of SSM for SES include: the management system for innovations, corruption counteraction, drug addiction counteraction, assessment of banks’ operating risk and capital reservation in accordance with Basel, management of systems and goods quality by WTO, bank loans management. Within the framework of economic safety the problems of risk modeling, analysis and management are solved, as well as the management of economic wars by the use of sanctions.

Our examples have demonstrated that: 1) it is very difficult to solve socioeconomic problems without the involvement of scientists and public opinion, 2) the creation of top priority SES is impossible without reforms in education, science and economy, 3) the future development of the SSM requires the certification of special software.

The book is intended for economists and managers who are interested in the problem of SES economic safety management. It will be also useful to undergraduate and postgraduate students of economics and their teachers.

FOREWORD

Economics is far from being perfect and needs to be developed further. This can be seen from the failures of companies, economic recessions in many countries and unsolved problems in economics. Let us name just a few problems in economics, unsolved due to the lack of or incorrectness of the following mathematical models of system states: connections between economy, politics, State, science and society; taking into consideration events-statements made by government officials, businessmen, scientists and public figures concerning changes in legislation, the situation in the market, the emergence of innovations, etc.; the interconnection of different socioeconomic systems (SES); transition from any databases to knowledge bases in order to make decisions; using multi-state invalidity in economics in the same way as failures in engineering; the techniques of building system risk models using the parameters of one of its states; invalid, conceptual, indicative and hybrid models built for the universal assessment of economic systems; the integration of models by logical operations *AND, OR, NOT*; the study course "Socioeconomic safety management" for economic departments. Economics departments at universities (created on the basis of accounting and audit departments) and academic institutions under the name of "Economic safety" do not actually deal with safety management.

Here are some more problems in economics which are unsolved due to the lack of or incorrectness of the following mathematical models of management: taking decisions using mainly certain "notions" and "manual operations"; management of the banks' operating risk and capital reservation by Basel; management of the quality of systems and products by WTO; management of the crediting process in banks; management of economic wars caused by sanctions; management of reforms in education, science and economy; management of the participation of public opinion and scientists in the solution of socioeconomic problems; the development of systems as complex objects moving along a pre-set trajectory with corrections in case of deviations from it; management of the strategy of the development of a country and its regions on the basis of adjustments of models using information concerning the changes in economy, politics, law and innovations.

The efficiency of LP-management is considered using the example of managing a country's SES safety. Socio-economic safety management is being made more difficult because of the following factors: management has a complex character, as it depends on several ministries, institutions and legal authorities; we do not have a unified system of models, methods, tasks, techniques and special software for managing socioeconomic safety. Sets and LP-models, according to some scientists, are the simplest and most transparent aspects of mathematics. Socioeconomic safety should be managed on the basis of mathematical models and not by "notions", which are often erroneous.

The analysis of unsolved problems in economics has shown that we need a new economic discipline "Socio-economic safety management". This new academic discipline has been influenced by many scientists: G. Boole who introduced the logical calculus of sentences; P. Poretsky who established the connection between logic and probability theory; I. Ryabinin who created the theory of LP-analysis of reliability in engineering; Nobel Prize winners J. Buchanan and J. Heckman who studied the interconnection of economy, politics and the State on the basis of games theory and statistical data analysis; N. Wiener and J. von Neumann who believed that mathematical methods, used for managing economic and social systems, must be based on logic, probability theory, sets and the combinatorial theory; A. Einstein who thought that no problem could be solved at the level where it appeared.

The book defines the invalidity of parameters and the system as a deviation from pre-set values. It introduces new types of Boolean events-propositions and new types of logical probabilistic (LP) risk models for managing socio-economic safety. We use the event approach to modeling the risk of systems and solving the problems of risk analysis, forecasting and management. We should consecutively build scenario, structural, logical and probabilistic risk models for a socio-economic system. In the SES safety management technique the central place is occupied by the following procedures: the orthogonalization of the risk logical function, the assessment of the invalidity of initiating events and the LP-analysis of system risk by the contributions of events.

