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Evaluation of strategic risks of credit processes in the banking system of Iran

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Abstract

In recent years, banks and financial institutions have always been at the forefront of identifying and assessing the operational risk of banking products and activities, processes and banking systems for effective risk management as an essential element of the Bank's risk management program of Banks. So that banks were able to reduce or even annihilate the potential risks of their banking activities. Therefore, the main objective of this study is to evaluate the strategic risks of credit processes in the banking system of Iran. The research method is also descriptive-applied and statistical population includes experts of banking and risk management. Data collection was performed by laboratory and field (questionnaire distribution) methods. In order to analyze the data, we used statistical tests (descriptive and inferential), factor analysis and multiple regression analysis. Therefore, the findings of this study illustrate that strategic risks of credit processes have a major effect on the performance of management of credit risks and operational risks in the banking system of Iran.

Keywords: Operational risk, Credit processes, Banking system of Iran.
2010 MSC: 91G40.

1. Introduction

Accounting risks have been one of the most prominent and hot issues in the world (Wahlstrom, Gunnar, 2006, p494). However, one of the most important risks in financial accounting is the operational risks or In particular risks of credit processes in banking systems. In fact, credit risk is the oldest and the biggest risk in the area of banking businesses, in a way that most of the literature in banking risk management is related to credit risk (Arunkumar, Rekha and Kotreshwar, 2006). Because banks and financial institutions, with regard to their invest and finance activities such as lending to various

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firms, are particularly vulnerable to risk taking on the effects of their repayment of principal and interest on their loans. In fact, one of the most important risks in the comprehensive risk management system is the operational risk. However, based on the definition of the Basel Committee on Banking Supervision (BCBS), the operational risk itself includes different levels such as trading risk, process risk, system risk, and manpower risk. Therefore, Basel Committee on Banking Supervision defines the operational risk as "probability of financial loss due to insufficiency of processes and methods, privates and internal systems or the events occurring outside of credit institution" (Basel Committee on Banking Supervision, 2001, Guidelines of central bank of I.R.I, provisional notices No.1172, Bureau of Banking Studies and Regulation). It should be noted that evolution and development of provisions of the Basel Committee had been carried out by focusing on the credit risk (Meulbroek, 2002). Nevertheless, credit risk has been examined from various perspective in different studies. Credit risk has been examined from measures and policies related to credit risk management in a number of studies including, Stulz (1984), Smith, Froot, Sharfstein and Stein (1993), Anbar (2005), Horstedt and Linjamaa (2015). They have concluded that there is a need for active management of credit risk due to several reasons, such as individual benefit of the manager, the nonlinear tax structure, and financial costs of bankruptcy and lack of competitive markets (Saghafi et al., 2017). There are also a number of studies that use various methods like, neural network (Atiya, 2001), genetic algorithm (Chen and Huang, 2003), integration of audit analysis and neural network (Yu, Wang and Lai, 2008), data envelopment analysis (Emel et al., 2003, Min, Lee and Young-Chan, 2008), support vector machine (Yu, 2010), decision tree (Yanping et al., 2012), Integration of decision tree and neural network (Kabari and Nwachukwu, 2013), logistic regression , The KMV structural model (Khansari and Shamsfallah, 2010), bee colony oriented neural network (Fallahpour,Raei and Hendijanizadeh, 2013), application of survival analysis theory (Karani and Aghaeipour, 2014) , Multi-criteria hybrid algorithm for neuro-fuzzy ant colony neural network (Horri and Mahdavi, 2015), Regression and decision tree (Mirghafouri, 2015), Support vector machine and hybrid genetic algorithm (Kord, Zaferani and Emamdoust, 2016) in order to examine the credit risk that are published in national and International journals. In addition there are some studies that are focusing on the evaluation of credit risk management including, Hayali et al., (2012), Nawaz and Munir (2012), Abdelrahim, (2013), Singh, (2013), Aydu and Ayumi, (2014), Ogboi and Unuafe, (2013), Adossi et al, Kurawa and Garba, (2014), Li and Zou, (2014), y, Khoshsima and Shahikitash, (2012) and Saghafi et al., (2017). In this regard, it seems that in order to identify and describe the new method in credit risk from various measures and policies, evaluation of credit risk and performance of management of credit risk, there is a need to pay more attention to credit risk in credit processes of the banking system. In this study, we examined strategic risks in the banking system of Iran as one of the major dimension of the credit risk in the credit processes of the banking system. So that our attempt is to describe the strategic risks in the banking system of Iran with consideration of the currency market. Accordingly, the main objective of this study is the evaluation and examination of strategic risks in the banking system of Iran. The next topics of this study are as follows, the second section includes theoretical foundations and literature review, in the second section we describe the statistical population and employed analytical methods. Also, in fourth section analyses and findings of descriptive and inferential statistics have been presented in forms of tables and experimental patterns and in the end, there are conclusions and also suggestions for future studies.

