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MODEL OF MARKETING RISK ASSESSMENT IN INVESTMENT PROJECTS

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Solntsev S. O., Ovchynnikova A. V. Model of marketing risks assessment in investment projects

The goal of the article is the study of theoretical and methodical grounds of assessing marketing risks when realising investment projects for increase of efficiency of making managerial decisions and minimisation of the level of marketing risks. In the result of the study the article offers to allocate the stage of assessment in the process of management, consisting of detection, analysis and assessment of marketing risks. Structurisation of methods of assessment of marketing risks allowed supplementing the existing groups of methods of assessment of risks using methods of marketing studies of consumer behaviour and develop a model of stage-by-stage complex assessment of marketing risks in investment projects, which is based on the study of the process of market exchange of enterprises and modelling behaviour of consumers under market conditions. The prospect of further studies is identification of sources and specific features of assessing marketing risks during the further stages of realisation of an investment project and when a commodity enters the market.

Key words: marketing risks, assessment of marketing risks, consumer behaviour, model of assessment of marketing risks.
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Солнцев С. А., Овчинникова А. В. Модель оценивания маркетинговых рисков в инвестиционных проектах

Целью статьи является исследование теоретических и методических основ оценивания маркетинговых рисков при реализации инвестиционных проектов для повышения эффективности принятия управленческих решений и минимизации уровня маркетинговых рисков. В результате исследования предложено выделить этап оценивания в процессе управления, состоящий из выявления, анализа и оценки маркетинговых рисков. Структуризация методов оценивания маркетинговых рисков позволила дополнить существующие группы методов оценивания рисков методами маркетинговых исследований потребительского поведения и разработать модель поэтапного комплексного оценивания маркетинговых рисков в инвестиционных проектах, которая основана на исследовании процесса рыночного обмена предприятий и моделировании поведения потребителей в рыночных условиях. Перспективой дальнейших исследований является определение источников и особенностей оценивания маркетинговых рисков на последующих фазах реализации инвестиционного проекта и при выведении товара на рынок.

Ключевые слова: маркетинговые риски, оценивание маркетинговых рисков, поведение потребителей, модель оценивания маркетинговых рисков.
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Солнцев С. О., Овчиннікова А. В. Модель оцінювання маркетингових ризиків в інвестиційних проектах

Метою статті є дослідження теоретичних та методичних засад оцінювання маркетингових ризиків при реалізації інвестиційних проектів для підвищення ефективності прийняття управлінських рішень та мінімізації рівня маркетингових ризиків. У результаті дослідження запропоновано виокремити етап оцінювання в процесі управління, що складатиметься з виявлення, аналізу та оцінки маркетингових ризиків. Структуризація методів оцінювання маркетингових ризиків надала можливість доповнити існуючі групи методів методами маркетингових досліджень споживчої поведінки та розробити модель поетапного комплексного оцінювання маркетингових ризиків в інвестиційних проектах, яка заснована на дослідженні процесу ринкового обміну підприємств та моделюванні поведінки споживачів у ринкових умовах. Перспективою подальших досліджень є визначення джерел та особливостей оцінювання маркетингових ризиків на подальших фазах реалізації інвестиційного проекту та при виведенні товару на ринок.

Ключові слова: маркетингові ризики, оцінювання маркетингових ризиків, поведінка споживачів, модель оцінювання маркетингових ризиків
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The economic recession in Ukraine is marked with decreasing investments in the industrial sector of the economy of Ukraine, one of the reasons for which is companies' restraint in implementation of the long-term investment projects due to the high uncertainty in the market environment and, consequently, a high level of marketing risks. The crises of 1998 and 2008 made the managers realize that the existing approaches to the marketing risk assessment cannot by applied in full and are to be supplemented with more detailed market research of consumer behavior

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and at the early stages of the implementation of the investment projects.

The marketing risk assessment is of great concern for the investment-attractive markets, the alternative energy market of Ukraine being among such. On one hand, this can be explained by the irreversible exhaustion of traditional energy sources, increasing prices, and environmental pollution; on the other hand, by significant raw materials available for the production of alternative fuels in Ukraine and favorable geographical location. This is why the marketing investment risks assessment for the investment projects at the alternative energy market is vital for local companies.