The new economic discipline "Socioeconomic safety management" is a unified complex of models, methods, knowledge, techniques and software based on LP-risk models and LP-calculus. The academic and practical relevance of this discipline is defined by the fact that it solves the unsolved problems in economics mentioned above.

The efficiency of an economy will increase if, together with the tasks of microeconomics and macroeconomics, we solve the tasks of socioeconomic safety management.

The book introduces new scientific directions: "Management of socioeconomic safety" and "The top level of managing in economics". The objects of management include: governments, socioeconomic problems of governments, socioeconomic systems of a country and its regions.

The author
Honoured scientist of the Russian Federation,
Doctor of Technical Sciences,
Professor, Saint-Petersburg State University
of Aerospace Instrumentation, Faculty of Economics.

INTRODUCTION

Economic efficiency can increase if together with
the tasks of micro- and macroeconomics we deal
with the problems of top-economics or
economic safety management.
E. Solozhentsev

The academic discipline “Reliability and Safety” exists in engineering, but not in economics, though failures, recessions, crises and bankruptcies are very common in an economy. We call the academic discipline “economic reliability” or “socioeconomic safety management”.

The problem of socioeconomic safety management (SSM) of socioeconomic systems (SES) of a country, its regions, cities and companies has a high (top) mission, and for short we call it “top-economics”, by analogy with the terms “microeconomics” and “macroeconomics”. Top-economics has its own methods, models, technologies, objects, tasks and software for the management of economic safety of SES.

The safety of a country depends not only on its military, technological, energy, ecological and information safety [1], but also on its economic safety – sustainable development of its socioeconomic systems, and of the systems counteracting corruption, the systems counteracting drug addiction, etc.

A lot of resources are required for the management of the State and evolution of socioeconomic systems. Therefore, a SES is needed for innovations management in order to reduce financial losses and increase revenues from industry and business. We have adopted as the basis the principle of a Chinese political leader Li Keqiang, according to which technological innovations are viewed as equal to innovations in management, including State management.

A lot of departments of economics faculties, regional centers and research institutes bear a loud name “Economic safety”. The topics of their research and publications prove that they view economic safety management as guided by their own rules, which are very different and changeable, depending on who sets them. We propose universal rules of

economic safety management, based on logical probabilistic (LP) risk models.

We formulate a risk scenario and build LP-risk models of failure risk of SES states, and we use monitoring data of indicators of SES and signaling events for changes in the economy, politics, laws and innovations, etc. to correct the probabilities of initiating events in the LP-risk model of SES. We carry out assessment, analysis and forecasting of SES risk and managing risk, making decisions about allocating resources to change the probabilities of initiating events.

We develop the concept of management of the economic safety of a country, bringing together the management of the innovation system and SES economic safety. We present some examples of the management of SES economic safety based on LP-risk models and LP-calculus too.

The author established the basic principles of building automated management systems by developing (debugging) structurally complex engineering systems (doctorate thesis, Institute of Cybernetics, Ukrainian Academy of Sciences, 1982). An engineering system (for example, a motor) consists of subsystems. There are certain initiating events (IE), which cause the destruction of subsystems and systems or their invalid performance (deviation from the norm). A table of the connections of the states (failures of subsystems) and initiating events is built. Common initiating events (parameters) define the connections of the states of subsystems. Using the connections table one builds LP-risk models of system state for assessment, analysis, forecasting and management by debugging (development).

LP-risk models are also built for the management of the State and evolution of economic safety of SES (and a country). The success of a country (a complex system) is viewed as an event with a certain probability. Invalid events are considered. They denote the deviation of the state of an economic system from norms and requirements. Socioeconomic systems have common initiating events, which provide their interconnection. It is easy to combine logically the LP-risk models of different SES into one LP-risk model, which should be used to deal with the tasks of assessment, analysis, and forecasting of risk of the state and development of SES and the country.

