

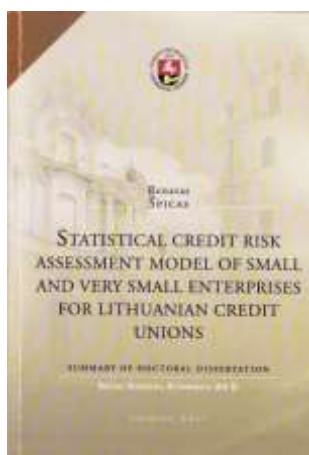
REVIEWS ON DOCTORAL DISSERTATIONS

-----TRANSFORMATIONS IN -----
BUSINESS & ECONOMICS

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REVIEW ONE

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<i>JEL classification:</i>	Y40



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<i>Author's Affiliation:</i>	Vilnius University, Lithuania
<i>Title of PhD Dissertation:</i>	STATISTICAL CREDIT RISK ASSESSMENT MODEL FOR SMALL AND VERY SMALL ENTERPRISES FOR LITHUANIAN CREDIT UNIONS
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<i>PhD dissertation defended in:</i>	June, 2017
<i>PhD degree granted in Social Sciences:</i>	Social Sciences, Economics (04S)

The author of the doctoral dissertation “Statistical Credit Risk Assessment Model for small and very small Enterprises for Lithuanian Credit Unions” Renatas Špicas has formulated the title of the doctoral dissertation, which directly focuses on two main research objectives: how to assess credit risk and how to adapt this assessment to the needs of the business and the external surroundings where the credit unions function. “In the scientific literature, it is recognised that the credit union operation model is different from the operation models of commercial banks or other financial institutions... Therefore, it can be assumed that the models of the credit risk assessment suggested in contemporary scientific literature are not applicable to the sector of Lithuanian credit unions due to the differences in the demands of the business of credit institutions and non-compliance of applied statistical sampling to target credit segment of credit unions” (Špicas, 2017, pp.6-7). According to the author “...there is a general lack of research in scientific literature dealing with credit risk assessment issues in credit unions, and cooperative banking in general. So far, the researchers have not analysed business needs of credit unions for credit risk assessment models, and there are models corresponding to target credit segment of credit unions, i.e. small and very small enterprises created” (Špicas, 2017, p.10).

The scientific problem of the dissertation has been formulated: creation and application of statistical credit risk assessment models in credit unions, taking into account their specificity, the needs of the business and the external surroundings where the credit unions function (Špicas, 2017, p.10). The author strives to: create a statistical model of enterprise credit risk assessment for Lithuanian credit unions having examined the issues, needs and requirements of credit risk assessment in credit unions (Špicas, 2017, p.10).

The aim of research is met by implementing the following objectives of research (Špicas, 2017, pp.10-11).

1. To define the concept and nature of the risk, and to provide a theoretical analysis of the different types of risks in the credit union activity.
2. To provide a theoretical analysis of different aspects of credit risk assessment during various stages of credit union development.
3. To define and analyse the main model's development stages and factors affecting methods and data choice for model development.
4. Having analysed the issues of activities of Lithuanian credit unions, to identify the needs, expectations, and requirements of credit unions for statistical credit risk assessment model.
5. With regard to the identified business needs, expectations, and requirements of credit unions for credit risk assessment model, to develop the model creation sample and choose the proper methods for model development.
6. To create a statistical model of credit risk assessment for the Lithuanian credit unions.
7. To apply a developed model when analysing the business loan portfolio of Lithuanian credit unions and to carry out back-testing of the model.

