BATUMI SHOTA RUSTAVELI STATE UNIVERSITY

FACULTY OF ECONOMICS AND BUSINESS

DEPARTMENT OF FINANCE, BANKING AND INSURANCE

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The ways of perfection of factors affecting the risk management In the modern banking system

Speciality: Business Administration

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Introduction

The relevance of the topic. Banking business management includes itself uncertain elements that manifest in making risky decisions, and it is a source of profit at the same time. Risk and indeterminacy is a companion of human life from birth to death. Almost daily, we have to make a risky decision since the stochastic nature of natural phenomena and social events do not allow predetermining the development of events. This circumstance creates many problems related to human activities such as economic, political, managerial or scientific ones. The future seems always to be open, but not undefined.

According to philosophical science "uncertainty is the state of the brain when making a decision, or the level of its knowledge of a specific situation". Thus, according to this definition, the low level of knowledge of each person to some extent contributes to the growth of uncertainty in a particular situation, and not "the uncertainty" itself. Due to this explanation, in order to accomplish the dissertation thesis at a high level, we considered it necessary to study in depth the research conducted by scientists on risk and uncertainty from ancient times to the present day. So that the conclusion obtained in the study of risk management factors of the banking sector would be more specific, and the risk-benefit ratio was in the real structure.

The psycho-emotional mood in the perception of risk is aimed at waiting for danger and leads to the suppression of human abilities even at the moment, but it can have a significant impact on decision-making.

Modern commercial banks have to work in conditions of diverse and numerous risks as they have relations with clients, partners and the environment, and risks associated with them are generated as bank risks. Therefore, it is necessary to establish a banking risk management system. One of the reasons for giving special importance to bank risks is the close link of banks with their contracting party.

The bank, as a central figure, connects the market subjects with each other, so risks occurring in front of each economic entity contribute to the emergence of banking risk factors, and their uncontrollability becomes the basis of the economic crisis. Security issues related to the banking business have always been a significant and topical issue. In this regard, the most acute problem in the banking system of Georgia is the improvement of the

quality of management methods and the introduction of risk management procedures in current activities.

The risk management system is essential for the success of banks and the provision of sustainability. Today's market requires high standards of risk management, which is stipulated by increased competition. Due to competition, the demand for quick and effective solutions increases, that is accompanied by the subsequent risk of effective management. The second reason is that the business environment is growing and expanding, which in turn, expresses the increase in risky decisions in business.

The events in the Georgian economy over the past two decades have shown that the reduction of banks in the banking market was, to a certain extent, caused by an incomplete assessment of banking risks. Therefore, we believe that the improvement of an effective risk management mechanism and its compliance with modern management standards are relevant for the development of an effective competitive environment and their sustainability among commercial banks in Georgia.

The goals and objectives of the study. The main goals of the dissertation thesis are:

- to study the level of risk management of commercial banks in Georgia and to identify the problems associated with the efficient management of risks and set ways of improvement;

-to study the causes for the current and expected risks in the banking sector, ways to identify and evaluate them, their impact on the stability and reliability of financial institutions;

-to develop the theoretically based approaches and practical recommendations concerning the development of an effective risk management mechanism.

To achieve these goals, the following specific objectives were developed:

- To study the views of the world researcher on the risk as a scientific direction;
- to study risk-management as the formation of a scientific direction and stages of evolution;
- to consider and analyze risks in the banking business and their causal factors;
- To study and analyze all the regulations that apply to risk management in the banking system;

- To consider the role of the National Bank of Georgia as a supervisor in the improvement of the banking system;

- To study how the internal control system is implemented in individual commercial banks in relation to identification, assessment, and monitoring of risks;

- To study and analyze financial and non-financial risks and factors affecting them using the example of system banks;
- To do the empirical analysis of overdue credits as one of the important credit factors, and to study the interdependence of macroeconomic factors;
- to study the tendencies of risk culture formation in Georgian commercial banks and to develop relevant proposals;

The subject of study. Banking risks and risk factors;

The object of study. Commercial banks determining the operating system in the banking system of Georgia;

The state of studying the problem. The risk management and factors affecting them, and also the theoretical and practical aspects of the effectiveness of bank risk management were studied by the following foreign scientists: Bachelier, Markowitz, Beekmann, Luhmann, Fischer Black, Myron Scholes, Crouch, Field and others.

Despite the fact that the research on banking risk management is not exhausted, the problems associated with risk management in the banking system were discussed in proceedings and textbooks of Georgian scientists: G. Tsutskiridze, I. Kovzanadze, G. Kontridze, A. Ergeshidze, L. Oniani, M. Shiukashvili, P. Chaganava, G. Tsaava and others. This is also natural, since the current processes in the economy, financial integration create new risks that need to be studied, and to develop new approaches to management, which determined the selection of the topic, goals, and objectives of our research.

Theoretical and methodological fundamentals of the study. Systematization of data, their analysis of Pearson's correlation and regressive method, presentation of determined relationships between the risks and factors by formulas and graphs.

Scientific novelty. The novelty of the thesis is as follows:

- the essence of banking risk was clarified and developed, in which the

materialization of the results of the activities of partners of the bank is the determining factor in the losses of financial resources of the bank.

- The effect of macroeconomic indicators on the credit risks developed by overdue credit of system determining commercial banks was established on the basis of data for eleven years using Pearson correlation method.

- The predicting size of credit risk at "shocking change" of macroeconomic indicators was determined as a result of the establishment of the statistical significance of macroeconomic indicators in relation to credit risk.

- Based on the study of audit reports of the financial statements of the commercial banks, for conducting a regressive analysis of credit and operational risks, the multiple regression model was created by selecting the factors which are most influenced by credit risk. The two-year prediction of the credit risk is determined in accordance with the time rows of financial indicators.
- The level of risk culture in commercial banks of Georgia was studied by a qualitative method, on the basis of which proposals were formed.

The theoretical and practical significance of the thesis. The thesis has both theoretical and practical values. Its involvement in the Master's program will improve the quality of teaching, helping students improve the theoretical knowledge on the development of risk management and study of new methods and approaches to identification and analysis of risks. The results of the study are practical importance since they contain recommendations for the improvement and effective management of credit risk in commercial banks.

The publication of proceedings. The main content of the thesis and the results of the study have been published in the scientific papers.

Thesis structure. The work consists of the introduction, 3 chapters, 9 subchapters, conclusions and proposals. It includes the printed 167 pages, which is accompanied by a list of references and annexes.

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The main contents

The first chapter of the thesis "Theoretical Aspects of Banking Risk Management" consists of three subchapters.

The prerequisites of risk occurrence as a term, the development stages of the theory, the opinions and theories of researchers of those periods were studied and reviewed in the first subchapter: "development stages of the risk theory - the opinions of the world researchers". The four phases of the awareness of the risk and its evolution are separated in this subchapter. Hence, the first phase includes 13th-17th centuries.

During this period, it is worth mentioning the opinions on calculations and predictions of expected cases belonging to the Italian mathematician, philosopher and astrologer- Gerolamo Cardano (16th century), French mathematicians Blaise Pascal and Pierre de Fermat (17th Century), English Haberdasher John Grant (17th Century).

In this period, the probability theory was developed, which gave scientists new opportunities to determine the risk size. Although the probability theory has significantly changed the risk theory, we believe that it is impossible to accurately assess the risk.

One of the difficulties associated with using probability theory is that the probability calculations are based on data of events that have already occurred, and consequently, information on expected new cases in the future becomes less reliable, which makes it more difficult to make a decision.

The second stage of risk theory includes 1700-1900 years. During this period, it is worth mentioning the ideas belonging to the German philosopher Gottfried Wilhelm and the Swiss mathematician Jacob Burnley, the scientific papers belonging to Smith (the connection between risk and income level), American economist John Morris Clarke, German economist Johann Heinrich Von Thunen, who have consistently explained and extended theories of risk.

The third stage of development of the theory of risk involves the years 1900-1960. During this period, the concept of risk is already inseparable from the business. Dependence on risks has already arisen when analyzing the results of the uncertainties of the natural conditions and changes in external factors. Even increasing human knowledge will create new risks.

It was necessary to develop new approaches to risk management, their assessment and prediction, which would remain unsolved without mathematical tools.

This period includes the scientific works of American economist Joseph Schumpeter (Theory of Economic Development), Alfred Marshall and Arthur Cecil Pigou (Neoclassical theory), American economist Charles Nate (Separates Risk from immensity), John Maynard Keynes. The term of diversification appeared in this period that was offered in 1952 by American scholar Harry Markowitz. He defined the dispersion "variability" as an unprecedented measuring of risk and income.