Economic safety management does not belong to top priority fundamental directions in science, defined by the Government of the Russian Federation and the Russian Academy of Sciences (RAS). The Russian Scientific Foundation also offers no grants for research in economic safety management. And this is not surprising, as certain

Russian economists do not consider economics to be a fundamental science.

The book deals with one of the sections of the new scientific direction in economic science. Content management of socioeconomic security is virtually non-existent. The author was guided mainly by the ideas of John Boole on the truth of propositional logic and Nobel Prize laureates James Buchanan [2] and James Heckman [3] on the interconnection of economics and politics in the development of the State on the basis of game theory and of statistical data analysis.

Developing their ideas we offer a new approach to the analysis and economic safety management of SES, which is based on top-economics. The connections between economy, politics and society are considered in a broad aspect.

The LP-risk model takes into account:

- initiating events, which depend on the government's decisions, the laws on education, science, social programmes, competition, legal protection of mothers and families, living standards, the level of medical care and other actions;
- the ability of subjects (State, business and society) to solve the SES problems, depending on their desires and capabilities;
- alarm events - changes in economy, politics, laws and legislation, innovation, natural disasters and wars, to change the situation on the world market for the correction of initiating events probability in the LP-risk model of SES.

Objective – the creation of the scientific foundation for the economic safety of SES based on LP-risk models and the development of examples of the management of SES economic safety.

This objective presupposes dealing with the following problems:

1. Introduction of a new academic discipline "top-economics" for the economic safety management of socioeconomic systems;
2. Definition of invalidity in economics by analogy with reliability in engineering;
3. Clarification of the features of a new academic discipline "top-economics";
4. Introduction of the new types of Boolean events-propositions and the new types of LP-risk models for economic safety management of SES;
5. Description of the components of top-economics: methods, models, technologies, tasks, objects and special software;

6. Development of the techniques of logical probabilistic analysis, forecasting and risk management, as well as the technique of management of economic wars using sanctions;
7. Introduction of the technique of the synthesis of events probabilities in LP-risk models by non-numerical, incomplete and inaccurate expert information;
8. Development for top-economics of special software for structural logical simulation and synthesis of IE probabilities in LP-risk models;
9. Consideration of the examples of using top-economics for economic safety management of the country, its regions, cities, companies and their SES.

Top-economics has the unified model system, methods, technologies, and software for managing the economic safety of SES with varying complexity. To indicate that this is a unified system of knowledge and methods, which are based on LP-models and LP-calculus, we propose the name “top-economics”. The discipline “top-economics” includes the following components:

1. **Methods:** the definitions of invalidity in economics and top-economics; LP-calculus with “events-propositions”.
2. **Models:** hybrid LP-risk models of a problem’s 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 - structurally complex systems.
4. **The tasks** of assessment, analysis, forecasting and risk management.
5. **Objects of management:** SES of groups SES-1, SES-2, SES-3.
6. **Special software.**
7. **Examples** of management of SES economic safety.
8. **Subject index.**

Invalidity LP-models can be applied in management of the state of socioeconomic systems under risk criteria. Also, these LP-models can be used for management of a system's development. Resources should be reserved for management of the state and development of systems.

The following hierarchy of socioeconomic systems and problems can be established: large socioeconomic systems-countries, socioeconomic problems in countries, socioeconomic systems of the country (Russia).

In the present work we consider in detail the tested LP-risk models for management of the safety of the socioeconomic system (SES) of a country (for example, Russia). These systems exist in reality and are understandable to everyone. With the use of LP-models the SES invalidity risk is estimated and analyzed. Resources and investments are allocated for invalidity management annually.

Thus, the object of assessment, analysis and management is the following:-

Group SES-1, including the SES which are of top priority for the government, aimed at reducing financial losses and increasing revenues:

1. Management of the innovation's system state of a country.
2. Counteraction to bribery and corruption.
3. Counteraction to drug addiction in a country.
4. Management of the banks' risk and capital reservation in accordance with Basel.
5. Systems and goods quality management by WTO.
6. Monitoring and management of credit provision to banks.