Scientific novelty of dissertation is defined in the following statements by Renatas Špicas (2017, pp.11-12):

1. The specific features of the activities of the credit unions were identified and their cause and effect relation with particular risks of credit union operating were determined.
2. Different aspects of credit risk assessment during various stages of credit union development were revealed.
3. The factors affecting the choice of methods and data for the development of credit risk assessment model identified.
4. Following detailed research of the sector of Lithuanian credit unions, the problematic aspects of Lithuanian credit unions, targeted segments of credit and the requirements for statistical credit risk assessment model were defined.
5. The new method of definition formulating of a "good" and "bad" loans for the segment of small and very small enterprises was developed and presented in detail.
6. The statistical credit risk assessment model of small and very small enterprises using a statistical sample corresponding to the target segment of Lithuanian credit unions and taking into account the requirements and needs of the credit union was developed.
7. The provided recommendations of integration of the model in the decision-making support system of credit unions allow including the Central Credit Union into the credit decision-making process. Moreover, the proposed integration method provides the ability to exploit the broad capabilities of the credit unions network more effectively when sharing the rejected applications.

The main defended statements:

1. The expert assessment of the credit risk in the performance of credit unions can be effective only as long as the credit union is in the early stage of the development, and has the ability to use the social control element to reduce information asymmetry.
2. Contemporary credit risk assessment models (including the combined and applied other types of credit institutions and credit offices) are not suitable for the use in the activities of Lithuanian credit unions since when they are created the analysis is not performed from three perspectives: credit institutions, external factors and homogeneous risk groups.

3. The developed statistical credit risk assessment model for small and very small businesses is an effective tool for credit risk assessment in credit unions when they are in transition and maturity development stages.

Dissertation logical diagram of the three parts:

Part I “*Theoretical aspects of credit risk assessment in the credit unions*” deals with the concept of risk, highlights the usual features of the activities of credit unions, reveals the cause-effect links to operating risks of credit unions, analyses the credit risk assessment peculiarities in different stages of credit union development. The scarcity of expert credit risk assessment methods is distinguished and the stages and methods of the credit risk assessment model development are considered. The procedure of statistical credit risk assessment model composition is analysed and the factors determining methods applied for the model creation and the data used are identified. Also, the basic model development techniques, distinguishing their advantages, disadvantages and limitations of application are dealt with in the first chapter.

Part II “*Composition methodology for credit risk assessment model*” reviews the survey methodology of credit union sector with regard to clustering of comprising credit unions, the study of the business loan portfolio and the survey of credit unions. Moreover, the methodology of the statistical model creation is presented in this chapter and research hypotheses are formulated.

Part III “*Credit risk assessment model of enterprises for Lithuanian credit unions*” presents the results. At first, the results of the credit union sector are introduced, providing the ability to choose methods and data suitable for model development for the credit unions. Secondly, the logistic regression model is designed and its pre-assessment was made. Thirdly, the model back-testing is performed. Fourthly, the recommendations for the model application are submitted and the model integration into the decision-making support system for credit unions is suggested.

Research methods and empirical basis. Systematic and comparative analysis, synthesis, systematization and generalization, logical-critical analysis of scientific literature were applied in defining essential concepts of the work, revealing their contents, identifying the dimensions that are essential in the context of the research and preparing the methodological basis. When dealing with the sector of Lithuanian credit unions the following quantitative methods were applied: a survey (interview), and survey by phone. Survey data is summarised and structured, forming a statistical sample. When processing statistical data, MS Excel and R Software Package were employed. For the presentation of the results of the research visual information Circos Software Package was used as well. When creating the statistical credit risk assessment model, the following mathematical and statistical methods were applied: Markov chain, the visual data rendering techniques, methods based on entropy measure (information value, further IV), regression analysis. The methods applied for the assessment of binary classification models were used to evaluate the reliability of model: the ROC curve, AUC measure, the Gini index and the graph of forecasted probabilities. In order identify the optimal cut off point the method of expected maximum profit (EMP) calculation was applied.