The fourth stage of development of the theory of risk began in 1960 and continues to the present. During this period, German sociologists Niklaus Lumen, Ulrich Bak and English sociologist Anthony Giddens created social concepts according to which sociology answered the question “how society explains and corrects norms, unfavourable or unforeseen randomnesses, even if it is the dark side of life”.

In our opinion, classical and neoclassical theories do not exist in the form of a pure term, because they were transformed. The neoclassical theory with the addition of Keynes is considered as the most common theory is the economic risk.

First, Keynes gave us a classification of entrepreneurial risks, filled with a factor of satisfaction. The negative side of the neoclassical theory, Keynes considered an incomplete assessment of gamblers, which was often the case in entrepreneurial activity. In order to enrich the researches of economists, mathematicians and sociologists of that period, we have studied the psychological and philosophers' opinions on the risks, because in our view, it is possible to determine the risk, to manage it with mathematical regularity but each person perceives and uses these regularities in different ways, which certainly gives a different result.

Studies by psychologists are certainly reliable since they can directly assess people's psychological emotions, but according to these studies it can be said that the regularities formed by mathematicians are just regularity and cannot be used. However, in our opinion, we believe that mathematical regularities are really unsuitable for decision-making in the life of a particular person, but in the production sphere, where “benefits-risks” faced with each other, making decisions is unjustified without calculations subjectively, while the possibility of collection of information is possible at the production level.

Reviewed and studied works of world researchers on the essence of the risk and human dependence on risk management allows us to say that the risk is the greatest phenomenon in which scientific research lacks absolute certainty.

Prerequisites for the development of modern risk management as a science were reviewed and studied in the second subchapter of the thesis “Risk management as science on risk management”, and many researchers dedicated their work to this in the last century.

We studied the financial tasks and activities of economic journals on risk management, in which the scientific works of researchers (Bachelier, Markowitz, Beekmann, Luhmann, Fischer Black, Myron Scholes, Crouch, Field etc.) were actively published. They got a revolutionary character in financial science. Some of the authors became Nobel Prize winners.

The errors made by the supervision service related to the bankruptcy of Herstatt Bank are presented in this subchapter, which led to the emergence of payment risk, which is known as the risk of Herstatt Bank, which later led to the creation of the Basel Committee for Banking Supervision

The same period is associated with "RiskMetrics" - for market risk, "CreditMetrics" - the development of models for credit risk which led to the basis for a credit risk assessment model - risk assessment by their value (Value-at-Risk-VaR). Based on the study of the crisis phenomenon and the evolution of banking services in general, we have concluded that today the creation of risk management as a science and a tool for ensuring financial sustainability was also been caused by the invasion of advertising in the banking business of the 70s. This led to the internationalization of banking operations, resulting in an intensification of competition, interbank strategic planning, which included the need to develop effective risk management models.

Therefore, we consider that international mechanisms of risk management, despite its development and evolution phases, are imperfect and it requires new approaches to each new stage of development of financial markets.

In the third subchapter "Risks in Banking Business," we thoroughly studied the essence of the banking risk, as well as the views and opinions of Georgian researchers regarding the risks of banking operations. Based on an analysis of their opinions, we developed our vision of the concept of risk. We believe that anticipation of danger based on existing definitions of risk is detrimental to the object or subject of exposure. Hence, we create the concept of banking risk, which is as follows: “Bank risks are the materialization of events in the activities of subjects related to the banking business, which are reflected in the loss of financial resources of the bank.”

All options for the banking risks and the classification of factors affecting them were reviewed in this subchapter because we believe that such an approach will allow us to clearly define the area of each risk in the banking system, and the risk management methods will be effectively used. The classification of risks affecting banking activities allows each commercial bank to identify risks that affect most of the financial results of a bank. In our opinion, credit and operational risks are the “key risks” of banks, and, above all, their inefficient management leads to bank bankruptcies.

We believe that the past crisis of the financial system has become the reason for introducing and analyzing new models of their management of bank risks and factors affecting them in the constantly updated mode.

Currently, due to the specificity of the activities of the banking system (internationalization), it can not come under the frame of internal regulations of the financial system of individual countries. According to international standards, the expected risks are subject to standards under conditions integration into the international financial system of commercial banks of individual countries, because in this way, if one kind of risk disappears on the market, new ones will appear, especially the risks existing outside the control mechanism. That is why we believe that research is a continuous process in the direction of banking risk management.

Hence, the macroeconomic regulations of the banking system of developed countries, namely European (Basel) and American (Dodd-Frank) models were studied in the first subchapter "Macroeconomic Regulations in Banking Risks in Developed Countries" of the second chapter "Modern Mechanism of Risk Management Regulation"

We reviewed the analysis of the results obtained using stress-tests by the regulatory authority of the European banking system, their views on the possibilities of financial sustainability, stress-tests carried out by the banks of the European G10 group and the recommendations of the Basel Supervision Committee. We explained the stress-testing methodology and the practical results of using the models that show that their direct copying in other economic development countries will be a wrong result. The advantages and disadvantages of using single-factor and multi-factor stress testing methods are revealed.

The materials studied showed that in the extreme conditions, no model of testing can provide a perfect result in the management of risks and an example of this is many financial crises in recent years. As for the US regulations, although it approached Basel standards and recommendations, in terms of banking norms it is still unclear what is the common point of contact with the recommendations of Dodd-Frank and Basel.

We agree with the idea that it is necessary to amend the Dodd-Frank Act because all banks operating in the international market are subject to systemic risks. American banks cannot be a part of a closed circle, and globalization forces the regulatory institutions to adopt such laws that will replace the global financial system "under the regulation of one umbrella".

In the second subchapter, "Role of Banking Supervision in Risk Management System", we studied all regulatory documents or normative acts based on which commercial banks manage risk, as well as we studied “GRAPE” (General Risk Assessment Program). The risk-oriented supervision process of the National Bank of Georgia is based on it. It seems, the National Bank, within the framework of risk-based supervision, seeks to eliminate and reduce the potential risks that may cause problems for the healthy and safe functioning of the financial system, and of course, this will contribute to timely detection of bankruptcy risks and threats and the maximum reduction of negative effects caused by their realization on the stable functioning of the financial system

Given the fact that the commercial banks have been growing in the Georgian business space with increasing tendencies over the past decades, the specific weight of aggregated assets of the banking system is high with the GDP (Gross Domestic Product) (average

85.5%). In addition, two Georgian banks are already operating on the London Stock Exchange. A written textbook, such as GRAPE (General Risk Assessment Program), can be considered as a step forward in the effective management of existing or potential risks in the Georgian banking space. At the same time, the risk management infrastructure will be considered effective if it promotes to establish more healthy competition between banks, and unfortunately, the Georgian financial markets are experiencing its shortage today.

In the third subchapter of the second chapter- "Role of Internal Control and Audit in Risk Strategic Management", we draw attention to the issues of effective management of internal control, since the effective system of internal control presents an important component of banking risk management and security conditions. For the development of this system, the National Bank of Georgia imposes requirements on the activities of the internal audit of commercial banks, which are regulated by the relevant regulatory acts.

Based on this, we studied the main stages and types of internal control, the history of international practice of establishing a system of internal control in banks and the theoretical bases of its implementation. We paid special attention to the role of internal audit in remote banking services since today electronic banking is an integral part of our life, where there is a high probability of the formation of hardly identifiable and qualitatively evaluated specific risks. That's why we set up a sequence of audit processes. We prefer to evaluate the information system using the methods of an integrated system for the rapid elimination of operational risks, which takes into account the cooperation between the bank personnel and auditors. Both sides see the existing picture and make their contribution in common circumstance. An auditor should be able to determine the main objects of the risk, but a detailed assessment of daily operations exceeds his capabilities. But the bank's employees are well aware of the specificity of the current works but they can not imagine a general picture of the operation, so if the survey is conducted complexly, then the staff will assess the risk, while the auditors will be able to determine the qualitative parameters of the risks.

We consider that such approaches allow the auditor to properly assess and understand the risk structure in the field of remote services and to reveal high-risk objects. But it should be noted that the recommendations of internal auditors should serve to prevent the risk

foreseen in the future and rather than conclusions drawn from the established fact, which, unfortunately, often takes place in actual practice.

The first sub-chapter “Empirical analysis and management of financial and non-financial risks” of the third chapter "Risk Management Efficiency Factors and Their Influence on the Georgian Banking Business" mainly devoted to the regressive analysis of operational and credit risks. Based on the obtained results, we have identified the impact of credit and operational risks on the Bank's financial results and it is worked out the recommendations to improve the efficiency of risk management.