The risks in entrepreneurship are covered in the major works of F. Knight, J. Neumann, A. Smith, and A. Marshall. Among native and foreign scientists who studied the problem of risk assessment management are as follows: T. Bachkai, A. Alhin, I. Blank, I. Balabanov, V. Vitlinskiy, N. Vnukova, G. Velykoivanenko, O. Gavrysh, V. Dergachova, L. Dovgan, P. Krush, O. Okhrimenko, B. Reizberg, N. Simchenko, D. Stechenko, Ye. Utkin, V. Shapkin, U. Sharp, and others. The significant contribution to the study of marketing risks is made by S. Illiashenko, S. Solntsev, A. Starostina, V. Kravchenko, and L. Balabanova.

However, most risk assessment techniques do not provide for detailed analysis of the market situation and quantitative assessment of marketing risks depending on conditions in the market environment, which determines the importance of the further theoretical insights in this direction.

The *purpose* of the article is to study the theoretical and methodological foundations of marketing risk assessment in case of implementation of the investment projects with the purpose to improve the efficiency of managerial decisions and minimize the level of marketing risks.

The need of the companies to make decisions under the conditions of the limited information is related to a significant internal and external uncertainty that creates risk. In case of the implementation of the investment projects, the companies face the need to make decisions on the probability of commercial success of the investment project, that requires detailed analysis of market environment.

The nature of the market risk emergence is defined by uncertainty in the information environment of the company due to the activity of the business entities in the marketing environment [3 – 6, 8, 9, 12]. Some scholars treat risks as components of the other risk groups, or isolate the point up the components of the marketing risks, treating them separately, with no relation to the marketing risks [3, 4, 8, 10]. The definition of the marketing risk is proposed based on the analysis of the essence of marketing risks. The marketing risk is the economic category that describes the uncertainty in the information environment of the company due to the marketing environment factors directly affecting the process of market exchange process between producers and consumers in the competitive environment (direct marketing risks), or arising out of market exchange, but have a direct influence on industrial and business activity of the companies (affiliated marketing risks). Proceeding from the above definition of the marketing risks, the nature of the marketing risk emergence has been considered. Thus, the marketing risks have been classified with the purpose of their further identification based on the above criteria.

In case of the implementation of the investment projects, to reveal the marketing risks it is required to use several inter-related classification criteria, namely, based on field of origin, type of influence on the process of the market exchange, and economic counteragents [7-10, 12]. Thus, the external marketing risks shall include the risks of macro-marketing, meso-marketing, and micro-marketing environments. The internal ones shall include the marketing risks of the internal environment of the company. According to the types of the subjects the risks are classified into consumer risks, competitor risks, risks of suppliers, state, agents, etc. The competitor risk shall include the risks of the current competitors, risks of the potential competitors, and risks of the substitute goods. The consumer risks shall include the risks of the direct influence on the company, as well as the price sensitivity risks. The supplier risks shall include the risks of the raw materials suppliers, components, workforce, and equipment. The agent risks shall include the risks of the logistics, trade, marketing agents, and lending and financial institutions. The risks of the contact audience shall include the risks of mass media, financial circles, NGOs, and public institutions. The risks of the internal and meso-marketing environment are referred to the direct marketing risks; and the risks of the macro-marketing environment are referred to the affiliated marketing risks.

Apart from identification of the type of the risk, it is required to cover the blocking factors formed in the marketing environment and being obligatory, but not sufficient, conditions for decision-making as to the expediency of the implementation of the investment projects. Normally, such factors are under review in the business plan, namely, the marketing plan. We believe they need to be grouped separately as the blocking factors are the basis for the further development of the product and marketing strategies and determination of the marketing risks level (*Table 1*).

Table 1

Blocking Risk Factors
(drawn by the author based on sources 13, 14)

Group of Blocking Factors	Subgroups of Factors
Legislative Restrictions	Competition law
	Condition of the foreign economic activity
	Price regulation for goods and services
	Goods standardization
	Regulation of the advertisement activity of the company
	Document flow and obtaining permits, certificates, etc.
Restraint of Demand	Market capacity
	Operating characteristics of goods
	Conditions of supply and settlement
	Seasonality
Restraint of Supply	Price discrimination
	Unique character of the technological, and production lines
	Control over distribution channels
	Protection of intellectual property rights

Assessment is one of the stages of the marketing risk management [3, 8]. The necessity of improving the sequence

of stages of marketing risk management, which involves the separation the assessment stage in order to identify causal relationships between risk factors and elements of their profit generation, is proven. The assessment shall include: (1) risk identification, (2) risk analysis, which includes determination of the consequences of occurrence of the risk event, the probability of risk event, and the opportunity to influence on risk factor, and (3) risk evaluation.