2. Theoretical foundation

One of the most important tools to acquire economic development is an efficient banking system. Banks play an important role in economic and their situation can affect other parts of the economy.

By organizing receipts and payments they can facilitate commerce and commercial exchanges that can lead to economic flourishing. However, the banking system has been facing some obstacles due to fluctuations in the rate of interest, inflation, currency and no refund of loan. Such Obstacles led to a social crisis in some countries. Therefore, risk management of financial institutions is in consideration of authorities of the regulatory and financial system (Arani, 2001). As a consequence, if this issue, it is important to realize how banking risk can affect the banking system with the aim of management of such risk and their undesirable
outcomes (Ahmadi et al.,2016). However, today the banking system in the world has been able to absorb the potential and actual shocks of the economy by creating appropriate methods and creating a proper change in the cost of capital. In this regard, one of the most important methods that financial and the banking system benefit from, which has been under consideration recently, is the risk management method. In fact, in the real world of business, risks are a hot topic for most business conferences (Danielsson et al., 2002). Risks have a variety of types in a banking world, but one of the most important risks that emerged in the banking system, which attracted the attention of the world at the end of the twentieth century, is an operational risk (Fengge, Hongmei and Luan Jiaqi, 2012).Theoretical foundations and empirical evidence in this regard have shown that, given that operating losses of commercial firms may result in more severe credit losses, it is not usually taken into account when modeling and evaluating operational risk (Eckert and Gatzert, 2017). Therefore, identifying and evaluating the operational risk of a trading company, such as assessing credit losses, can fill this gap. The Basel Committee defines operational risk as "The risk of losses due to inappropriate or incapable processes, people and systems or external events". It is worth noting that operational risk differs from other banking risks, which means that acceptance of this risk is not specifically aimed at achieving expected returns. Rather, operational risk is in the normal course of the bank's operations and can be linked to all banking activities. It is important that any financial and economic organization such as banks and financial and credit institutions should clearly formulate a strategy in relation to risk management. This strategy should be based on the organization's overall approach to risk and risk management. In order to create this strategy, it is necessary to decide on the risk appetite of the organization. It is important that the risk-taking flow is within the overall capacity of the organization's risk, therefore, it must also be decided on how to calculate the risk capacity. There are important risk management decisions that must be approved by the organization, such as decisions on designing and implementing risk management initiatives to meet the requirements of the risk strategy (Hopkins, 2010). In this regard, the Basel Committee recently issued a new capital adequacy accord, which mainly emphasizes operational risk. The new accord will be the basis for stabilizing the global financial system (Danielsson et al., 2002). The new accord is sensitive to risk which means in this internal banking accord, the banks are over-emphasized to calculate the minimum capital requirements because this methodology will be a supporter of banks in the event of a crisis (Basel Committee on Banking Supervision). In fact, the operational risk refers to operational risk costs relative to the capital needed to cover losses from the daily activities of a company (Urbina and Guillén, 2014). Thus, according to the definition given by Basel's Committee in the year 2001, operational risk is classified into four types of risk, which include: 1) trading risk (such as billing errors), 2) process risk (such as rules, policies, and methodology), 3) system risk (such as device and communication failures) 4) human risk (such as unintentional errors, fraud, and unauthorized activities). Nevertheless, according to the latest definition presented by the Basel Committee in (2004), this risk includes "losses due to inadequate internal processes, historical events, system errors, and human errors". However, the most important risks that the bank's system faces are the following categories including credit risk, market risk, operational risk, legal risk, capital adequacy risk, rate of return risk, currency risk, and liquidity risk. However, risk

as a threat has affected the activity of banks, with credit risk rising as a result of the most important banking operations, namely loaning. Credit risk is one of the most important factors affecting the health of the
banking system (Baral, 2005). The risk associated with losses caused by non-repayment or repayment by the principal or subordinated loan delay from the customer is called credit risk (Nikpei, 2006). In another definition, credit risk is the probability of postponement, suspicion of receipt or non-receipt of loaning provided to customers. In another word, credit risk is a risk that the borrower is not able to pay his principal (loan) in accordance with the terms of the contract or in accordance with this risk, the repayments are either delayed or not collected. This causes problems in the cash flow of the bank (Musavian and Kavand, 2011) Four indicators are widely used to determine the level of credit risk for banks including a) the ratio of unrealized assets to total loans and leased assets; unrealized assets are income-generating assets such as loan that 90 days passed from its due date, b) the net ratio of the unpaid loans to the total loans and leased assets; the unpaid loans are loans that are not available to the bank and are ineffective and the banks have removed them from their documents, c) annual precautionary loss of loans to total loans and leased assets or total equity, d) the ratio of doubtful receipts to gross loans and leased assets. The inattention of credit risk reduces the liquidity and profitability of the banks. Credit risk derives from the fact that the contractor fails to fulfill his obligations. In a traditional way, the impact of this risk is measured at rial cost due to the default of the parties to the contract (Ahmadi et al., 2016).