In order to create a credit risk assessment regression model, we have excluded internal and external factors that increase both financial and non-financial risk. The main part of the work is the selection of regressive equations of credit and operating risk and conducting empirical analysis. The main part of the study is the selection of regressive equations of credit and operational risk and conducting empirical analysis. When building the risk models, the Group of Internal Factors were taken into account, whose impact is high on the financial results of commercial banks. For the credit risk measurement it was taken The ratio of total liabilities with total assets (dependent Y variable);

Independent variables:

1. Total liability / own capital - X1; 2. X2-ROE; 3. X3-ROA.

The regressive model was built as follows:

$$Y = \beta_0 + \beta_1 \times X1 + \beta_2 \times X2 + \beta_3 \times X3 \quad (1)$$

The study analyzes the credit risk based on the 11 years data of the Bank of Georgia (data from the audit accounts of the commercial bank). Dependence on credit risk factors is linear. Independent variables are calculated for each year according to 2007-2017 data. The purpose of the analysis is to determine the impact of the variability of economic indicators on credit risk annually.

Table №1, the financial data of the Bank of Georgia

Years	liability	Own capital	Net profit	Capital	Assets
2007	2395620	557991	75642	557991	2953611
2008	2540058	718849	174000	718849	3258907
2009	2315012	598417	-98908	598417	2913429
2010	3311581	693341	82667	693341	4004922
2011	3852658	812603	135710	812603	4665261
2012	4594096	1061184	182745	1129786	5727018
2013	5279919	1244315	213800	1244315	6524234
2014	6076214	1461087	245984	1461087	7537301
2015	7778938	1224607	260722	1224607	9003545
2016	9499861	1265946	289094	1233144	10732932
2017	11138797	1481919	338907	1481919	12620716

Source: The National Bank of Georgia

Table № 2, the economic indicators

Credit Risk	0.811082	0.77942	0.7946	0.826878	0.825818	0.802179	0.809278	0.806152	0.863986	0.885113	0.88258
liability/ Own capital	4.293295	3.533507	3.86856	4.776266	4.741132	4.329217	4.243233	4.158694	6.352191	7.50416	7.51646
ROE	0.135561	0.242054	-0.16528	0.11923	0.167007	0.161752	0.171821	0.168357	0.212903	0.234437	0.22869
ROA	0.02561	0.053392	-0.03395	0.020641	0.029089	0.031909	0.03277	0.032636	0.028958	0.026935	0.02685

Source: The financial reporting of the commercial bank

Table №3, The correlation matrix of the data of the economic indicators has the look

	Row 1	Row 2	Row 3	Row 4
Row 1	1			
Row 2	**0.987466**	1		
Row 3	0.412063	0.428932	1	
Row 4	0.05781	0.074484	**0.932181**	1

Source: Regression analysis, Authors' calculations

From the matrix it is seen that between the credit risk and the "liability/own capital" index is a strong linear connection, there is also a strong linear connection between ROE and ROA, which is not surprising, as both rankings depend on the size of the profit. Based on the selected multiple regression model, the β-coefficients are calculated.

$$Credit\ risk = \beta_0 + \beta_1 \times \frac{liabilities}{own\ capital}. + \beta_2 \times ROE + \beta_3 \times ROA \quad (2)$$

	Coefficients
B0	*0.789332654*
B1	*0.002386698*
B2	*0.785352462*
B3	*-3.808866234*

$$\text{Credit risk} = 0.789332654 + 0.002386698 \frac{liabilities}{own\ capital} + 0.785352462\ \text{ROE} + -3.808866234\ \text{ROA} \quad (3)$$

The selected model evaluation using the F - test according to all the factors determining credit risk shows, that the model is selected correctly and the results received can predict the impact of the change of factors in future periods:

Table №4, the results of the regressive model and F-Test (2007-2017 Years)

Assists	*df*	*SS*	*MS*	*F*	*Significance F*	Multiple R	R Square
Regression	1	9,1113E+13	9,1113E+13	152,6756573	1,71497E-06		
Residual	8	4,7742E+12	5,96775E+11				
Total	9	9,58872E+13				0,974787287	0,950210255
Liabilities	*df*	*SS*	*MS*	*F*			
Regression	1	7,5052E+13	7,5052E+13	112,154162	5,52293E-06		
Residual	8	5,35349E+12	6,69186E+11				
Total	9	8,04055E+13				0,966136051	0,933418869
Own Capital	*df*	*SS*	*MS*	*F*			
Regression	1	8,07617E+11	8,07617E+11	40,45759494	0,000218113	0,913732565	0,834907201
Residual	8	1,59697E+11	19962065059				
Total	9	9,67314E+11					
Net Profit	*df*	*SS*	*MS*	*F*			
Regression	1	90084519770	90084519770	14,92447852	0,004787042	0,806863092	0,651028049

Residual	8	48288196948	6036024619		1,71497E-06		
Total	9	1,38373E+11					

Source: Authors' calculations

The results of the regressive analysis show that the determinant coefficient besides, the net profit ratio is placed at the 0,914-0,975 interval, there is also high the corrected determination coefficient 0,835-0,950. This data gives us a reason to assume that the model explains 95% of the data. Analyzing the financial reporting in the time gives the opportunity to review the relevant timelines. According to the table:

Table No.5, Change of Financial reporting Indexes in Time

	Year	*liabilities*	*Own capital*	*Net profit*	*Assets*
Year	1				
Liabilities	0.95399	1			
Own capital	0.930017	0.862117	1		
Net profit	0.806005	0.833208	0.857944	1	
Assets	0.964401	0.998433	0.888912	0.847365	1

Source: Regressive analysis, Authors' calculations

The matrix of correlation coefficients shows that the correlation coefficient of all values is greater than 0,83. Analyzing the financial reporting in the time gives the opportunity to review the relevant timelines.

Table №6, forecasting data of financial reporting indicators

The equation of time regression line of the time dependence	**prognosis**	
	The 2018 year	**The 2019 year**
liabilities=-560942.0848+953793.1515*i	10884575.73	11838368.88
Own capital=413111.0485+98940.88485*i	1600401.667	1699342.552
Net profit= -32316.61818+33044.41818*i	364216.4	397260.8182
Assets= -132053.1636+1050904.564*i	1594041.133	1691174.648

Source: Regressive analysis, Authors' calculations

Table №7, Comparison of forecast indicators (2017-2018-2019years)

Financial data	**2017**	**2018**	**%**	**2019**	**%**
liabilities	11 138 797	10 884 575.73 (-)	2,3	11 838 368.88 (+)	8,7
Own capital	1 481 919	1 600 401.667 (+)	7,9	1 699 342.552(+)	6,2
Net profit	228 907	364 216.4 (+)	59,1	397 260.8182 (+)	9,1
Assets	12 071 662	12 478 801.6(+)	3,4	13 529 706.16 (+)	8,4

liabilities/own capital	7,5165	6.801152 (-)	9,5	6.966441 (-)	2,4
ROE	0,2287	0.228486 (-)	0,09	0.234902 (+)	2,8
ROA	0,0269	0.029187 (+)	7,4	0.029362 (+)	0,7
Credit risk	0,8826	0.873838 (-)	0,99	0.878604 (+)	0,01

Source: Authors' calculations

The accuracy of the selection of the regression model is well illustrated in the prediction data. Compared to 2017, the liabilities decrease in 2018 and thus the volume of assets increases, so credit risk slightly reduces. The commercial bank must expect a steady increase in 2019, as both the credit risk determiners are increasing and at least the thousandths change of credit risk will not become a subject of discussion.

The changes shown in percentages do not accurately show evidence obtained by correlation, But in our work, we noted that correlation of credit risk and its factors can be considered a linear if the dependency schedule includes linear areas. Depending on the credit risk and the financial indicators, there is no accurate reflection of the direction of correlation in our view, ignoring the influence of these indicators. The value of the correlation coefficient and the set of sample parameters of the regression model assures us that the forecast parameters correspond to high probability events.

As we have noted, the operational risk hasn't less impact on the activities of the commercial bank, which is not a financial risk for scientists, but risk management methods consider it as a risk factor generating the credit risk. That's' why We have chosen a regressive model and calculations of correlation coefficients based on analysis and calculation of time changes it was calculated the forecast indicators.

$$\text{Risk Model of Operational Risk: Operation risk } = \boldsymbol{\beta_0} + \boldsymbol{\beta_1} \times \frac{\textit{total liabilities}}{\textit{own capital}}. + \boldsymbol{\beta_2} \times \frac{\textit{overdue credit}}{\textit{total credit}} + \boldsymbol{\beta_3} \times \frac{\textit{total operational expenses}}{\textit{total capital}} + \boldsymbol{\beta_4} \times \frac{\textit{credit liquidity}}{\textit{total depossits}} \quad (4)$$

Let's review changes the financial reporting liabilities in time, ie The time series of these time rows.