It was found out that domestic practice of risk assessment applies only a few methods of risk assessment, namely, expert methods, sensitivity analysis, statistics, simulation modeling, etc., are mostly used. ISO 31010-2009 standards, which cover most of the existing risk assessment techniques, are offered to serve the basis for risk assessment methods [2]. Such methods include: (1) look-up methods (aimed to identify groups of risk factors), (2) supporting methods (tools for the other methods for obtaining information), (3) scenario analysis (identification of casual relations) (4) functional analysis (identifying «bottle-necks» and latent risk areas), (5) control assessment (elimination of risks at production), (6) statistical methods (quantitative risk assessment). Such methods are not usually studies by local scholars, but being widely used in the world.

The existing methods of marketing risk assessment do not cover in full the market situation, and, consequently, do not give the possibility to determine the probability of commercial success of the investment project. The classification of risk study techniques let classify the risk assessment methods according to the sources of information, namely, three groups of methods have been identified: subject-oriented, object-oriented, and combined methods. Such classification made it possible to analyze the advantages and disadvantages of risk assessment techniques based on the sources of information, and to determine that existing methods do not cover the analysis of consumer preferences and behavior. Therefore, it was concluded about the necessity to supplement the risk assessment techniques with the methods of marketing research of consumer behavior which relates to the subject-oriented group. The comprehensive application of such techniques provides the greatest reduction in market uncertainty. For comprehensive marketing risk assessment, the necessity to combine different techniques of marketing risk assessment is detected. The model of marketing risk assessment, which is based on modeling of consumer behavior on the conditions of variability of product attributes and competitive pricing strategies to determine the projected cash flow for the investment project, which enables to determine the likelihood of different levels of return of the project (*Pic. 1*), has been worked out.

The first stage is to identify the risk factors. Firstly, the analytical model of the target function allowing analyzing the marketing environment factors, based on their impact on elements of profit generation of the company, is created. The next step is to identify the risk factors according to the sources of marketing risk, which is based on analysis of the marketing environment using checklists. The second stage is to analyze the risk factors. The analysis is to be conducted in two ways: the analysis of the elements of profit generation, and the analysis of the risk factors.

When analyzing the elements of the profit generation, the first step shall be to apply the sensitivity analysis aimed at identifying the elements of the profit generation which exert a significant influence on performance of the project implementation. The next step is to determine the range of variation of

the elements of the profit generation based on the groups as follows: incomes and expenses. The incomes shall include «sales volume» and «price», measured on the basis of the conjoint analysis. The expenses shall include internal costs (production, personnel), for which the technique of primary hazard analysis shall be applied; and external ones (price for electricity, raw materials, transportation, etc.), which should be assessed by applying forecasting techniques and expert evaluation method. It was determined that when analyzing the risk factors, it is required to define the consequences of the occurrence of the risk event, its probability, level of influence on project, and the level of the potential influence on risk factor which is to be defined based on the place of the company in the marketing environment.

The final state of the marketing risk assessment shall be the evaluation of the level of the marketing risks. Stimulation method is offered to be used as such method gives the possibility to assess a wide range of scenarios of the events, and define the fluctuation of the efficiency indices in case of different courses of events. The risk level shall be defined on the basis of the statistics data processing.