3. Research background

Eckert and Gatzert, (2017) reviewed the issue of modeling of operating risk in their study while considering credit risk, giving a comprehensive analysis of financial firms. They examined the credit risk using three different models: 1) a definite simple model, 2) a randomized model using distributional hypotheses, 3) the extension of the second model considering the company's ability to deal with the credit events. They concluded that the credit losses can be much wider than operational losses and the neglect of credit losses leads to a negligible assumption of operational risks, and in particular to Rick's fraud events.

Urbina and Guillén (2014) used the principles of allocating capital in line with operational risk and cost of fraud. Operational risk costs refer to the acquisition of the capital needed to cover the losses incurred by the company's normal activities. In this study, several principles of the allocation of capital are investigated to illustrate how these principles can be used to distribute capital generated among various components that cause operational risks. For example, the proportional allocation can also account for the cost of one unit. As a result, a comparative example is presented for risk management of bank fraud and correlation scenarios between business lines.

Mohammadi and Johari (2018) addressed the issue of assessing banks' credit risk models by approaching the customer's ethical characteristics. They concluded that a logistic regression model with a multilevel approach plays an important role in terms of the ethical characteristics of customers as an explanatory variable (such as the history of cooperation with the bank, income, financial ratios of legal clients, etc.) to express credit risk behavior.

Saghafi et al. (2017) described a comprehensive model of credit risk management in the banking system of Iran. To this end, they developed a framework for the theorizing of the foundations,
following the various stages of coding into the three-part framework of a comprehensive risk management strategy, including policy, methodology, and infrastructure.

Ahmadi et al. (2016) addressed the issue of credit risk affecting the performance of the banking system in Iran (interbank study) with the PANELVAR approach. The results showed that shacks like a standard deviation in credit risk led to a decrease in liquidity, return on assets and profitability of banks. Based on the results, credit risk does not play a role in determining the profitability of

banks, but liquidity and asset returns of banks are significantly affected by credit risk in the long term.

Mohammadianhajikord et al. (2016) presented the issue of credit risk assessment of legal clients that was developed using the support vector machine model and the hybrid model of the genetic algorithm at the Tejarat bank. In this research, the genetic algorithm has been used to optimize the support vector machine inputs. The high potential of the genetic algorithm in choosing the optimal points always ensures that the proposed optimum points are better points for the problem. In the hybrid GA-SVM model, the genetic algorithm optimizes the input data of the SVM model. The research findings show that the GA-SVM hybrid model has a better performance than the SVM model in identifying well-off and bad credit customers and predicting customer credit risk.

Abdoli and Fardhariri (2015) addressed the issue of modeling the credit risk assessment of the legal customers of the Rafah Bank. For this purpose, qualitative and financial information was collected from a random sample of 300 clients who have received credit facilities from the branches of the Rafah Bank in 2012 and 2013. Then using the logit regression method, the factors affecting the credit risk of the bank's customers are estimated. In this model, at first, 17 explanatory variables including qualitative and financial variables were considered as determining factors for customers' credit risk. Then using the likelihood ratio, five variables that had a significant effect on the credit risk of legal clients were considered among the variables and finally the choice and the final model is fitted by them.

Jameei et al. (2015) investigated the issue of credit risk assessment of customers of the Melli Bank of Kurdistan province using multi-criteria prediction and decision models. The results of this study show that both topics and logistic regression models can be used by credit institution managers to classify untrustworthy customers. Nevertheless the accuracy of the Topsis model is better than the Logit model.

Yazdani et al. (2016) addressed the issue of identifying the operational risks of Islamic contracts and providing solutions for managing the Ansar bank. In the results of the FMEA methodology, it was determined that the operational risks of Islamic contracts and banking contracts were divided into four broad categories: "risk tolerance", "risk reduction", "risk aversion" and "critical situation of immediate action". Also, the way of confrontation and control measures were introduced for each of these categories, in order to ultimately make operational risks acceptable for the bank.

Tehrani and Fallahshamslilastani (2005) developed and explained the model of credit risk in the banking system of Iran. The results indicate that the relationship between variables in the credit risk prediction model is not linear and the exponential and sigmoid functions are the most 24 appropriate models for predicting credit risk. The model that has the best performance for credit risk prediction relates to artificial neural networks and the logistic model, respectively.