Table №8, the Correlation coefficient

	Time	*Liabilities*	*Own capital*	*Overdue credit*	*Total credit*	*Operating expenses*	*Assets*	*Net profit*	*Equity capital*
Time	1								
Liabilities	0.95399	1							
Own capital	0.930017	0.862117	1						
Overdue credit	0.667158	0.709929	0.460035	1					
Total credit	0.738687	0.859959	0.593814	0.841582	1				
Oper.expenses	0.807561	0.752576	0.678264	0.794675	0.716621	1			
Assets	0.963907	0.998593	0.887773	0.693019	0.843323	0.75461	1		
Net profit	0.806005	0.833208	0.857944	0.41728	0.659897	0.550706	0.84665	1	
Equity capital	0.939482	0.877761	0.997403	0.472294	0.624482	0.68897	0.901717	0.856887	1

Source: Regression analysis

The matrix of correlation coefficients shows that liabilities, own capital, assets and equity increases with the increase of time, as the corresponding correlation coefficients are the values close to 1. Also, using a linear regression model, we can review the operating expenses and net profit timelines, besides we can compare the periods of credits and overdue credits to a relatively weak lineup, as their correlation coefficients are close to 0,7.

TableN° 9, forecasting data of financial reporting indicators

The equation of time regression line of the time dependence	Prognosis	
	The 2018 year	The 2019 year
liabilities=-560942.0848+953793.1515*i	10884575.73	11838368.88
Own capital=413111.0485+98940.88485*i	1600401.667	1699342.552
Net profit = -32316.61818+33044.41818*i	364216.4	397260.8182
Assets = -147691.6424+1052727.976*i	12485044.07	13537772.04
Equity capital = 369260.7576+101789.5758*i	1590735.667	1692525.242

Overdue credit 231359.303+26372.8303*i	547833.2667	574206.097
Total credit =7535.818182+12668.58182*i	103098.4	110634.2182
Operating expenses = 418040.9152+42506.55152*1	928119.5	970626.1

Source: The results of the regressive analysis

Due to the weak correlation of overdue loans, total credits and operating expenses, connections using this model are explained as an overdue loan -54%; Total credit score -73%; Operating expenses -78%. The weak link does not necessarily mean excluding these factors from operating risk assessment, but when risk management is to rank factors it should be taken into consideration that the indicators which are explained with low percentage using this model are intended to enhance their attention in the expert evaluation process.

TableN°10, Results of Regression Model and F-Test (2007-2017) - Operational Risk

Regression Analysis	Operation risk					
Regression Statistics						
Multiple R	0.999426805					
R Square	0.998853939					
Adjusted R Square	0.99793709					
Standard Error	0.01435078					
Observations	10					
ANOVA						
	df	***SS***	***MS***	***F***	***Significance F***	
Regression	4	0.897460275	0.224365069	1089.442217	1.55501E-07	
Residual	5	0.001029725	0.000205945			
Total	9	0.89849				
	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*
Free member	**-0.129747421**	0.042727278	-3.036641381	0.028861353	-0.239581386	-0.019913456
Liability/Equity capital	**-0.000660436**	0.004576719	-0.144303413	0.890896921	-0.012425266	0.011104394

Overdue credits /Total credits	**-0.000897984**	0.002754255	-0.326035321	0.757601131	-0.007978022	0.006182053
Operating expenses/Assets	**0.423208923**	0.2016852	2.098363795	0.08993981	-0.09523939	0.941657236
Liquid assets /Deposits	**0.319935385**	0.008125503	39.37422715	1.99181E-07	0.299048116	0.340822654

Source: Regression analysis

As the chart shows the determination coefficient, as well as the corrected determination coefficient, is 0.99, which gives us the basis to estimate that 99% of the data are explained by the model and the model is correctly selected. Regressive model depending on the factors of operational is the following:

Operating Risk = -0.129747421 - 0.000660436 × liability/ Equity capital - 0.000897984 × Overdue credits/Total credits + 0.423208923 × Operation expenses /Assets + 0.319935385 × liquid assets/ deposits. (5)

Table №11, Comparison of forecast indicators (2017-2018-2019) - Operational risk

Financial data	**2017**	**2018**	**%**	**2019**	**%**
Liabilities	11 138 797	10 884 575.73 (-)	2,3	11 838 368.88 (+)	8,7
Own capital	1 481 919	1 600 401.667 (+)	7,9	1 699 342.552(+)	6,2
Overdue credits	551380	547833.3 (-)	0,7	574206.1(+)	4,8
Operating expenses	1028342	928119.5 (-)	9,7	970626.1(+)	4,5
Equity capital	1481919	1590736 (+)	7,3	1692525(+)	6,3
Net profit	228 907	364 216.4 (+)	59,1	397 260.8182 (+)	9,1
Assets	12 071 662	12 478 801.6(+)	3,4	13 529 706.16 (+)	8,4
Total credit score	171106	103098.4 (-)	39,7	110634.2182(+)	7,3
Liabilities /own capital	7,52	6.842479 (-)	9,0	6.994501 (+)	2,4
Overdue credits/Total credits	3,22	5.313693(+)	0,09	5.190131 (-)	2,8
Operating expenses/Assets	0,08	0.074339 (-)	7,4	0.071698 (-)	0,7
Liquid assets/Deposits	0,40	0.4	0	0.4	0
Operation Risk	0,03	**0.020397** (-)	0,99	**0.01929** (-)	0,01

Source: Authors' calculations

The correlation of risk factor of "Overdue Loan / Equity Capital" to the operation risk is negative, and accordingly, the increase in one is causing the reduction of the other. This regularity is fulfilled with regard to the 2019 forecast parameter. The negative correction has also been fixed with "overdue credit/jumper credit", and the normality of 2018 is to be fulfilled. As regressive analysis has been revealed that some percentage of the explanation given by this model is low (overdue credits; Total Credit and Operational expense). It is interesting what their influence on Operational Risk is: According to the values listed in the table there should be a correct regressive link between the listed indicators and the operational risks by 2018 and by 2019 still there is a disorder. However, the reasoning has been based on forecasting indicators and it is expected to change the coefficients calculated by other (external) factors.

Thus, the regressive analysis carried out by the country's system bank confirms that banking risks (credit and operational) are factors correlated with these risks. An analysis of the financial data, risk factors brought in the audit report of the commercial banks of the banking system of Georgia, expert assessments, research scholarship approach to risk management models was founded as a basis for compiling the regressive equations. High coefficient of the regression model determination confirmed the accuracy of the chosen model. The small inconsistencies between the size of the risk and current factors according to the correlation coefficient are conditioned by the intense interaction of activating other risks in the banking sector short intervals of time.

The research revealed the factors that effectively affect financial and non-financial risks. The overdue loan, despite the 54% recurrence in the model, shows that its impact on the operational risk is statistically significant, which has been confirmed in the forecasting indicators. Net Profit/Total assets which are directly Definitive Indicators of the operational risk are positively correlated with operational risk, but unequal growth of constituent components has reduced operational risk. We are justified to evaluate credit and operational risks with economic indicators.

We believe that the conclusion made with this method will give risk management to the right direction for the development of risk reduction measures because risk management is part of financial management, these economic indicators will be controlled by financial

management, and risk management is likely to give more time to detect and manage other risks.

In addition to the operational risk assessment with the regressive model, The risk management of the Bank should take into consideration the possibility of influence on the operating risk to the Bank's reputation, Human capital development, the company's intangible assets, which is a precondition for increasing customer base and successful performance of the Bank.

In the second sub-chapter “Determining and predicting correlation of macroeconomic indicators on credit risk caused by overdue credit,” we studied the financial data of system determining commercial banks of Georgia's banking system. It is calculated the percentage indicator of credit risk caused by overdue credit and the strength of the impact of macroeconomic factors using Pearson’s correlation coefficient.

According to General Risk Assessment Program "GRAPE," we have taken for research the impact of macroeconomic factors on the credit risks arising from overdue loans of three system determining commercial banks. The study of financial data of “**Liberty Bank**” found that 70% -80% (2007-2017) loan in the bank's credit portfolio was issued to individuals. Despite the fact that the “**Bank of Georgia**” maintains its leading position over the years and is in the first place with profitability, 50% of the loans issued to individuals. The financial data of “**TBC Bank**” shows that the volume of loans granted to individuals is increasing (Annexes No1-3).