Group SES-2, containing complex SES for the State and the regions that depend on several ministries, agencies and legislative bodies:

1. The LP-risk model of a country's birth rate.
2. The LP-model of the failure to solve the problem of education.

.....

15. The LP-model of the failure to solve the problem of informatization.

Group SES-3, containing local SES for companies and firms whose success depends mainly on their wishes and capabilities:

1. LP-management of risk and efficiency of the restaurant "Prestige".
2. The LP-models of failure risk of managing ZAO "Transas".

.....

25. The LP-risk models of the transportation company "Logwin Road + Rail Rus".

Note that micro- and macroeconomics do not solve the problem of the economic safety management of socioeconomic systems of groups SES-1, SES-2, SES-3 [4-6].

The following definitions of invalidity have been formulated for top-economics:

1. Invalidity in economics is introduced by analogy with reliability in technology. It has not two values (failure/non-failure), but a set of values to [0, 1].
2. The international standard ISO 9000 – 2001 uses the term invalidity for assessing the quality of works, rendered services, products and management systems.
3. The invalidity of a system or a parameter is a deviation of their states from the states given by technical requirements and specifications.
4. An event-proposition corresponds to an invalid state. The degree of invalidity is considered as at risk.
5. This is the dialectic of subjective and objective in the assessment of invalidity: we set system requirements to the system subjectively and we consider objectively its status with respect to these requirements.
6. Constant parameters are not events in the system state.
7. The tasks of assessment, analysis, forecasting and risk management are solved by LP-models of SES invalidity risk.
8. LP-risk models of SES can be combined by logical operations *AND, OR, NOT.*

Top-economics has the following features and advantages:

1. Target management of economic safety is carried out by the criterion of risk with the assessment of potential losses.
2. Top-economics has an interdisciplinary character, as it deals with economic, social, organizational, information and logical probabilistic aspects of the management of socioeconomic systems safety.
3. The system invalidity state is multi-state.
4. SES economic safety has a complex character, as it depends on several ministries, the government and legal bodies.
5. Connection of LP-risk models of the state of different SES can be realized via repeated initiating events (IE), which are part of LP-risk models of different SES.
6. The dynamics of LP-models of SES are provided by the correction of IE probabilities when new statistical data appear about system states, as well as new signal events concerning the changes in economy, politics, rights and laws, innovations, the situation in the world market, reforms in education, science and economy.
7. Construction of the LP-risk model using the parameters of one system state.

8. Top-economics uses information and intellectual, innovative technologies of risk management in structurally complex systems.
9. Top-economics has transparent methods, models, techniques and tasks.

The following new types of Boolean "events-propositions" appear in top-economics: subjects' failure events, signal events, invalidity events, conceptual events, indicative events, etc. In the economic safety management of SES instead of the probabilities of true/false events we use the probabilities of success/failure and hazardous/non-hazardous events.

1. *Events-propositions about the non-success of subjects*. An event-subject is the failure by a subject to solve a difficult problem. The subjects are: 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.
3. *An 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]. An event-proposition about invalidity has the risk equal to the parameter value (the indicator).
4. *Conceptual events-propositions* predict the system's 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.* The probabilities of events-propositions are estimated by interviews and data from social networks.
7. *Incompatible events* in LP-risk models of SES are entered for grades of parameters.

The following new types of LP-risk models with events-propositions are introduced in top-economics:

1. *Hybrid LP-models* of failure risk of solving difficult socioeconomic 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 at the heart of the problem;
2. *Invalid LP-risk models*. They are built on the basis of invalid events;
3. *Conceptual LP-models* of predicting the system's evolution. They are built on the basis of the descriptions of the professionals who understand the nature of the problem;
4. *Indicative LP-models* of the system's dangerous condition, built by indicative indicators which characterize the danger of the system's state.