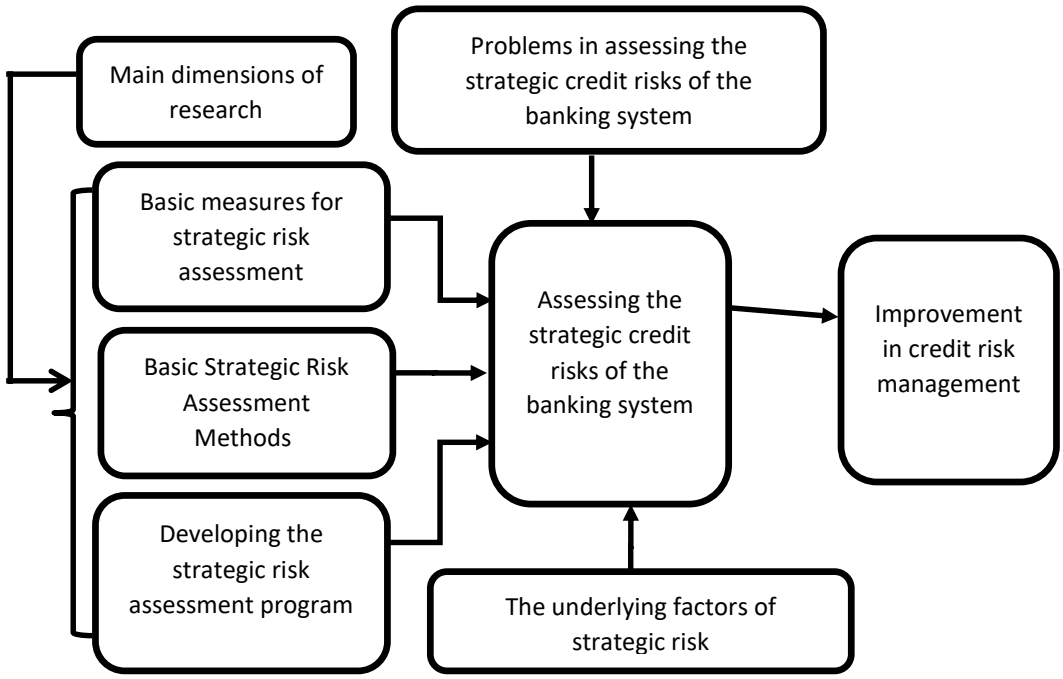
Conceptual model of research

In the following, based on the review of previous studies, the conceptual model of the research is presented in the diagram 1:

Figure 1. Conceptual model of research

4. Methodology of research

The present research investigates the impact of strategic credit risks of the banking system of Iran and the presentation of management strategies for them, so it has a practical nature in this regard. According to the research question, the researcher must decide on whether he wants to explore an exploratory, descriptive or hypothetical study (Tharenou, Donohue and Cooper, 2007). In the present research, the author first studied and collected the literature by preparing a research plan. After reviewing the theoretical foundations, he identified the components and variables of the hypotheses. Both methods of collecting information such as library methods and field methods have been used.



Studies on theoretical foundations, the subject matter and the background of the problem of the research have been carried out using a study of references 25
such as dissertations and research related to the topic and the use of internet databases. Meanwhile, in order to implement the main steps of the research and collecting information, field methods including researcher-made questionnaires have been used. The statistical population of this research is risk experts and risk managers of the banking system of Iran and professors and academic experts in the field of risk. Also, in order to analyze the data, statistical tests (descriptive and inferential), factor analysis (exploratory and confirmatory), and multiple regression have been used.
As shown in Table 1, the final statistical population of the research is determined based on Krejcie & Morgan method. In order to collect questionnaire data, the items to be examined and strategic risk assessment are described in Table 2. This data is collected based on the study of the theoretical foundations and operational structure of the credit process and considering the interviews with banking experts based on the observation of the actual documentation of the credit sector of the banking system of Iran.
As shown in Table 2, 12 items were identified as aspects of the strategic risks of the credit system process in the banking system of Iran. We continue to use the research data flow for analysis.
As outlined in Table 3, the strategic risks of the credit process are taken into account in the context of the actions taken by credit risk management, credit risk assessment and credit risk management in the banking system of Iran.

In Table 4, it is noted that a summary of the problems of assessing the strategic risks of the credit process in three structural, juridical and legal sections and the ownership structure in the banking system is introduced.
Table 5 summarizes the underlying factors of the strategic risks of the credit process of the banking system. Therefore, based on the study of theoretical foundations and empirical research background, we divided the underlying factors of the strategic risks of the credit system process of the banking system of Iran into internal and external factors. Among the internal factors of banks, corporate governance, risk and risk behavior are introduced. Among the external factors, the frameworks and

Table 1. Introducing the characteristics of the research sample

No.	Characteristics of the statistical population of research	Number of the statistical population (n)	Type of statistical population	Percentage of a statistical population	Statistical sample according to Krejcie & Morgan method	Selection of the final statistical sample
1	Students and graduates of financial and accounting management (incl. Tendencies)	More than 20000	great	8%	384 persons	30.72
2	Risk managers of banks and financial and credit institutions of Iran	More than 30000	great	12%	384 persons	46.08
3	Professors and academic elite in the field of risk management	More than 50000	great	20%	384 persons	76.80
4	Experts in the banking system of Iran	More than 150000	great	60%	384 persons	230.04
5	Total population of research	More than 250000	great	100%	***	384
Source: Researcher Findings (field observations)						