The financial crisis caused by the unbalanced economic situation of the country (2008-2009) has caused military conflict to reduce the solvency of individuals, reflecting the loss of jobs. To determine the influence of credit risk for macroeconomic indicators we used Pearson's correlation coefficient, which is based on linear dependence between variables.

Of course, the ideal linear attitude is rarely between economic variables, but Pearson's criterion is applicable even in the case when there are separate areas of dependence between variables. Graphs of attitudes between variables are created to determine the validity of the method. (See Figure№1-6)

The algorithm of the method used is based on the deviation from the average size of the study variables:

$$R = \frac{\sum(dx \times dy)}{\sqrt{\sum dx^2 \times \sum dy^2}} \quad (1)$$

Where, R - is Pearson's correlation coefficient, dx and dy are the sizes of the deviation from the average size of variables. Pearson's correlation criterion is the method of parameter statistics that evaluates the density of the connection between variables and the statistical significance of the independent variable. To determine statistically significant it is calculated the criteria of correlation t_r, whose comparison with critical criteria $t_{crit.}$ (it is taken from the table) has given a chance to determine statistical value f the correlation coefficient:

$$t_r = \frac{R \times \sqrt{n-2}}{\sqrt{1-R^2}} \quad (2)$$

Where, n -is a selection number. Critical criteria were taken from the table according to the interval of reliability $(p \leq 0,05 \ and \ p \leq 0,01)$ and the degree of freedom $(t_{crit.})$.

If $tr > t_{crit.}$. it is confirmed, that the connection between the correlated variables is not accidental; and if $tr < t_{crit.}$ Then variables are independent of each other.

When defining the determination of dependence at the same time, it should be noted that the unemployment rate has not been realized and inflation is rising due to emerging factors outside the country, and their regressive multi-factor model could not be realized. The use of Pearson's correlation method requires the following conditions: the linear correlation between variables, the subordination of the normal distribution of economic processes. The authors guarantee that the change in the parameters is subject to the normal distribution law.

We made the condition, that the change of the analyzing parameters is subjected to the normal distribution law. The schedule of individual macroeconomic indicators and credit risk connection (chart1) is designed to determine linear dependence.

Pearson's correlation coefficients, the results obtained by calculating critical criteria are outlined in the table.

Y-overdue credit / volume of credit portfolio;

X1-macroeconomic indicator - unemployment;

X2 - macroeconomic indicator-GDP;

X3-macroeconomic index - inflation;

Table №1

The result of the calculation of Pearson's correlation

2007 – 2017yy

Bank of Georgia											
Macroeconomic variable	$\sum dx$	$\sum dy$	$\sum dx^2$	$\sum dy^2$	$\sum (dx * dy)$	Pearson's correlation coefficient			Pearson's correlation criteria		
						R_{x1}	R_{x2}	R_{x3}	t_{r1}	t_{r2}	t_{r3}
Unemployment	0,1	10,91	29,46	462,99	67,42	0.58			2,12		
GDP	0.01	10,91	80,55	462,99	57,1		0,30			0,94	
Inflation	0,01	10,91	155,89	462,99	22,43			0,08			0,24
TBC Bank											
Unemployment	0.01	38,42	29,92	4815,300	144,61	0,38			1,12		
GDP	0,01	38,42	80,54	4815,30	54,25		0.09			0,27	
Inflation	0,01	38,42	300,27	4815,30	492,1			0,4			1,3
Liberty Bank											
Unemployment	0,10	0,01	29,92	759,9	-12,41	-0.08			-0,24		
GDP	0,01	0,01	80,54	759,9	160,54		0,65			2,56	
Unemployment	0,01	0,01	155,89	759,9	167,41			0,49			1.68

Source: The financial data of commercial banks, National statistics office of Georgia, The author's calculation.

According to the results obtained, the price, strength and significance of the macroeconomic indicators on the credit risks arising from the overdue loan of individual banks are analyzed.

"Bank of Georgia"

R_{x1} =0.58 (unemployment) - Under the interval of the value of Pearson's correlation coefficient, the correlation between the credit risk caused by overdue and the unemployment rate in the country during 2007-2017 is average.

For defining the importance of correlation it is calculated Pearson's criteria and compared with critical criteria $t_{r1} = 2,12$, $t_{rcritic} = 0,60$, when $p \leq 0,05$ and $t_{rcritic} = 0,$

74, when $p \leq 0,01$. i.e $t_{r1} = 2,12 > t_{critic}$. As we see in spite of low correlation, unemployment is statistically significant for the credit risk assessment caused by overdue.

R_{x1}=0.30 (GDP), t_{r2} =0,94, $t_{rcritic}$= 0,60, when $p \leq 0,05$ and $t_{rcritic}$= **0,74,** when $p \leq 0,01$. According to Critical criteria term $tr2 > t_{crit}$. Which means, that the received correlation is true in both case with reliability 95%-99%.

R_{x1}=0.08 (correlation with inflation rate) – is weak. Correlation criteria **t_{r3}=0,24, t_{critic}= 0,60,** and **t_{critic}= 0,74,** As we see Pearson's correlation criteria is lower than Critical criteria. In this case, following from the regularity of the method credit risk and inflation are independent variables, which does not math with reality.

"TBC Bank"

R_{x2} =0.58 (unemployment)

$t_{r2} = 1,12$, $t_{rcritic}$= 0,60, when, $p \leq 0,05$ and $t_{rcritic}$= 0,74, when , $p \leq 0,01$.

i.e. $t_{r2} = 1,12 > t_{critic}$.

R_{x2} = 0.09 (GDP), t_{r2} = 0,27, in this case $t_{r2} = 1,12 > t_{critic}$. The strength of correlation or the price of dpendnce with unemployment between variables is high.

R_{x2} = 0,4 (inflation), t_{r2} = 1,3> t_{critic}.

"Liberty Bank"

The situation has changed directly to Liberty Bank:

R_{x3} = -0.08 (unemployment), t_{r1} = - 0,24, According to obtained result the negative dependence is between variables I.e. The reduce of unemployment will cause the growth of credit risks arising from overdue loans. According to economic regulation Reduction of Unemployment If it is caused by employment growth and not the migration, population revenues will be positively reflected as a result of which loan solvency increases and the bank's credit risk is reduced.

R_{x3} = 0,65 (GDP), t_{r3} = 2,56, in this case $t_{r2} = 2,56 > t_{critic}$. Statistically strength of significant is great.

R_{x3} = 0,49 (inflation), t_{r2} = 1,68 > t_{critic}.

The influence of each macroeconomic indicators at the credit risk caused by overdue loan allowed to make the following conclusion:

"Bank of Georgia's" profits have been characterized by increasing dynamics over the years reviewed and the first place in this setting is the ratio of overdue loan to credit portfolio. The highest 22-24% was fixed in 2008-2009, on which influences have been made by famous events. Pearson's coefficient is similar to the unemployment and GDP influence power, but the high rate of inflation indicates that: Credit risk and inflation are independent variables.

Pearson's coefficient and criteria in relation to "**TBC Bank** " describe the dependence of the risk at macroeconomic indicators well, in particular, according to the results of the "**TBC Bank's "** credit risk are sensitive to unemployment.

Among the considered banks, "**Liberty Bank**" did not distinguish high profits, 70-80% of the loan to individuals with the unemployment correlation coefficient should be the highest, although as mentioned above the negative correlation is high. The results obtained in the survey are partially absent from an acceptable connection.

The weakest correlation of the most sensitive macroeconomic indicators is the question of how the impact of the inflation risk effects. In the reports of monetary policy of the National Bank of Georgia (2007-2017), we are reading that monetary policy measure is aimed at reducing banking risks, increasing the activity of banks and customers, but it is noted that refinancing is used as a basic instrument. Refinancing protects a commercial bank from increasing credit risk in the short term, but in the medium term, along with other factors, reduces population solvency and the bank is returned like a boomerang in the form of overdue credits.

The formation of monetary policy is based on the forecasted inflation rate, but Georgia is a small and open economy country, on which the shock processes developed in partner countries reflect and the factual result deviates from planned. According to the correlation coefficients calculated in the work, GDP has the most impact on credit risks, followed by unemployment and inflation, but from the contrast of annual data presented in the table shows that in one case credit risk corresponds the highest GDP, in another case the low indicator of GDP.