All of these new types of LP-risk models can be used for each SES for the comprehensive analysis and management of its economic safety.

The fundamental and novel character of top-economics is determined by the introduction of invalidity, the new types of Boolean events-propositions and new types of LP-risk models, techniques, tasks, objects of management and special software.

We can build the LP-models of a system's success or failure. The probabilities of success and failure are linked by simple dependence: their sum equals 1. We shall use LP-risk models of failure in economic safety more often. Logical addition is used in these models (the risks are added), and then they are adjusted for system risk management. LP-risk models are developed in such a way as to ensure their monotony. This means that by increasing or decreasing the probability of any initiating event the probability (the risk) of the final event should increase or decrease correspondingly.

The present work consists of the introduction, four chapters, conclusion, references and subject index.

Chapter 1. "Scientific foundations of top-economics" gives the definitions of "invalidity" in economics by analogy with reliability in engineering. The features and advances of top-economics are described, after which we deal with the components of top-economics: its methods, models, technologies, tasks, objects and special software. The new types of Boolean events-propositions and new LP-risk models for economic safety management are introduced. Methods of building invalidity LP-models are delineated. We offer the techniques of analysis, forecasting and management of risk of state and evaluation in LP-risk models. Further on we offer the technique of synthesis of the probabilities of events in LP-models and take into account the dynamics in LP-risk models. The notions of objective and subjective senses in invalidity are considered.

Chapter 2. "Examples of logical and probabilistic management of economic safety" focuses on the LP-risk model of the economic safety in Russia. The following LP-risk models are described: the state of the innovation system of the country, counteraction to bribery and corruption, counteraction to drug addiction, the management of the operation risk of a bank and capital reservation in accordance with Basel, the assessment of systems goods quality by WTO, monitoring and management of bank crediting. We also deal with the LP-models for managing the risk and efficiency of a restaurant, a transport company and the management of a company.

Chapter 3. "Special software for problems of economic safety" considers the software for the class "LP-modeling": "Arbiter" for the structural logic simulation, "ROCS 2" for analysis and optimization of the risk of large-scale systems, "Algebra of corteges" for arbitrary logic functions of risk. We also describe the software of classes "LP-classification" and "LP-efficiency" and software "Expa" for the synthesis of the probabilities of events in LP-risk models. We propose a set of software for the classes of risk models and bring out the algorithm of simulation and analysis of risk in a large system. We offer mathematical tools for economists: new Boolean events-propositions in economics, new LP-risk models with events-propositions, LP-calculus with events-propositions; the identification method of nonlinear problems with many real valued variables and integer optimization criteria; the method of summary randomized indicators to assess the probabilities of events; the computational apparatus of cortege algebra for risk assessment of arbitrary systems of logic functions with many multi-states; the method of presenting logical variables in binary codes and actions with them in the LP-risk models of high dimension models; the proof of the impossibility of establishing equivalent training and testing samples in the classification of problems with LP-models. The question "what mathematical tools are required by economists for risk management?" is discussed.

In **Chapter 4** "State of the problem of management of economic safety" we justify the importance and the fundamental character of the economic safety management problem in Russia. In this chapter the reader will find various data from papers, books, special editions of journals in Russian and in English, from dissertations and State University of Aerospace Instrumentation (SUAI) students' graduation and laboratory works, and from International Science Schools "Simulation and Analysis of Safety and Risk in Complex Systems". The perspectives of top-economics are closely linked with the creation of special inexpensive

software “Expa” and “Arbiter” for training the students of economics, as well as economists and company managers.

In the **Conclusion** we give the expanded definition of top-economics as a system of models, methods, technologies and software for the management of the economic safety of SES of varying complexity. It is pointed out that top-economics considers the connection of economics, politics, business, science and society more broadly. We provide the general scheme of the management of economic safety of the country, the region and the company (system) based on top-economics. We illustrate the necessity of reforms in education, science and economy in the country. We also illustrate improved methods of developing strategies for the economic and social development of the regions. A conclusion is made that socioeconomic problems cannot be solved without the support of public opinion and scientists.