Table 2. Introducing the minor dimensions of strategic risk

No.	Sub-component	Description of the item	reference
1	Process risk	Referral schedule of applicant companies	(field observations and interviews 2018)
		The probability to disclose customer information by validation companies	(field observations and interviews 2018)
		Validating by validation companies without referral to property	(field observations and interviews 2018)
		The willingness of branches to pay for facilities without due diligence due to the low-interest rates on surplus resources in the operational plan	(field observations and interviews 2018)
2	Manpower risk	Get Motivational Rewards by Validation Companies Without Tracking delinquent records	(field observations and interviews 2018)
		Receive rewards by of validation companies without tracking delinquent records	(field observations and interviews 2018)
		Lack of awareness of the staff of validation companies in the credit processes of the banking system of Iran	(field observations and interviews 2018)
		The lack of awareness of the staff of the validation companies regarding the real estate valuation affairs	(field observations and interviews 2018)
3	Systemic and structural risk	Lack of pursuit of low-value facilities by validation companies	(field observations and interviews 2018)
		No customer justification for providing the envelope containing the documents stamped by the company to the experts of the validation companies	(field observations and interviews 2018)

4	Trading risk	High cost due to parallel tasks in collecting claims	(field observations and interviews 2018)
		Increasing the opportunity cost of time because of the impossibility of fast communication with validation companies	(field observations and interviews 2018)
		Increasing the cost of outsourcing customer credit information to credit companies	(field observations and interviews 2018)
Source: Researcher Findings (field observations)			

Table 3. Introducing the major dimensions of strategic risk

No.	discussion	Major and minor perspective		References
1	Measures	Measures and policies for macroeconomic credit risk management	Credit risk assessment in small size banks	Horstedt, M., & linjamaa, J. (2015)
			Existence of different procedures for credit risk management in the banking system	Anbar, a. (2006)
			A framework for evaluating risk management practices in an organization	Basel arisni, (2002)
			The requirement for active credit risk management	Stulz, (1984), Smith, Smithson and Walford, (1990), Froot, Sharfstein and Stein (1993)
			Types of risk management strategies in banks	Groning and Brajweik, (2009)
		Management measures and policies at the	Scheduled plan	Wang et al. (2010)
			Qualities of data	

		level of micro-risk	Sharing processes	
			Predictability of the results of the models	
			High mortality rate	
2	Methods	The perspective of the credit risk assessment method	Neural network	Atiya, a. (2001)
			Genetic algorithm	Chen, M., Huang, S. (2003).
			Combining audit analysis and neural network	Yu, L., Wang, S., Lai, K. (2008)
			Data Envelopment Analysis	Emel, AhmetBurak. Oral, Muhittin. Reisman, Arnold. Yolalan, Reha. (2003) and Min, Jae H. Lee, Young-Chan. (2008)
			Combined support vector machine	Yu, L.,Yue, W., Wang, S., Lai, K.K.(2010)
			Decision tree	Yanping,Y.,Zhengming, Q., Min, Y.,Rui, G.,Liting, F.,Penghui, G. (2012)
			Combined decision tree and neural network	Kabari, L. G. Nwachukwu, E. O. (2013)
			Logistic regression	(Pusa, 2016)
			KMV structural model	(Khansari and Shamsfallah, 2010)
			Bee colony oriented neural network	(Fallahpour,Raei and Hendijanizadeh, 2013)
			Application of survival analysis theory	(Karani and Aghaeipour, 2014)
			A multi-criteria hybrid algorithm for neuro-fuzzy ant colony neural network	(Horri and Mahdavi, 2015)
			Regression and decision tree	(Mirghafouri, 2015)
			Support vector machine and hybrid genetic algorithm	(Kord, Zaferni, Emamdoust, 2016)
3	Strategic	Developing a	Managing the continuity of	(Circular number: M / 3244,

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Abstract

In recent years, banks and financial institutions have always been at the forefront of identi and assessing the operational risk of banking products and activities, processes and b systems for effective risk management as an essential element of the Bank's risk management program of Banks. So that banks were able to reduce or even annihilate the potential ri their banking activities. Therefore, the main objective of this study is to evaluate the stra risks of credit processes in the banking system of Iran. The research method is also descripti applied and statistical population includes experts of banking and risk management. Data collection was performed by laboratory and field (questionnaire distribution) methods. In order to analyze the data, we used statistical tests (descriptive and inferential), factor analysis an multiple regression analysis. Therefore, the findings of this study illustrate that strategic risks credit processes have a major effect on the performance of management of credit risks an operational risks in the banking system of Iran.