Methodological approaches and limitations are established in the scientific work (Špicas, 2017, p.13): At the time of the survey of credit unions there were 72 credit unions operating in the country that constituted the research population. In order to ensure the accuracy of the research, the entire research population was intended to be surveyed, however, only 56 credit unions agreed to participate. The survey data were generalised for the entire survey population making a summary compilation of the business needs of the credit unions that is used for enterprise credit risk assessment model. When creating enterprise credit risk assessment model, statistical sample of the enterprises including enterprises from different

geographical areas of Lithuania was used. It was assumed that small and very small enterprises operating in different geographical areas constitute a single homogeneous risk segment. For the creation of the model, a maximum sample of 1252 enterprises, with regard to the actual possibilities, was used. Whereas there were no data on rejected applications in the statistical sample, appropriately, the problem of rejected inference was not analysed.

Practical adaptation of the dissertation by the author (Špicas, 2017, p.13): “The results of this research were used by the author to create interactive credit risk modelling system, which has been successfully installed in various types of credit institutions in Lithuania and abroad. Currently, the system is adapted for the activities of the central credit unions in order to assess and manage risk at the systematic level.”

At the end of dissertation are presented the main *conclusions*:

1. The risk is defined as a probability that factual results of credit institutions will be different from the planned ones in the future. The risk may be statistically measured by expressing it as a probability that may be determined by analysing the factors that arise due to the operation of a credit institution and condition the risk formation. In the operation of credit unions as well as in the commercial banking, four main risk types are distinguished: operational, credit, market and liquidity.

In cooperative banking, in contrast to the traditional, such risk as adverse selection, moral, issues in raising equity that are characteristic to other banking types emerge, but in cooperative banking, their exhibition is related to the peculiarities of the features of this banking type. Exceptional and unique risk factors: the overlapping of interests, small market depth, the implementation of expert credit risk assessment models, limited possibilities to procure a borrowed capital and a high price for a borrowed capital. All risk types and factors are interrelated by cause-and-effect relations - and influence the common risk of the operation of credit unions.

2. It was determined after conducting the analysis of the scientific literature that operating in accordance with the new operational model aiming at operation effectiveness and the economy of scale, credit unions must evolve and their development essentially will correspond to development stages defined by Sibbald et al (2002). In different stages of development of unions, depending on the analytical information being received by credit unions, human, technology and financial resources that are available, unions should implement different credit risk assessment methods in order to assess the credit risk of potential receivers of loans as accurately as possible. During the early stage of development credit unions may relatively effectively assess the credit risk by expert credit risk assessment methods, employing the element of social management.

During the transition stage, the operation of unions is enhanced beyond the community, the element of social control weakens, and, therefore, credit unions should employ quantitative methods by using objective analytical information. Normally, during this development stage credit unions have not yet accumulated a sufficient amount of data for the creation of statistical models, therefore, during the intermediate period, assessment models expertly composed rule-based models may be implemented. However, in order to assess the credit risk of potential loan receivers as accurate as possible, credit unions should aim at implementing statistical credit risk assessment models as soon as possible. During the maturity stage, the social control element disappears or is particularly insignificant, hence, statistical credit risk assessment methods should be implemented during this stage.

3. The development of a statistical credit risk assessment model is a complex process that may be divided into six main steps: 1) the analysis of model composition requirement and possibility, 2) the compilation of statistical data sample, 3) the definition of a dependent variable, 4) the definition of independent variables, 5) the composition of a model, 6) the assessment of qualitative and quantitative features of a model.

a. The thesis broadens the first step of the model creation and suggests a theoretical concept of the model development that provides an opportunity to assess the possibility to compose a statistical model, to select model creation methods and data employed for the model creation during the analysis from three perspectives: a creditor's, external factors and a homogenous risk segment's. While conducting the analysis from the perspective of a creditor, a creditor's target credit segment is established, the internal information infrastructure as well as HTF resource available are assessed, credit policy and loan portfolio are analysed. While conducting the analysis from the perspective of external factors, the external information infrastructure and regulatory requirements are analysed, and the competitive environment is assessed. While conducting the analysis from the perspective of a predicted segment that is analysed in the context of a binary event, potential discriminatory variables are determined, and the typical behaviour is assessed. The thesis demonstrates that applied methods and employed data determine main features of a composed model: the discriminatory power regarding the segment being analysed, the interpretability of model results, the risk tolerance level, the compliance with the regulatory requirements applicable to a creditor as well as other business requirements of a creditor.