The list of **subject indexes** of the scientific discipline “top-economics” is presented by the following sections: top-economics’ components, top-economics’ features and the current evolutionary stage of top-economics.

The author is also indebted to his former students Dr. V. Karasev, Dr. N. Lebedev, Dr. V. Alekseev, Dr. E. Karasev for their contributions in this volume.

The author expresses special gratitude to Professors Eberhard Stickel (Germany), Hiromitsu Kumamoto (Japan) and Giovanni Barone-Adesi (Switzerland) for being given opportunities to visit their universities and for their teamwork in the field of risk.

Sections 1.8 and 2.7 of the present book are written together with the candidate of technical sciences V. V. Karasev; sections 2.5 and 3.8 are written together with the candidate of economics E. I. Karaseva.

The author is sincerely grateful to academician of RAS A.G. Aganbegyan for highlighting the key points in the book, to Doctor of Technical Sciences I. A. Ryabinin for his support and advice on logical probabilistic aspects, to Doctor of Mathematical and Physical Sciences V. P. Odinets and Doctor of Mathematical and Physical Sciences N. V. Hovanov for his valuable comments in reviewing the book.

The book is addressed to managers and economists concerned with economic safety management of SES, undergraduate and graduate students and university professors of economics, as well as those from the branches of the Academy of Civil Service.

CHAPTER ONE

SCIENTIFIC FOUNDATIONS OF TOP-ECONOMICS

No problem can be solved at the level where it appeared.
Albert Einstein

In this chapter we establish the scientific foundations of top-economics and give the definitions of "invalidity" in economics by analogy with reliability in engineering, after which we pass on to describe the features and components of top-economics: its methods, models, technologies, tasks, objects and special software.

We will consequently introduce the new types of Boolean "events-propositions" and the new types of LP-risk models. The objects, analyzed and controlled by top-economics, are defined – three types of socioeconomic systems: SES-1 of top priority for the State; SES-2, which are complex ones for the State and the regions, depending on several ministries and government bodies; SES-3 – local ones for companies and firms. Analysis, forecasting and risk management procedures are considered.

We will discuss the following problems: management and regulation in an economy, objectivity and subjectivity in invalidity, connection between SES and environment, unforgotten knowledge, and the concept and principles of SES safety management.

1.1. Components of Top-economics

Top-economics has a unified system of models, methods, technologies, and software for the management of economic safety of SES with varying complexity. To define the unified system of knowledge and methods, which are based on LP-models and the LP-calculus, we propose the name "top-economics". We propose to study and analyze economic safety management, applying universal rules, formulated for risk management technologies in structurally complex systems. The academic discipline "top-economics" or economic safety management in socioeconomic systems includes the following components [7, 8]:

1. **Methods:** The definitions (axioms) of invalidity in economics and top-economics, LP-calculus with Boolean "events-propositions".
2. **Models:** Hybrid LP-risk models of the failure to manage complicated SES, invalid LP-risk models of SES states, the conceptual LP-model of SES development forecast, indicative LP-models of SES state danger.
3. **Risk management technologies** in structurally complex systems.
4. **The tasks** of assessment, analysis, forecasting and risk management.
5. **Special software.**
6. **Objects of management** - socioeconomic systems of SES-1, SES-2 and SES-3 groups.
7. **Examples** of economic safety management.
8. **Subject Index.**

Top-economics deals with management objects belonging to three groups of SES.

Group SES-1 consists of the SES which are of top priority for the State, aimed at reducing financial losses and increasing revenues:

1. The management of the state of the system of innovations of the country.
2. Counteraction to bribery and corruption.
3. Counteraction to drug addiction in the country.
4. Management of the operation risk of banks and capital reservation in accordance with Basel.
5. Management of the quality of systems and goods by WTO.
6. Monitoring and management of credit provision to banks.