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1. Introduction

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Table 4. Introduction obstacles in assessing the strategic risks of the credit process of the banking system

No.	discussion	Major and minor perspective	References
1	Structural	Social and cultural	(field observations and interviews
			2018)
		Weaknesses in software and hardware systems	(Shirvani, 2004)
		Management weakness	(Shirvani, 2004)
2	Juridical and legal problems	The weakness of knowledge and education on Islamic banking issues	(Shirvani, 2004)
3	Ownership structure	Caution in the lending behavior of state-owned banks	(Sapienza, P. 2004), (Kordbacheh, H and Noushabadi, L. 2011)
		Management ownership and Risk-taking Behavior	Chun, S. E. et al, (2011)
		Focus on ownership and risk behavior	(Sariri, s. 2013), (Meshki, 2010)

Table 5. Introducing the underlying factors of the strategic risks of the credit process of the banking system

No.	discussion	Major and minor perspective			References
1	Internal	Corporate governance mechanisms and risk behavior of	Internal	Board size	(Masoumi 2015), (Mahmoudabadi and Zamani, 2016), (Homayoun and Yarahmadi,
				Board independence	
				Duality in the	

approaches of monetary and financial stability of financial markets and the risk appetite behavior of banks were introduced as the most important factors.

5. Results

In this part of the research, statistical methods are used to describe and analyze the data. Therefore, firstly the findings of the Cronbach's alpha and Kolmogorov-Smirnov tests are presented. Then, the inferential statistics were obtained by employing exploratory factor analysis, confirmatory factor analysis (first and second order) and structural equation modeling (SEM) using Liserl (8.72) and SSPS (23) software are presented in tables.

The results of tables (6) to (7) show that the questionnaire has the necessary validity and reliability for the research problem. Also, the results of the Kolmogorov-Smirnov test show that the variables of the research have a normal distribution ($P < 0.05$). Therefore, standard statistical least squares (OLS) methods are used to perform statistical analyses.

Exploratory factor analysis

Before performing factor analysis, data must first be checked. Table 8 shows the results of the test (KMO) and Bartlett. According to this table, since the size of the Kaiser-Meyer is 0.786 and greater than 0.7, so that the data is suitable for performing factor analysis. Also, considering that the significance value is 0 and less than 0.05, then the results of Bartlett's test are significant. It means that there is a significant correlation between the variables and can be examined by the factor analysis method.

According to the results of (9) to (11), the questionnaires were categorized into 14 dimensions, which are in fact the same as the sub-components of the seven main dimensions of the questionnaire. However, the summary of the results of this categorization is presented in table (8) to (10). Also, there are symbols that will be used to introduce components and sub-components.

First-order confirmatory factor

In this section, the first-order confirmatory factor analysis was used to test and validate the sub-components of the major and minor dimensions along with the related items of the questionnaire. Therefore, the results of the method in two states of standard coefficients and significant numbers have been used to examine the significance of the obtained coefficients. Thus, if the absolute value of a significant number is greater than 1.96, it indicates the significance of the corresponding path in the model. Therefore, due to the significant values obtained in this section, all sub-components of the main dimensions of the model are significant.

Summary of results of first-order confirmatory factor

Strategic risks of credit processes (XSi, j): As in Table 9, strategic risk dimension (XSi, j)

		bank		role of CEO	2017), (Forouzan, 2017)
				Management ownership	
				Focused ownership	
				Unauthorized members of the board	
				Board Bonus	(Hamidian, 2017)
				Separation of the CEO from the members	
				Cabinet shares	(Demsaz and lenn 1985), (Hamidian, 2017)
			Exterior	Free float percentage	(Hamidian, 2017)
				Ownership percentage of institutional shareholder	(Hamidian, 2017)
				Ownership and influence of government in companies	(Hamidian, 2017)
2	External	The framework and approaches to the monetary and financial stability of financial markets		Integrated and two-peak surveillance model	(UK Financial Policy Committee, 2006-2015)
				Integrated monitoring model	(German Financial Stability Commission, 2006-2015)
				Functional (with some two-peak	(High Council for Financial Stability (HCSF), 2006-

			structures)	2015)
			A couple of two- peaks	(US Financial Stability Monitor, 2006-2015)
			Integrated	(Central Bank Cooperation with the Ministry of Finance of Japan, 2006-2015)

Table 6. Descriptive statistics of Cronbach's alpha and Kolmogorov-Smirnov tests (research items)

No.	criterion	Default	Cronbach's alpha test				Kolmogorov-Smirnov test		
				Modified correlation	Alpha if the criterion is removed from the questionnaire	Cronbach's alpha	Number	Level (Z)	The significance level
1	Minor dimensions of		q_1	0.308	0.886	0.887	384	0.209	0.000
			q_2	0.332	0.886	0.703	384	0.208	0.000