The income elements of profit generation are covered in details: sales volume and price. The criteria defining the market situation and influencing the methods of research haven been defined: the level of goods novelty, demand level, and type of consumers, which gives the possibility to forecast the potential financial flow in case of the implementation of the project. The following criteria are sorted out:
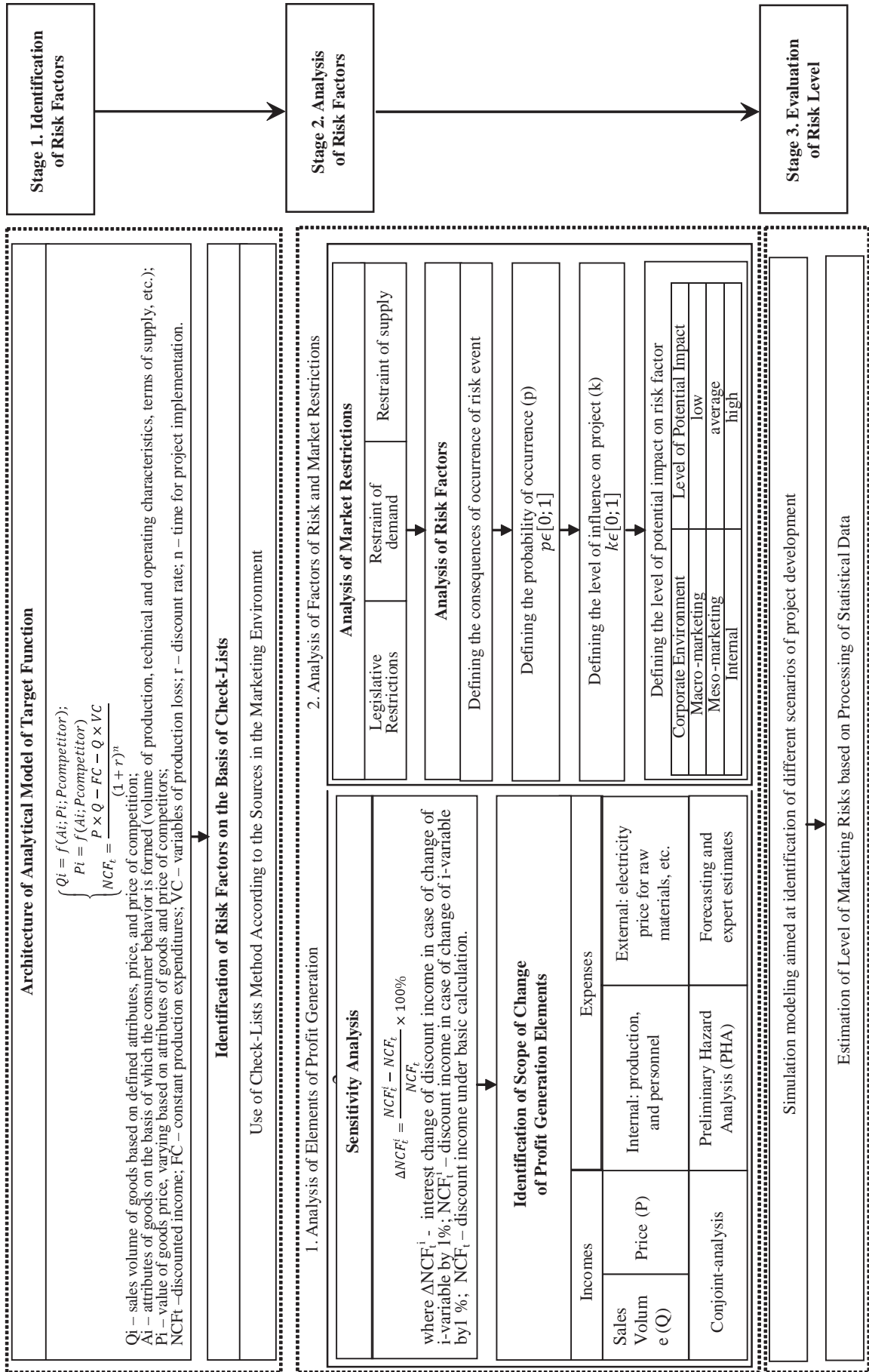- the level of novelty of goods: (1) fundamentally new goods, (2) goods of fundamental novelty, (3) goods of new field of use, (4) renewed goods, (5) goods new for specific market, (6) existing goods, but new for the company;
- demand level, based on analysis of correlation of demand and supply;
- consumers: final, industrial.

Determination of the methods of study of consumer behavior depending on the market situation is based on the analysis of the application of the conjoint analysis and research of the peculiar behavior of consumers depending of the market condition. Thus, the application of its different types based on such criteria as time of interview, sample size, number of the attributes of goods, necessity of price research, and type of questioning, has been offered.

The existing restrictions, advantages and disadvantages of the use for the choice of the strategies and marketing risks management tools have been analyzed. The matrix method of the analysis based on such criteria as probability of the occurrence of the risk event, influence of the project and potential influence on risk factor has been offered to serve as the basis of defining the strategies and tools. It should be noted that the possibility to influence the risk factor is determined by the place in the marketing environment of the company: macro-marketing environment is characterized by low influence; meso-marketing – the average one; and internal – a high one. The strategies of the marketing risk management are determined according to the matrix quadrants.