Group SES-2 contains complex SES for the State and regions, depending on several ministries and government bodies:

1. The LP-risk model of birth rate in the country.
2. The LP-risk model of death rate.
3. The LP-risk model of inflation growth.
4. The LP-risk model of economic growth slowing down.
5. The LP-risk model of decay in agriculture.
6. The LP-risk model of an environmental catastrophe.
7. The LP-risk model of actual salaries decrease.
8. The LP-risk model of unemployment rate growth.
9. The LP-risk model of educational system failure.
10. The LP-risk model of health care system failure.
11. The LP-risk model of the failure to solve the problem of a lack of kindergartens.

12. The LP-model of the failure to solve the problem of building housing accommodation.
13. The LP-model of the failure to solve cultural problems.
14. The LP-model of the failure to solve the IT development problem.
15. The LP-model of the current situation with economic safety in Russia.

Group SES-3 contains local SES for companies and firms, whose success mainly depends on their wishes and possibilities [7, 8]:

1. The LP-risk model of management and efficiency of a restaurant.
2. The LP-assessment of ratings and comparison of office centers in St. Petersburg.
3. The LP-risk model of the failure of a company ZAO BaltAvtoPoisk.
4. The LP-risk models of the failure of the management of ZAO Transas company.
5. The LP-risk model of a building company.
6. The LP-risk model of the transport company Logwin Road + RailRus.
7. The LP-model of the steel mill electrical supply safety.
8. The LP-model of the insurance of explosions and fires at hazardous objects.

It should be noted that microeconomics and macroeconomics do not solve the problems of managing the economic safety of socioeconomic systems of groups SES-1, SES-2 and SES-3.

There are up to 20 risk initiating indexes in the above mentioned SES, which is a lot fewer than the number of fundamental indexes describing SES states. The initiating events are connected with the derivative events by logical operations *OR, AND*. The examples of calculation research of economic safety management of several SES from groups SES-1, SES-2 and SES-3 are provided in Chapter 2.

1.2. Definitions of Invalidity

The problem of a system's invalidity has recently appeared. This problem accompanies technical progress and will be solved using economic tools and knowledge available in the considered period. The necessity of a special discipline concerning a system's invalidity was caused by WTO requirements to estimate the system's and the product's quality, management of the state and development of socioeconomic

systems, estimation of risk of socioeconomic problem decision failure, forecast of system's development, estimation of system's state danger. Together with the usual sense of the word "invalidity", which means the deviation of the system's parameters from given values, for quantitative estimation of invalidity we need a more rigorous scientific definition of the term "invalidity". Invalidity is an event which leads to a loss of a system's quality, but a system can perform its assigned goals.

The following definitions (axioms) are introduced for invalidity and top-economics:

Definition 1. Invalidity in economics is introduced by analogy with reliability in engineering. Unlike reliability in engineering it has not two values (failure/non-failure), but a set of values in the interval [0, 1].

Definition 2. The international standard and GOST R ISO 9000-2001 use the terms validity or invalidity for assessing the quality of works, rendered services, produced goods and systems of management.

Definition 3. The invalidity of a system is a deviation of its state from the state given by technical requirements and specifications. The invalidity of a parameter or a factor of a system is a deviation of its value from the set or the standard value.

Definition 4. The invalidity of a state is considered as an event-proposition, which corresponds to a logical variable. The degree or characteristics of invalidity have different values in the range [0, 1] and are considered a system state risk.

Definition 5. The invalidity of a system as an event is calculated by the invalidity of its events-parameters.

Definition 6. If a parameter is constant, then it is not viewed as an event in the system state. For example, "the number of women" is a constant parameter in the current state of SES "Birth rate in the country". This parameter is not introduced in the LP-risk model.

Definition 7. The number of risk initiating indexes is substantially less than the number of parameters describing a system's state.