In December 2016, Overdue loans Increased by 36, 6 million GEL in the Georgian banking system, 41.5% of these are denominated in national currency, which indicates to the excess of dollarization. According to 2007-2017 during this period inflation growth rate is

the lowest (1,8%). It is also evident that periodically the impact of inflation is weak on credit risk and due to overdue credit risk is caused by other factors. In particular, increased unemployment, exchange rate, poverty level, inequality of incomes, wrong assessment of risk and others, which is in line with the calculated correlation indicator (Bank of Georgia - 0,08), this is explained by the fact that the National Bank of Georgia's monetary policy was based on the wrong forecasted index, and on the other, the reason was shocking processes.

The correlation values provided a possibility to draw the equation of the linear function between variables, which can explain the impact of shock processes on the research index.

$$\boxed{Y = \beta 0 + \beta 1 \times X1} \quad (3)$$

1. *Credit risk arising from the Overdue loan - Y;*

2. *Macroeconomic indicator - x;*

3. $Pearson's\ Correlation\ Coeficient - \beta 1$;

$$\beta 0 = Y - \beta 1 \times X1 \quad (4)$$

By solving this equation, it is possible to determine the impacts of shock indicators of macroeconomic factors on the research indicator.

Let us consider the shocking scenario on the example of “Bank of Georgia”

I-unemployment, $\beta 0 = 10{,}91 - 0{,}58 \times 16{,}27 = 1{,}48$

II-GDP, $\beta 0 = Y - \beta 1 \times X1 = 10{,}91 - 0{,}30 * 5{,}19 = 9.35$

III- inflation, $\beta 0 = 10{,}91 - 0{,}08 \times 4{,}37 = 10{,}56$

Suppose a GDP reduction is expected by 7%, based on correlation connection and the reliability of the credibility the impact of overdue loans at credit risk will be:

$$\boxed{Y = \beta 0 + \beta 1 \times x1 = 9{,}35 + 0{,}3 * (-7{,}0) = 7{,}25}$$

I.e. credit risk will be reduced by 7, 25%. Is this situation for a commercial bank acceptable and what factors cause credit risk reduction? The GDP reduction itself means the weakening of economic activity, so the bank cannot get the credit and the danger of credit risk lessens.

Inflation Increase Despite the weak correlation, the cause of which is explained above, should be displayed with the credit risk increase. Suppose that the stress test scenario was designed to increase the risk of rising inflation by 15% for the purpose of protection against expected risks, then

$$\boxed{Y = \beta 0 + \beta 1 \times X2 = 10{,}56 + 0{,}08 * 15{,}0 = 9{,}36}$$

As we can see, with a 15% increase in inflation, credit risk is expected to increase by 9, 36%. In such cases, NBG (National Bank of Georgia) is conducting a change in the monetary policy rate, namely through a refinancing loan, the banking system provides short term (7 days) liquidity on the auction and bail basis, thus partially ensuring to protect the banking system from the risk.

The actions aimed at shocks "threaten" NBG (National Bank of Georgia) and a separate commercial bank, which allows the possibility to plan actions to reacting at expected events. As the calculations show, the average correlation is at the unemployment level:

$$Y = \beta 0 + \beta 1 \times X2 = 1{,}48 + 0{,}4 * 8{,}0 = 4{,}68$$

I.e. If the unemployment rate is increased by 8%, credit risk will increase by about 4, 68%. This is also natural since the unemployment growth reduces the income of the population and therefore the solvency to the credit falls. The correlation with unemployment is not a valid indicator between these two variables.

The unemployment rate in Georgia has been reduced by the number of self-employed people, most of which are low income or produces family firm only for family storage. In Georgia, over the last two years, Liberalization of credit issuance has played a significant role in the growth of overdue loans, especially in those commercial banks whose credit portfolio was mainly created by loans from individuals.

The calculations carried out by us have identified trends of problem research in the methods of efficient management of bank risk management, which will enable commercial banks step by step to analyze risks identified by the expert assessment with the quantitative method and to develop effective measures.

Calculations carried out based on the statistical information studied provided the possibility to formulate the following proposals:

- Banks to tighten credit policies and to increase customer business risk assessment by shocks scenarios in order to minimize credit risk, which will reduce sectoral risks in credit risks.

- Calculations for the improvement of correlation credibility can be carried out based on real data, quantitative research within the scope of the risk of the most "sensitive" factor in the risk-generating sphere;
- Estimate with Pearson's method the connection of macroeconomic indicators with credit risk caused by overdue loans to determine the quality of credit risk and shift preventive measures during shock change.

Conclusions and Suggestions

Research conducted enables us to provide a number of conclusions and formulate several recommendations, including:

- ✓ As a result of the study of researches and works on risks revealed that the basis of risks is a danger and where there is no alternative, the risk should not be discussed. However, we think that despite the fact that non-alternative conditions risk still has a place, moreover, in this case, its quality is high. An example of this is the case of the specific bank when the bank is oriented on a specific field or banking service, it can't stand for any significant risk and non-alternatively addresses to other mechanisms for its management.
- ✓ Despite the explanation of the essence of risk comes from the ancient Greek science, including classical and neoclassical sciences, there is no the united approach about the essence of the risk, the reason may be the fact that despite many research, the fundamental research has not been conducted yet. But we believe that Economic risk This is a cost-effective expression of possible losses.
- ✓ Therefore, the risk in the existing explanations is the probability of danger, which harms the subject of object of the risk impact, founding a bank risk concept In our interpretation, which is the following: "Banking risks are the materialization of the developed events in the activities of the subjects related to Banking Business, Reflected in Bank financial losses. "
- ✓ As for banking risk management, by our explanation it is "Bank Risk Management - This is complex management of banking risks, which includes the effective system of identification, analysis, evaluation, regulation and control of risks."
- ✓ Classification of risks associated with banking activities allows each commercial bank to identify the risks most affecting the financial results of the bank. In our opinion, credit and operational risk are "key risks" of banks and operating risk is generated in credit risk. In the first place, their inefficient management leads to bank bankruptcy.
- ✓ We assume that the methodology for regulating bank risks in conformity with Basel's recommendations and forecasting and regulating systemic risks within a country is not the ultimate verdict for achieving the performance activity of bank credit field. As the country is involved in the process of globalization, as it is a danger to not only for its country but also for the formation of the systemic risks of other countries.

- ✓ We believe that risk management, as another management process, must be explicitly regulated. Organizational structures, role, procedures, instruments, models should forme harmonized mechanisms, but it is not enough to adapt to the formal risk management system for having a stable risk management system and its constantly changing internal and external factors, as in most cases the life practice and situation ahead Even the largest and detailed regulations. That is why one of the ways to eradicate deficiencies and vulnerabilities in regulations is knowledge, values, principles and beliefs in risk management. That is exactly the combination of these components (knowledge, values, principles and beliefs), their entirety has received the name of Risk Culture in the international practice.

Therefore, whatever the risk management tools are perfect, it can not be effective if the organization does not have a risk management culture developed. Accordingly, the results of our survey conducted in banks showed that approximately 30-40% of staff do not know the basic concepts and criteria that demonstrate the risk-culture development of the corporation.

In order to enhance risk culture in the Georgian commercial banks, as well as to approach to the international standards of ethics and banking professionals, we consider it appropriate to develop such mechanism of management with the existing principles of ethics and the Code of Professional Behavior Standards, which will promote to perfect above-mentioned questions.

In System Determining commercial banks the obtained correlation from the statistical analysis of macroeconomic impact at credit risk is out of touch with reality in some case, in our opinion the reason is that the unemployment rate in Georgia has been reduced by the number of self-employed people, most of which are low income or produces family firm only for family storage. In Georgia over the last two years Liberalization of credit issuance has played a significant role in the growth of overdue loans, especially in those commercial banks whose credit portfolio was mainly created by loans from individuals, and the inflation impact criterion, in particular with regard to the credit risk of the Bank of Georgia, has been achieved with monetary policy measures, in particular refinancing. Refinancing protects a commercial bank from increasing credit risk in the short term, but in the medium term, along with other factors, reduces population solvency and the bank is returned like a boomerang in the form of overdue credits.

According to the research, GDP(Gross Domestic Product) has the most impact on credit risks, followed by unemployment and inflation, but from the contrast of annual data presented in the table shows that in one case credit risk corresponds the highest GDP(Gross Domestic Product), in another case the low indicator of GDP(Gross Domestic Product).

Macroeconomic factors are usually changed independently from commercial banks as a result of economic processes developed both in the country and outside the country. Therefore, the commercial bank should be prepared for macroeconomic shocks.

In the case of solving the linear function of the variables in the study, it has been established that the credit risk increases in the case of shock changes of macroeconomic indicators. Shocking scenario research has shown a difference in the correlation with respect to inflation. In particular, according to the critical criteria of inflation, credit risk and inflation are inter independent variables, and in the case of a shocking scenario with 15% inflation growth, the credit risk increases by 9,36%.