b. The definition of a dependent variable signifies the definition of a "bad" loan in the context of credit risk assessment. Defining a "bad" loan answers two questions: firstly, what feature or set of features may characterise the analysed loan as a "bad" one; secondly, what is the optimal loan performance period. Most frequently, various signs of the non-compliance with a loan agreement, i. e. a bankruptcy, insolvency or prolonged payment delay are the main features of a "bad" loan. The analysis of the scientific literature conducted in this work demonstrated that the most frequently employed definition of a "bad" loan is a payment delayed for more than 90 days. Such a maximum period for late payment tolerance is established by Bank for International Settlements. The most frequently applied method for statistical definition of a "bad" loan is Markov's transition matrix. The essence of optimal loan performance period determination is to determine such a monitoring period during which the average number of days for delayed payments of the selected loan segment grows rapidly. Most frequently, a cohort analysis is implemented for this cause.

c. The selection of independent variables is performed in three stages. Firstly, a set of variables available for use is composed. Secondly, an analysis of values is carried out, whereby variables of low discriminatory power and interrelated variables are eliminated. During this stage, filter methods are the most widely employed methods that allow assessing an individual discriminatory power of variables and their interdependence. Thirdly, an optimal set of independent variables is composed that is included into the final model. During this stage, backward stepwise regression is most widely used.

d. While developing the model, a classification method is selected and implemented. Classification methods are usually grouped into statistical and artificial intelligence. In the work, it is determined that most widely implemented classification methods are discriminant analysis, logistic regression, neuron networks and decision trees. These theoretical approaches were presented in the work.

e. The discriminatory power assessment methods of a model may be divided into two types: Assessment taking the cut-off point into account and assessment not taking the cut-off point into account. Graphic methods are attributed to the first type: receiver operating characteristics curve (ROC), cumulative accuracy curve (CAP). The following values are related to these graphic methods: area under the curve (AUC), accuracy rate (AR), the Gini index, the Pietra index. It is demonstrated in the work that these assessment methods are connected by linear relations. If the cut-off point is selected near assessment methods various classification accuracy assessment values that are calculated from the classification matrix

data are applicable. These model assessment methods are applied while conducting a pre-assessment or a back-testing of a model.

f. In order to determine an optimal cut-off point, two types of methods are distinguished in the scientific literature: based on the classification accuracy analysis and based on profit optimization analysis. Due to the differences in losses in case of first and second type classification errors, profit maximization methods are more appropriate.

4. Exhaustive analysis of the Lithuanian sector of credit unions was performed in order to make a credit risk assessment model conforming to needs of Lithuanian credit unions. First of all – the Lithuanian sector of credit unions was analysed as well as structure thereof and the portfolio of business credits at the credit unions. Issues faced by the credit unions when evaluating credit risks of enterprises were identified. Second, credit unions were surveyed. Requirements of the credit unions for general features of the credit risk assessment model were identified by the survey, difficulties in improvement of the current credit risk assessment model or in creation of a new one were analysed.

a. The performed analysis of structure of the sector led to two conclusions. First – credit unions are non-homogeneous, significant differences are obvious – they operate in markets of different sizes, have different structure of assets, follow different strategies of property management, their sizes are significantly different, loan portfolios and the general assets alike. Second, the majority of Lithuanian credit unions are small considering the size of assets at their disposal and loan portfolio. Although the majority of credit unions operate in small markets, and Lithuanian credit unions operate according to the territorial principle, it is obviously not the main factor preventing the credit unions from development – a significant part of credit unions operating in medium and large markets are also small (both in terms of assets and loan portfolio at their disposal). Such situation in the Lithuanian sector of credit unions leads to an assumption that credit unions face difficulties when transferring from socially oriented model to business activity.