	Strategic Risks		**q_3**	0.358	0.885	0.810	384	0.188	0.000
			q_4	0.264	0.887	0.846	384	0.209	0.000
			q_5	0.220	0.887	0.809	384	0.217	0.000
			q_6	0.193	0.888	0.812	384	0.204	0.000
			q_7	0.256	0.887	0.832	384	0.206	0.000
			q_8	0.596	0.879	0.829	384	0.160	0.000
			q_9	0.607	0.879	0.867	384	0.163	0.000
			q_{10}	0.602	0.879	0.866	384	0.150	0.000
			q_{11}	0.609	0.879	0.875	384	0.152	0.000
			q_{12}	0.593	0.879	0.807	384	0.153	0.000
2	Measures	macro	**maq_1**	0.602	0.879	0.863	384	0.157	0.000
			maq_2	0.553	0.880	0.887	384	0.185	0.000
			maq_3	0.648	0.878	0.796	384	0.166	0.000
			maq_4	0.471	0.882	0.864	384	0.172	0.000
			maq_5	0.484	0.882	0.851	384	0.185	0.000
		micro	**miq_1**	0.482	0.882	0.803	384	0.186	0.000
			miq_2	0.434	0.883	0.811	384	0.180	0.000
			miq_3	0.446	0.883	0.826	384	0.181	0.000
			miq_4	0.374	0.885	0.877	384	0.165	0.000
			miq_5	0.446	0.883	0.848	384	0.189	0.000
3	Methods		**$method.q_1$**	0.445	0.883	0.866	384	0.207	0.000
			$method.q_2$	0.404	0.884	0.868	384	0.201	0.000
			$method.q_3$	0.414	0.884	0.883	384	0.206	0.000
			$method.q_4$	0.472	0.882	0.879	384	0.206	0.000
			$method.q_5$	0.378	0.820	0.794	384	0.238	0.000
			$method.q_6$	0.339	0.822	0.797	384	0.205	0.000
			$method.q_7$	0.361	0.821	0.778	384	0.203	0.000

		method.q8	0.525	0.812	0.836	384	0.196	0.000
		method.q9	0.525	0.812	0.854	384	0.200	0.000
		method.q10	0.403	0.819	0.861	384	0.232	0.000
		method.q11	0.445	0.816	0.857	384	0.193	0.000
		method.q12	0.400	0.819	0.802	384	0.243	0.000
		method.q13	0.396	0.819	0.817	384	0.206	0.000
		method.q14	0.430	0.817	0.871	384	0.201	0.000
4	Plans	**eq1**	0.417	0.792	0.884	384	0.361	0.000
		eq2	0.652	0.725	0.799	384	0.107	0.000
		eq3	0.533	0.713	0.841	384	0.119	0.000
		eq4	0.554	0.876	0.807	384	0.323	0.000
		eq5	0.564	0.857	0.862	384	0.322	0.000
5	Performance	**perfor.q1**	0.374	0.915	0.928	384	0.300	0.000
		perfor.q1	0.391	0.915	0.974	384	0.243	0.000
		perfor.q1	0.404	0.915	0.839	384	0.248	0.000
		perfor.q1	0.406	0.915	0.836	384	0.369	0.000
		perfor.q1	0.457	0.914	0.845	384	0.254	0.000

Table 7. Descriptive statistics of Cronbach's alpha and Kolmogorov-Smirnov tests (research items)

No,	Criterion	Default	Cronbach's alpha test			Kolmogorov-Smirnov test		
			Modified correlation	Alpha if the criterion is removed from the questionnaire	Cronbach's alpha	Number	Level (Z)	The significance level
5	Issues	Structural	**q1**	0.544	0.912	0.918	384	0.285	0.000
			q2	0.634	0.910	0.936	384	0.232	0.000

				q_3	0.543	0.912	0.920	384	0.270	0.000
		Juridical and legal problems		**q_4**	0.520	0.913	0.915	384	0.318	0.000
		Structure of ownership		**q_5**	0.556	0.912	0.921	384	0.251	0.000
				q_6	0.629	0.911	0.927	384	0.305	0.000
				q_7	0.635	0.911	0.865	384	0.350	0.000
6	Internal and external fields	Corporate governance	Interior	**cgq_1**	0.611	0.911	0.779	384	0.220	0.000
				cgq_1	0.619	0.911	0.851	384	0.249	0.000
				cgq_2	0.616	0.911	0.731	384	0.286	0.000
				cgq_3	0.638	0.910	0.852	384	0.274	0.000
				cgq_4	0.618	0.911	0.748	384	0.239	0.000
				cgq_5	0.580	0.911	0.886	384	0.237	0.000
				cgq_6	0.593	0.911	0.791	384	0.225	0.000
				cgq_7	0.638	0.911	0.923	384	0.260	0.000
				cgq_8	0.402	0.915	0.809	384	0.231	0.000
				cgq_9	0.474	0.913	0.799	384	0.224	0.000
			Exterior	**cgq_{10}**	0.482	0.913	0.832	384	0.214	0.000
				cgq_{11}	0.453	0.831	0.828	384	0.228	0.000