Thus, the weak linkage with macroeconomic indicators does not necessarily mean a low level of their influence. Based on the results obtained, we conclude that, for quality improvement of Correlation authenticity, the calculation should be carried out based on the real data, within the scope, the quantitative research should be carried out at the impact of the most “sensitive” factor in Risk-shaped spiral.

To develop the preventive measures to minimize the credit risk caused by overdue loans during the "shock" change of macroeconomic indicators. Specific proposals should be based on not only the credit risk size of the commercial bank but also based on the analysis of the financial position of all the partners related to the bank's activities, considering the forecast parameters in their activity.

- ✓ The regressive analysis was also conducted for the study of credit and operational risks. The results of the analysis indicate that the risk factors (credit and operating) are correlated with given risks. Analyzing the financial data of the commercial banks of the banking system of Georgia, the risk factors presented in the Audit Report, experts' assessments, approaches to researchers for risk management models were taken as a basis for drawing up the regressive equations.

The high coefficient of the determination of the regressive model confirms the correctness of the selected models. The small inconsistencies between the risk-sized and

current factors according to correlation coefficient are motivated by the intense interaction of time by activating other risks in the banking sector.

The research revealed the factors that effectively affect financial and non-financial risks. The overdue loan, despite the regression analysis with 54% is explained in the model, its impact on the operational risk is statistically significant, which has been confirmed in the forecasting indicators. Direct defining indicators of operational risk - net profit/total assets has a positive correlation with operational risk, but unequal growth of components has reduced operational risk. We consider the credit and operational risks to be estimated by economic indicators.

Assuming that the conclusion made by this method will give Risk Management the right direction to develop risk reduction measures because risk management is part of financial management and in this case the economic indicators will be controlled by financial management and risk management will have an opportunity to give more time to exposing and managing other types of risks.

In addition to the operational risk assessment of the bank, risk management of the bank should take into consideration the possibilities of impact of operational risk on the bank's reputation, human capital development, the company's intangible assets, which is a precondition for the bank's customer base growth and success.

- ✓ Financial institutions are constantly searching for innovations and offering the market more innovative products that can be accompanied by unexpected risks for the market,

Hence, we believe that the international mechanism of risk management, despite its development and evolution phases, cannot be perfectly complete. It requires new approaches to each new stage of development of financial markets.

The approbation of the work. The main conclusions, sentences and recommendations are given in the Author's (T. Ghoghoberidze) articles and in the materials of scientific-partial conferences:

1. T. Gogoberidze, L. Oniani "The Modern Aspects of Management of Selling Banking Products". International Scientific Scientific-Practical Conference "Economic, Legal and Social Problems of Modern Development" (EISSN 2346-8203), Kutaisi, 2015

2. T. Gogoberidze, A.Tsintsadze „The Role of Business Social Responsibility in The Social Risks Management" International Scientific Refereed and Reviewed journal "Innovative Economics and Management " (ISSN 2449-2604), pp.220-224, Batumi, 2016
3. T. Gogoberidze, L. Oniani "The Modern Method of Banking Risk Assesment" International Scientific Scientific-Practical Conference "Economic, Legal and Social Problems of Modern Development" (EISSN 2346-8203), Kutaisi, 2017
4. T. Gogoberidze, L.Oniani "Risk Culture at the Stage of Economic Development" International Scientific Refereed and Reviewed journal "Innovative Economics and Management " (ISSN 2449-2418), pp.158-166, Batumi, 2018
5. T. Gogoberidze, L.Oniani, A.Tsintsadze „Determining and predicting correlation of macroeconomic indicators on credit risk caused by overdue credit" http://dx.doi.org/10.21511/bbs.13(3).2018.11 journal "Banks and Bank Systems" (ISSN:1991-7074), pp. 114-119, Ukraine, 2018
6. T. Gogoberidze, L.oniani, A. Tsintsadze, V.Glonti „Empirical analysis of financial and non-financial risks of the commercial bank „ journal "European Journal of Sustainable Development", (ISSN 2239-5938), Rome, 2019

Reference

1. Aver Boštjan, "An Empirical Analysis of Credit Risk Factors of the Slovenian Banking System", Managing Global Transitions, 2008, vol. 6, issue 3,
2. Basel Committee on Banking Supervision, "Basel III Monitoring Report", Bank for International Settlements, March, 2018
3. Beekmann, Martin J.,"Von Thunen Revisitied: A Neoclassical Land Use Model," Swedish journal of Econommics, March, 1972
4. Beverly Hirtle J., "What Market Risk Capital Reporting Tells Us about Bank Risk" 2003, https://www.newyorkfed.org/research/epr/03v09n3/0309hirt/0309hirt.html
5. Berkowitz, J. "A Coherent Framework for Stress-Testing", Federal Reserve Board, 1999

6. Bolthausen Erwin and Mario V. W¨uthrich, “Bernoulli’s Law of Large Numbers” Astin Bulletin 43(2), 73-79, 2013
7. Carlson Mark, “A Brief History of the 1987 Stock Market Crash with a Discussion of the Federal Reserve Response”, “Finance and Economics Discussion Series Divisions of Research & Statistics and Monetary Affairs Federal Reserve Board”,2006
8. Cucinelli Doriana, Maria Luisa Di Battista, Malvina Marchese, Laura Nieri „Credit Risk in European Banks: Does Effective Risk Management Matter?“, 2016 file:///D:/Documents/Downloads/285_credit-risk-in-european-banks-does-effective-risk-ma%20(3).pdf-2016
9. Dowd Kevin, ”The 2017 Stress Tests: Are us banks really in god shape?”, August,2017
10. Eisenbach Thomas M. , Lucca David O., Townsend and Robert M.,” The Economics of Bank Supervision”, Federal Reserve Bank of New York Staff Reports, no. 769 March 2016; revised January 2017
11. *Eur*opean banking authority, “2016 EU-Wide Stress Test”, “Methodological Note Methodological Note” 24 February 2016
12. European banking authority, “2018 EU-Wide Stress Test”, “Methodological Note Methodological Note” 07 June, 2017
13. Field, P. “Introduction to Modern Risk Management, A History, London: Incisive RWG”, Haymarket House, 2003
14. Gorroochurn Prakash, „Some Laws and Problems of Classical Probability and How Cardano Anticipated Them“, 2012
15. Graunt John, “Natural and Political Observations Mentioned in a Fallowing Index, and Made Upon the Bills of Mortality”, From Journal of the Institute of Actuaries 90. (1964 (1662)
16. Gustafsson Martin and Morck Erik,”Black-Scholes Option Pricing Formula-An Empirical Study”, School of Business, Economics and Law, Goteborg University, 2008
17. Hall Anders,” The Foundation of Probability Theory by Pascal and Fermat in 1654”, Wiley Series in Probability and Statistics, 2005
18. Hanley M. “Integrated Risk Management”, London, LLP, 2000
19. Harper David, “Understanding Liquidity Risk”, 2017 http://www.investopedia.com/articles/trading/11/understanding-liquidity-risk.asp