b. Analysis of business loan portfolio of the credit unions disclosed that the quality of loan portfolios at credit unions operating in small markets is significantly higher compared to those in medium and large markets. These results lead to a conclusion that the social control element is more effective in small markets and it decreases when the activities are expanded beyond the community. It confirms the need for statistic credit risk assessment models when credit unions expand their activities beyond the community. The result of this analysis leads to definition of limitation of the credit risk assessment model used by the credit unions – the model is not suitable in activities of credit unions operating in medium and large markets. It should also be noted that the model used by the credit unions does not conform to recommendations of the Basel Committee on Banking Supervision regarding a number of grades that should be on the scorecard.

c. Analysis of target crediting segments and related issues shows that most difficulties in credit risk evaluation are faced by the credit union when analysing applications for credit by natural persons and legal entities. Such results lead to a presumption that using a statistic credit risk assessment model in activities of credit unions would simplify application analysis process and would have a positive effect on efficiency of activities of the credit unions. The results of analysis of target crediting segments and related issues lead to a motivated definition of the target crediting segment – small and very small companies, as defined in the Lithuanian Law on Development of Small and Medium-Sized Companies (1998, No. 109-2993).

d. Analysis of corporate needs and requirements for the model to be created disclosed that most difficulties in improvement of the current credit risk assessment model or in creation of a new one were faced by the credit unions due to limited HTF resources and lack of political willpower of management bodies. Requirements of the credit unions for the model

to be created were also identified: high discriminatory power, explainability of the results provided by the model and inclusion of available external information (as independent variables) into model composition, including financial and non-financial information.

5. Model formation methods were selected and model formation sample was formed in consideration of issues in activities of the credit unions and identified needs of the credit unions, as well as requirements for the credit risk assessment model.

a. In accordance with the Lithuanian Law on Credit Unions, survey results of the sector and in consideration of the maximum possible amount of one loan that the credit unions can grant to one member, the segment of small and very small enterprises were chosen for model development.

b. The dependent variable was defined in accordance with definition of a bad loan as established in the sector of credit unions. The survey of Lithuanian credit unions disclosed that loan repayment delay (DPD) is usually applied on the definition of a “bad” loan. To summarise the analysis, the majority of respondents consider payment delay of 90 or 60 days to be the main feature of a “bad” loan. In consideration of the fact that the analysed segment of credit unions was revealed to be non-homogeneous in respect of the definition of a “bad” loan, statistical methods were used to determine the definition of a “bad” loan: Markov chains and cohorts. Statistical analysis was performed using the business loan portfolios of the Central Credit Union of Lithuania as a sample. It was disclosed that the following shall be considered a “bad” debtor: an enterprise that bankrupted or was late to pay to one of the creditors (according to available data) for more than 90 calendar days within an observation period of 24 months, where the total delayed amount was 2000 or more EUR, and the total amount of delayed loans were two or more.

c. Additional inspection of the sample of “good” enterprises using the method suggested by the author disclosed that a significant part of “good” enterprises should not be considered as “good”. Such results lead to the conclusion that a significant part of companies granted with loans that become non-performing do not go bankrupt. These results also lead to the conclusion that the segment of small and very small enterprises forms a separate homogeneous risk group where specific methods for credit risk evaluation are required, other than those previously suggested in scientific and professional literature.

d. A modified definition of a “good” enterprise was applied when forming the model formation sample in accordance with the results of the additional inspection of the “good” companies. Companies not conforming to established definitions of “good” and “bad” companies were removed from the model formation sample. According to calculations, the formed model formation sample allows 95% probability and 7% error in PD estimation.