To choose the set of the strategies and tools of marketing risk management, it is offered to use the procedure as follows [11]:
- risk analysis through matrix method based on criteria as follows: probability of the occurrence of the risk event, influence on project, potential influence on the risk factor;

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Stage 1. Identification of Risk Factors → **Stage 2. Analysis of Risk Factors** → **Stage 3. Evaluation of Risk Level**

Architecture of Analytical Model of Target Function

$$\begin{cases} Qi = f(Ai; Pi; Pcompetitor); \\ Pi = f(Ai; Pcompetitor) \\ NCF_t = \dfrac{P \times Q - FC - Q \times VC}{(1 + r)^n} \end{cases}$$

Qi – sales volume of goods based on defined attributes, price, and price of competition;
Ai – attributes of goods on the basis of which the consumer behavior is formed (volume of production, technical and operating characteristics, terms of supply, etc.);
Pi – value of goods price, varying based on attributes of goods and price of competitors;
NCFt –discounted income; FC – constant production expenditures; VC – variables of production loss; r – discount rate; n – time for project implementation.

Identification of Risk Factors on the Basis of Check-Lists

Use of Check-Lists Method According to the Sources in the Marketing Environment

1. Analysis of Elements of Profit Generation

Sensitivity Analysis

$$\Delta NCF_t^i = \frac{NCF_t^i - NCF_t}{NCF_t} \times 100\%$$

where ΔNCF_t^i - interest change of discount income in case of change of i-variable by 1%; NCF_t^i – discount income in case of change of i-variable by 1 %; NCF_t – discount income under basic calculation.

Identification of Scope of Change of Profit Generation Elements

Incomes		Expenses	
Sales Volume (Q)	Price (P)	Internal: production, and personnel	External: electricity price for raw materials, etc.
Conjoint-analysis		Preliminary Hazard Analysis (PHA)	Forecasting and expert estimates

2. Analysis of Factors of Risk and Market Restrictions

Analysis of Market Restrictions

Legislative Restrictions	Restraint of demand	Restraint of supply

Analysis of Risk Factors

Defining the consequences of occurrence of risk event

Defining the probability of occurrence (p) $p \in [0; 1]$

Defining the level of influence on project (k) $k \in [0; 1]$

Defining the level of potential impact on risk factor

Corporate Environment	Level of Potential Impact
Macro -marketing	low
Meso -marketing	average
Internal	high

Simulation modeling aimed at identification of different scenarios of project development

Estimation of Level of Marketing Risks based on Processing of Statistical Data

Pic. 1. Model of Marketing Risk Assessment for Investment Projects

- ✦ determination of the basic management strategies for each group of risks;
- ✦ targeting the most significant group of factors of the marketing risks;
- ✦ determination of the potential losses for the company based on occurrence of each risk event;
- ✦ determination of the tools of influence on risk factor as to cost of their implementation;
- ✦ application of the scenario approach to defining the potential ways of the implementation of the tools;
- ✦ choice of the tools on risk management on the basis of the correlation of expenses for risk management and the level of potential losses.

The area of the inefficient managerial decisions and the area of the efficient decisions shall be defined by the ratio calculated as follows:

$$K_i = \frac{\sum_{j=1}^{n} I_n}{\sum_{j=1}^{n} Dam_n}, \qquad (1)$$

where K_i – the ratio of efficiency of managerial decision of i-scenario, defined as the correlation of the cost of the sold risk management tools and amount of the potential losses due to the occurrence of the risk event; I_n – the cost of the sold n-risk management tools in i-scenario; Dam_n – amount of n-potential losses due to the occurrence of the risk events in i-scenario.

In case the managerial decisions efficiency ratio is below 1, the scenario is efficient; and the lower the value of the index is, the higher the efficiency is. In case the ratio is above 1, the scenario is inefficient; and the higher the ratio is, the lower the scenario efficiency is. The scenario approach gives the possibility to choose the most efficient scenario, but subject to the budgetary restrictions of the company.

The application of the offered procedure gives the possibility to work out the set of the managerial decisions, characterized by the higher profitability of the risk management measures and covering the budgetary restrictions of the company.