Definition 8. "Risk management technologies" with LP-risk models are employed. They view risk and efficiency as a single entity. The mathematical expectation of losses is calculated as the product of risk and system assets value.

Definition 9. The SES LP-risk model allows one to assess, analyze, predict and manage system risk, allocating resources for reducing the risk of initiating parameters.

Definition 10. The management of an economy can be improved, if, together with the problems of micro- and macroeconomics, we solve the problems of the management of economic safety of SES of groups SES-1, SES-2 and SES-3.

Definition 11. LP-risk models of the state of different SES can be combined into one model by logical operations *AND, OR, NOT.*

The following restrictions exist in top-economics:

1. We should select the most important events as initiating events (IE) in socioeconomic systems. It is not required to describe events in a system in detail. In considered applications the number of IE is not more than 20.
2. A failure (reliability) of a technical system depends on the failure of certain elements of it (IE). The invalidity of an economic system is not a failure but a quality of a system. An invalid system can have all IE invalid but it still works and is still in demand because the deterioration of a system's quality is compensated, for example, by a lower price in the market.
3. An invalid event has an invalidity measure which is considered as the probability (risk) of an invalid state. In the model of the system's invalidity we assume that IEs are independent.
4. A decision-making person manages an invalid system by distributing the resources in order to reduce IE invalidity, taking into account the IE contributions to the system's invalidity and their significance in the market.

1.3. Advantages and Features of Top-economics

Top-economics or economic safety management has the following features and advantages:

1. Economic safety is carried out by the criterion of risk with the assessment of potential losses.
2. New types of LP-risk models can be used for each SES for comprehensive analysis and management of economic safety.
3. Top-economics has an interdisciplinary nature, as it deals with the economic, social, organizational, legal, information and logical probabilistic aspects of SES safety management.
4. Unlike classical reliability theory in engineering, where the states of system elements have only two values (failure and non-failure), the state of the system's invalidity has many values (multi-state).

The probability of system state invalidity as an event corresponds to the values of invalidity states of its elements.

5. SES economic safety management has a complex nature, as it depends on the government, several ministries and legal bodies. Due to its complex nature there are certain difficulties in SES economic safety management.
6. The connection of LP-risk models of the states of various SES is performed via repeated initiating events (IE), which are part of LP-risk models of different SES.
7. The dynamics of the LP-risk models of SES is achieved by the correction of IE probabilities in the following cases: the emergence of new statistical data about system states; the emergence of signal events connected with changes in the economy, in politics, in law, and the arrival of innovations; a change of the situation in the world market; reforms in education, science and economy.
8. Construction of LP-risk model by parameters of one system state.
9. We use risk management technologies with logical probabilistic models which are informational, intellectual and innovative [7].
10. An advantage of top-economics is the transparency of its methods, models and technologies.

1.4. Boolean Events-propositions in Economic Safety

We extend the concept of a Boolean "event-proposition" with the aim of building LP-models of risk management and efficiency in SES and processes. New types of "events-propositions" have been introduced: the events of subjects' failure, signaling events, invalid events, conceptual events, indicative events, etc.

I. A. Ryabinin in [9, 10] evaluated the contribution of outstanding scientists G. Boole, P. Poretsky, S. Bernstein, A. Kolmogorov and V. Glivenko in the foundations of LP-calculus. The uniqueness of LP-calculus consists in the fact that it is not considered an academic discipline in mathematical handbooks, although it is used in many applications.

Boole's axioms of propositions logic. In 1840 the English scientist George Boole published the paper in which he introduced the evaluation of the truthfulness of expressions, or Boolean algebra. This work laid the foundations of the new academic discipline - mathematical logic. In mathematical logic a sentence is understood as any expression which can be said to be true or false. The notation *A and B* is a sentence whose truthfulness equals the truthfulness of both sentences *A and B*. The notation *A or B* is the sentence, whose truthfulness equals the truthfulness