e. A list of possible independent variables is comprised of two parts. First, a set of financial independent variables to be used was formed after an exhaustive analysis of scientific and professional literature. Second, nonfinancial variables were selected after an analysis of external informational infrastructure of the credit unions. The financial and nonfinancial data were joined and a list of possible independent variables was formed.

f. In consideration of the possible accuracy of the classifiers, frequency of their application, possibilities of explainability of the results of the model, the logistic regression method was selected for formation of the statistical model of company credit risk evaluation.

g. In consideration of importance of profitability of activities of credit unions, the expected maximum profit method (EMP) was selected for determination of the cut-off point. The scorecard was formed in consideration of the determined cut-off point and recommendations of the Basel Committee on Banking Supervision.

h. When assessing the model, most attention was paid to the features that were considered the most important by the credit unions. The economical logic of model operation

was thoroughly evaluated, as well as discriminatory power, explainability of the results and possibility to apply the model in automated or semi-automated mode.

6. A model of company credit risk assessment was created for Lithuanian credit unions using logistic regression as a basis. Pre-assessment of the model revealed that variables included in formation of the model have strong discriminatory power and are statistically important. In terms of economical logic, the selected variables are considered important because they analyse important areas of activities of the enterprises and include both financial and non-financial data.

a. It was found that using the created model, Lithuanian credit unions would possibly maximise the profit of credits to companies, if the established cut off point would be set at $T=0,48$.

b. The scorecard of the model consists of 10 ranks, 6 of them are for enterprises executing their obligations, 3 – for those non-executing their obligations and 1 (the 10th one) – for factually insolvent companies. Such method of ranking conforms to recommendations of the Basel Committee on Banking Supervision.

7. To summarise the results of model application and back-testing, the discriminatory power of the model is excellent. Analysis of suitability of the model in activities of the credit unions shows that the model was created after an exhaustive complex analysis of the sector of credit unions. Model making methods were selected in consideration of specifics of activities of the creditor, risk tolerance and applied regulatory requirements. The model making sample was formed in consideration of the target crediting segment of the creditor, the sample conforms to the shaped homogeneous group. Variables of the model were selected after an exhaustive analysis of scientific and professional literature and possibilities of practical implementation, as well as external informational infrastructure of the credit unions. The discriminatory power of the model was statistically evaluated and compared to the results of latest scientific research. The method of model application was presented as an additional result of the research.

Reference

Špicas, R. (2017), *Statistical Credit Risk Assessment Model of small and very small Enterprises for Lithuanian Credit Unions*. Summary of Doctoral Dissertation (Social Sciences, Economics, 04S). – Vilnius: Vilniaus universiteto leidykla. – 72 p.

SANTRAUKA

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<i>Daktaro disertacijos pavadinimas:</i>	STATISTINIS MAŽŲ IR LABAI MAŽŲ ĮMONIŲ KREDITO RIZIKOS VERTINIMO MODELIS LIETUVOS KREDITO UNIJOMS
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<i>Suteiktas socialinių mokslų daktaro laipsnis:</i>	Socialiniai mokslai, ekonomika (04S)

Renato Špico disertacijai pasirinkta tema „Statistinis mažų ir labai mažų įmonių kredito rizikos vertinimo modelis Lietuvos kredito unijoms“ Lietuvoje pakankamai aktuali. Kredito unijų evoliucijos procese, joms plečiant veiklą už bendruomenės ribų, socialinės kontrolės elementas iš dalies arba pilnai nustoja veikti, todėl kredito unijos susiduria su sunkumais vertindamos kredito riziką. „Iki šiol tyrėjai nėra analizavę kredito unijų verslo poreikių kredito rizikos vertinimo modeliams, nėra sudaryta ir modelių, atitinkančių kredito unijų tikslinį kreditavimo segmentą – mažas ir labai mažas įmones“ (Špicas, 2017, p. 59).

Suformuluota mokslinė problema – statistinių kredito rizikos vertinimo modelių kūrimas ir taikymas kredito unijose, atsižvelgus į jų veiklos specifiškumą, verslo poreikius bei išorinę aplinką, kurioje jos veikia.