CONCLUSION

The undertaken study of the theoretical insights and experience of marketing risk assessment in the investment projects gave the possibility to classify the marketing risks based on field of emergence, type of impact on market exchange process, and economic counteragents, which serve the basis for revealing the risk factors. It is offered to distinguish the assessment stage in the management process, which would comprise of revealing, analyzing, and assessing the marketing risks. The structuring of the methods of risk assessment gave the possibility to update the existing groups of methods by the methods of the marketing study of consumer behavior, and work out the model of the staged comprehensive assessment of the marketing risks in the investment projects, based on study of the market exchange process of the companies and modeling of the consumer behavior under market conditions, which enables to define the probability of the different levels of profitability of the investment project. The procedure for choosing the set of strategies and tools for marketing risk management, which envisages the application of such method allowing to analyze all possible ways of use of risk management tools and choose the set of the managerial decisions with maximization of the profitability of sale and addressing corporate budgetary restrictions, has been defined. ∎

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НЕПРЕРЫВНАЯ МОДЕЛЬ ФИНАНСОВОГО ВЗАИМОДЕЙСТВИЯ ПРЕДПРИЯТИЙ В ВЫПОЛНЕНИИ ИНВЕСТИЦИОННОГО ПРОЕКТА

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Кузниченко В. М. Непрерывная модель финансового взаимодействия предприятий в выполнении инвестиционного проекта

Рассмотрен вероятностный подход к модели товарно-денежного распределения во времени бюджета инвестиционного проекта между предприятиями на базе цепей Маркова (дискретная модель) и на базе системы линейных дифференциальных уравнений (непрерывная модель). Для решения дискретной модели используется метод z-преобразований, для решения непрерывной модели – преобразование Лапласа. Стохастическая матрица цепей Маркова полностью определяет дискретную модель распределения бюджета инвестиционного проекта между предприятиями, а дифференциальная матрица – непрерывную модель этого распределения. Использование z-преобразования и преобразования Лапласа позволяет найти решения задач в аналитической форме. Полученные выражения упрощают анализ и расчет состояний системы по сравнению с другими методами. Устанавливается взаимосвязь между дискретной и непрерывной моделями, то есть решения этих задач при t = n совпадают.

Ключевые слова: *стохастическая матрица, цепи Маркова, z-преобразование, дифференциальная матрица, преобразование Лапласа, аналитическая форма.*
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Кузніченко В. М. Безперервна модель фінансової взаємодії підприємств у виконанні інвестиційного проекту

Розглянуто імовірнісний підхід до моделі товарно-грошового розподілу в часі бюджету інвестиційного проекту між підприємствами на базі ланцюгів Маркова (дискретна модель) та на базі системи лінійних диференціальних рівнянь (безперервна модель). Для вирішення дискретної моделі використовується метод z-перетворень, для вирішення безперервної моделі – перетворення Лапласа. Стохастична матриця ланцюгів Маркова цілком визначає дискретну модель розподілу бюджету інвестиційного проекту між підприємствами, а диференціальна матриця – безперервну модель цього розподілу. Використання z-перетворення і перетворення Лапласа дозволяє знайти вирішення завдань в аналітичній формі. Отримані вираження спрощують аналіз і розрахунок станів системи порівняно з іншими методами. Встановлюється взаємозв'язок між дискретною і безперервною моделями, тобто вирішення цих завдань при t = n збігаються.

Ключові слова: *стохастична матриця, ланцюги Маркова, z-перетворення, диференціальна матриця, перетворення Лапласа, аналітична форма.*
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Kuznichenko V. M. Continuous Model of Financial Interaction of Enterprises when Carrying Out an Investment Project

The article considers a probabilistic approach to the model of the commodity-money time distribution of the budget of an investment project between enterprises on the basis of Markov chains (discrete model) and on the basis of the system of linear differential equations (continuous model). In order to solve the discrete model, the z-transform method is used, and for solution of the continuous model – the Laplace transform is used. The stochastic matrix of Markov chains completely identifies the discrete model of distribution of the budget of an investment project between enterprises, and the differential matrix – the continuous model of this distribution. The use of z-transform and Laplace transform allows finding a solution of tasks in the analytical form. The obtained expressions simplify analysis and calculation of states of the system compared to other methods. The article establishes interconnection between the discrete and continuous models, in other words, solutions of these tasks are similar if t = n.

Key words: *stochastic matrix, Markov chains, z-transform, differential matrix, Laplace transform, analytical form.*
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ЕКОНОМІКА ЕКОНОМІКО-МАТЕМАТИЧНЕ МОДЕЛЮВАННЯ