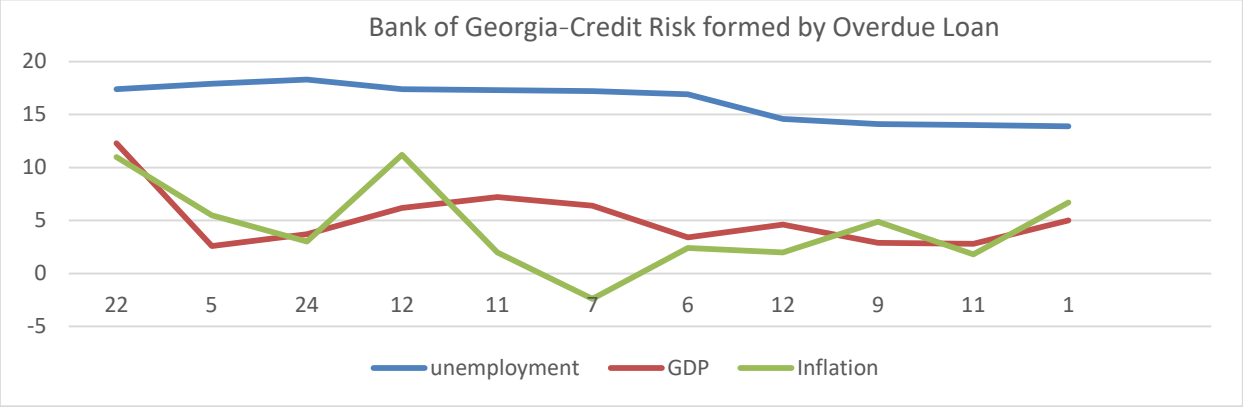
20. Harry Markowitz," Portfolio Selection", the Journal of Finance, Vol. 7, No. 1. Mar., 1952
21. Homer, "The Odyssey", Part 1-3, Adventure, monsters,temptresses,and a whole lot of wine-dark Aegean, "episode 12: Kleos and Nostos", 8-th century http://literatureandhistory.com/index.php/episode-012-kleos-and-nostos
22. Ivan Moscati,"History of Neoclassical Consumer Theory: A Neo-Kantian Epistemological Perspective", La matematica nella storia dellíeconomia. Primo Workshop, Torino 16-17 ottobre, 2003
23. Jakubik Petr, „Macroeconomic Credit Risk Model," ResearchGate",2006
24. Jorion Philippe, "Risk Management Lessons from Long-Term Capital Management", European Financial Management, September, 2000
25. Jose A. "Lopez, what is operational risk?", 2002, http://www.frbsf.org/economic-research/publications/economic-letter/2002/january/what-is-operational-risk/
26. Kahneman Daniel and Tversky Amos, „Daniel Kahneman and Amos Tversky", The Econometric Society, Mar., 1979
27. Knight Frank H.,"Risk, Uncertainty and Profit", Reprints of Economic Classics, Augustus M. Kelley, Bookseller New York, I964
28. Kuprianov Anatoli,"Over-The-Counter Interest Rate Derivatives", Federal Reserve Bank of Richmond Richmond, Virginia, 1998
29. *Kushmeider Rose Marie, The U.S. Federal Financial Regulatory System: Restructuring Federal Bank Regulation, FDIC Banking Review, Vol. 17, No. 4, 2005, 31 Pages Posted: 17 Feb 2006*
30. Laino Antonella, "Innovation and monopoly:The position of Schumpeter", 2011
31. Laurence Laughlin J. „John Stuart Mill Abridged, with Critical, Bibliographical, and Explanatory Notes, and a Sketch of the History of Political Economy „, New York: D. Appleton And Company, 1885
32. Luhmann Niklas "Risk: A Sociological Theory", N.Y..: Walter de Gruyter, Berlin, 1993
33. Milevska-Kostova Neda, Dunn William N.,"Delphi Analysis", Hans Jacobs Publishing Company,2010

34. Millo Yuval and Mackenzie Donald,"Building a Boundary Object: The Evolution of Financial Risk Management", the Centre for Analysis of Risk and Regulation at the London School of Economics and Political Science,2007
35. Mishkin Frederic S.,"How Big a Problem is too big to fail?" "National Bureau of Economic Research", December, 2005
36. Morgan J. P. & Co.," CreditMetrix", 1997
37. Musau Salome, Muathe Stephen and Mwangi Lucy,"Financial Inclusion, GDP and Credit Risk of Commercial Banks in Kenya", "International Journal of Economics and Finance"Vol. 10, No. 3; Published by Canadian Center of Science and Education ,2018
38. Neumann John Yon and Morgenstern Oskar,"Theory of Games and Economic Behavoir", Princeton University Press, 1953
39. Papadopoulos George, Papadopoulos Savac and Sager Thomas "credit risk stress testing for EU 15 banks: a model combination approach", "Bank of Greece, Economic Analysis and Research Department" – Special Studies Division21, January, 2016
40. Perold Andre F.,"The Capital Asset Pricing Model", Journal of Economic Perspectives, Volume 18, Number 3, 2004
41. Rouse Richard H. "Manuscripts belonging to Richard de Fournival" Année 1974 3-1973
42. Saeed MS* and Zahid N, "The Impact of Credit Risk on Profitability of the Commercial Banks", 2006
43. Saunders A. "Financial Institutions Management", A Modern Perspective, Irwin/McGraw-Hill, 2000
44. Svensson Roger, "Growth through Research and Development - what does the research literature say?", Vinnova- Swedish Governmental Agency for Innovation Systems / Verket för Innovations system, December, 2008
45. Weiss, M.A., Qiu, J."The Journal of Risk and Insurance: A 75-Year Historical Perspective, Journal of Risk and Insurance 75 (2), 2008
46. Zhu Wenzhong and Rui Shen, "The Historical Dimension of the US Dodd-Frank Bill and its Implications to the Financial Governance Reform in Emerging Markets", Published Scientific Research, 2013

47. http://www.bankdelo.ru/
48. https://www.investopedia.com/
49. http://www.bankofgeorgia.ge/
50. http://www.tbcbank.ge/web/ka
51. https://www.libertybank.ge/
52. http://www.basisbank.ge/
53. https://www.hsbc.com
54. https://www.bis.org/
55. https://www.frbatlanta.org/?panel=1
56. https://www.garp.org/#!/home
57. https://www.history.com/topics/dodd-frank-act

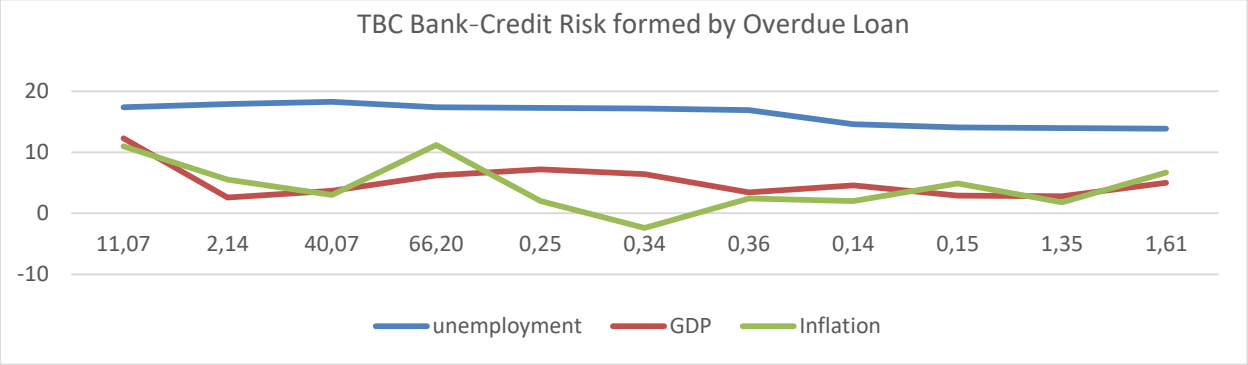
Appendix

Schedule №1



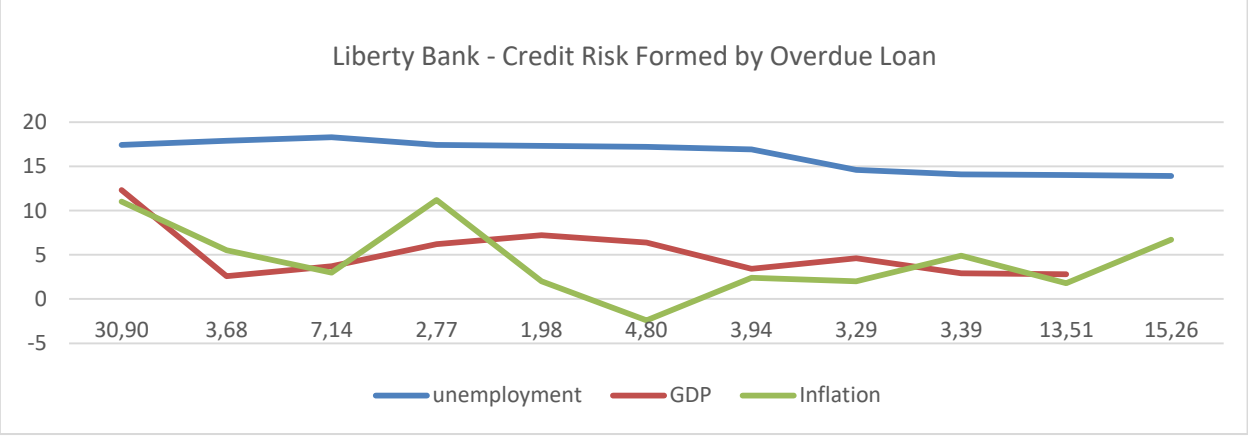
Source: National Statistics Office of Georgia; Financial Data of Commercial Banks with Author's Calculations.

Schedule №2



Source: National Statistics Office of Georgia; Financial Data of Commercial Banks with Author's Calculations.

Schedule №3



Source: National Statistics Office of Georgia; Financial Data of Commercial Banks with Author's Calculations.