Mokslinio darbo tikslas – išanalizavus kredito unijų kredito rizikos vertinimo problematiką, poreikius ir reikalavimus, sukurti statistinį įmonių kredito rizikos vertinimo modelį Lietuvos kredito unijoms.

Mokslinio darbo uždaviniai, kurie iškelti suformuluotam darbo tikslui pasiekti:

1. Apibrėžti rizikos sampratą ir rūšis bei teoriškai išanalizuoti skirtingų rizikos rūšių raišką kredito unijų veikloje.
2. Teoriškai išanalizuoti kredito rizikos vertinimo aspektus skirtingais kredito unijų raidos etapais.
3. Apibrėžti ir teoriškai išanalizuoti pagrindinius statistinio kredito rizikos vertinimo modelio sudarymo etapus, metodus bei veiksniai, lemiančius modelio sudarymo metodų ir naudojamų duomenų pasirinkimą.
4. Išanalizavus Lietuvos kredito unijų veiklos problematiką, nustatyti kredito unijų poreikius, lūkesčius ir reikalavimus statistiniam kredito rizikos vertinimo modeliui.
5. Atsižvelgus į nustatytus kredito unijų verslo poreikius, lūkesčius ir reikalavimus kredito rizikos vertinimo modeliui, suformuoti modelio kūrimo imtį ir parinkti tinkamus modelio sudarymo metodus.
6. Sukurti statistinį kredito rizikos vertinimo modelį Lietuvos kredito unijoms.
7. Pritaikyti sukurtą modelį analizuojant Lietuvos kredito unijų verslo paskolų portfelį bei atlikti grįžtamąjį modelio įvertinimą.

Renatas Špicas nurodė *mokslinio darbo naujumą ir teorinį reikšmingumą*:

1. Išskirti kredito unijų veiklos bruožai bei jų priežasties ir pasekmės ryšys su specifinėmis kredito unijų veiklos rizikomis.
2. Išanalizuoti kredito rizikos vertinimo ypatumai skirtingais kredito unijų raidos etapais.
3. Nustatyti veiksniai, lemiantys kredito rizikos vertinimo metodų ir duomenų pasirinkimą kuriant kredito rizikos vertinimo modelius.
4. Atlikus išsamų Lietuvos kredito unijų sektoriaus tyrimą, nustatyti probleminiai Lietuvos kredito unijų veiklos aspektai, tiksliniai kreditavimo segmentai bei reikalavimai statistiniam kredito rizikos vertinimo modeliui.

5. Sukurta ir detaliai pristatyta nauja „gerų“ ir „blogų“ įmonių apibrėžimų formavimo metodika mažų ir labai mažų įmonių segmentui.

6. Sudarytas statistinis mažų ir labai mažų įmonių kredito rizikos vertinimo modelis naudojant statistinę imtį, atitinkančią Lietuvos kredito unijų tikslinę kreditavimo segmentą bei atsižvelgus į kredito unijų reikalavimus ir poreikius.

7. Pateiktos modelio integravimo į kredito unijų sprendimų priėmimo paramos sistemą rekomendacijos leidžia į kreditavimo sprendimų priėmimo procesą įtraukti Centrinę kredito uniją. Pasiūlytas integracijos metodas taip pat suteikia progą efektyviau išnaudoti plataus kredito unijų tinklo galimybes dalijantis atmestomis paraiškomis.

Pagrindiniai ginamieji teiginiai:

1. Ekspertinis kredito rizikos vertinimas kredito unijų veikloje gali būti efektyvus tik tol, kol kredito unija yra pradiniam raidos etape ir turi galimybę naudoti socialinės kontrolės elementą informacijos asimetrijai mažinti.

2. Šiuolaikiniai kredito rizikos vertinimo modeliai (taip pat sudaryti ir taikomi kitų rūšių kredito įstaigose bei kredito biuruose) nėra tinkami naudoti Lietuvos kredito unijų veikloje, kadangi juos kuriant neatliekama analizė iš trijų perspektyvų: kredito įstaigos, išorės veiksnių bei homogeninės rizikos grupės.

3. Sukurtas statistinis mažų ir labai mažų įmonių kredito rizikos vertinimo modelis yra efektyvus įrankis vertinti kredito riziką kredito unijoms esant tranzitiniame ir brandos raidos etapuose.

Praktinis darbo reikšmingumas. Šio darbo tyrimų rezultatai autoriui padėjo sukurti interaktyvią kredito rizikos vertinimo modeliavimo sistemą, kuri sėkmingai įdiegta skirtingų tipų kredito įstaigose Lietuvoje ir užsienyje. Šiuo metu sistema adaptuojama centrinių kredito unijų veiklai siekiant vertinti ir valdyti kredito riziką sisteminiu lygmeniu.

Pasirinkta darbo struktūra logiška, atitinka tyrimo tikslą. Darbas susideda iš įvado, 3 dalių, išvadų, naudotos literatūros sąrašo bei priedų. Įvade suformuluotas temos aktualumas, mokslinė problema bei aptartas ištyrimo lygis, suformuluotas tyrimo tikslas, nurodyti darbe sprendžiami uždaviniai, pateikti darbo mokslinį naujumą atskleidžiantys rezultatai. Taip pat įvertinta darbo praktinė reikšmė bei tyrimo rezultatų aprobavimas. Įvade trumpai apibendrinta darbo struktūra, pateikta loginė disertacinio tyrimo schema, atspindinti iškeltų uždavinių sprendimo seką, bei tyrimo apribojimai.

Pirmojoje dalyje analizuojama apibrėžiama rizikos samprata, išskiriami tipiniai kredito unijų veiklos bruožai, nurodomi jų priežasties ir pasekmės ryšiai su kredito unijų veiklos rizikomis, išanalizuoti kredito rizikos vertinimo ypatumai skirtingais kredito unijų raidos etapais. Išskirtas ekspertinių kredito rizikos vertinimo metodų ribotumas, išnagrinėti kredito rizikos vertinimo modelio sudarymo etapai ir metodai. Išanalizuota statistinio kredito rizikos vertinimo modelio sudarymo eiga bei nustatyti veiksniai, lemiantys modelio sudarymo metodus ir naudojamus duomenis. Pirmoje dalyje taip pat analizuojami pagrindiniai modelio formavimo metodai, išskiriami jų privalumai, trūkumai ir taikymo apribojimai. Antrojoje dalyje formuojama kredito unijų sektoriaus tyrimo metodologija, kurią sudaro kredito unijų klasterizavimas, verslo paskolų portfelio tyrimas ir kredito unijų apklausa. Šioje dalyje taip pat pateikiama statistinio modelio sudarymo metodika ir iškeliamos tyrimo hipotezės. Trečiojoje dalyje pateikiami tyrimo rezultatai. Pirma, pristatomi kredito unijų sektoriaus rezultatai, suteikę galimybę parinkti kredito unijoms tinkamus modelio sudarymo metodus ir duomenis. Antra, sudarytas logistinės regresijos modelis ir atliktas jo išankstinis įvertinimas. Trečia, modelis pritaikytas vertinant kredito unijų verslo paskolų portfelį bei atliktas grįžtamasis modelio įvertinimas. Ketvirta, pateikiamos modelio taikymo rekomendacijos ir pasiūlytas modelio integravimo į kredito unijų sprendimų priėmimo paramos sistemą būdas.

Darbo pabaigoje pateiktos išvados ir rekomendacijos.

Disertaciją sudaro trys dalys, apimtis 236 p., yra 23 lentelės, 42 paveikslai, 6 priedai, Literatūros sąrašas 363 šaltiniai.