				cgq_{12}	0.446	0.832	0.936	384	0.219	0.000
7	Monetary and financial stability	Financial monitoring models	Integrated and two-peak	**smq_1**	0.338	0.839	0.890	384	0.257	0.000
			Integrated (1)	**Smq_2**	0.628	0.821	0.902	384	0.236	0.000
			operational	**smq_3**	0.618	0.822	0.914	384	0.234	0.000
			A couple of two-peak	**smq_4**	0.656	0.819	0.873	384	0.237	0.000
			Integrated (2)	**smq_5**	0.650	0.820	0.937	384	0.252	0.000

Table 8. KMO and Bartlett test results

KMO test		0.785
Bartlett's test	**Chi-square**	22334.49
	Degree of freedom	3486
	(**p-value**)	0.000

Table 9. Identified factors by exploratory factor analysis

Name and symbol of the components	Name and symbol of sub-components	Description of the research items	Number of items	Symbol of the items ($Q_{i,j}$)	Number of related items
Strategic risks od credit processes ($XS_{i,j}$)	**Process risk ($XS_{F1,j}$)**	Referral schedule of applicant companies	4	$q_{1,j}$	($XS_{F1,1}$) to ($XS_{F1,4}$)
		Probability to disclose customer information by validation companies	6	$q_{2,j}$	($XS_{F1,5}$) to ($XS_{F1,10}$)
		Validating by validation companies without referral to property	4	$q_{3,j}$	($XS_{F1,11}$) to ($XS_{F1,14}$)
		The willingness of branches to pay for facilities without due diligence due to the low-interest rates on surplus resources in the operational plan	5	$q_{4,j}$	($XS_{F1,15}$) to ($XS_{F1,19}$)
	Manpower risk ($XS_{F2,j}$)	Getting motivational rewards by validation companies without tracking delinquent records	3	$q_{5,j}$	($XS_{F1,20}$) to ($XS_{F1,23}$)
		Receive rewards by of validation companies	5	$q_{6,j}$	($XS_{F1,24}$) to

		without tracking delinquent records			$(XS_{F1,29})$
		Lack of awareness of the staff of validation companies in the credit processes of the banking system of Iran	4	$q_{7,j}$	$(XS_{F1,30})$ to $(XS_{F1,34})$
		The lack of awareness of the staff of the validation companies regarding the real estate valuation affairs	5	$q_{8,j}$	$(XS_{F1,35})$ to $(XS_{F1,40})$
	Systemic and structural risk **$(XS_{F3,j})$**	Lack of pursuit of low value facilities by validation companies	6	$q_{9,j}$	$(XS_{F1,41})$ to $(XS_{F1,46})$
		No customer justification for providing the envelope containing the documents stamped by the company to the experts of the validation companies	5	$q_{10,j}$	$(XS_{F1,47})$ to $(XS_{F1,51})$
	Trading risk **$(XS_{F4,j})$**	High cost due to parallel tasks in collecting claims	6	$q_{11,j}$	$(XS_{F1,52})$ to $(XS_{F1,58})$
		Increasing the opportunity cost of time because of the impossibility of fast communication with validation companies	4	$q_{12,j}$	$(XS_{F1,59})$ to $(XS_{F1,62})$
		Increasing the cost of outsourcing customer credit information to credit companies	5	$q_{13,j}$	$(XS_{F1,63})$ to $(XS_{F1,68})$
Reference: Researcher Findings (field observations)					

Table 10. Identified factors by exploratory factor analysis

Name and symbol of the components	Name and symbol of sub-components	Description of the research items	Number of items	Symbol of the items ($Q_{i,j}$)	Number of related items
Measures ($XA_{i,j}$)	**Macroscale** ($XA_{F1,j}$)	Credit risk assessment in small size banks	4	$q_{1,j}$	($XA_{F1,1}$) to($XA_{F1,4}$)
		Existence of different procedures for credit risk management in the banking system	6	$q_{2,j}$	($XA_{F1,5}$) to ($XA_{F1,10}$)
		A framework for evaluating risk management practices in an organization	4	$q_{3,j}$	($XA_{F1,11}$) to ($XA_{F1,14}$)
		The requirement for active credit risk management	5	$q_{4,j}$	($XA_{F1,15}$)to ($XA_{F1,20}$)
	Microscale ($XA_{F2,j}$)	Types of risk management strategies in banks	3	$q_{5,j}$	($XA_{F1,21}$) to ($XA_{F1,23}$)
		Scheduled plan	2	$q_{6,j}$	($XA_{F1,24}$) to ($XA_{F1,26}$)
		Qualities of data	5	$q_{7,j}$	($XA_{F1,27}$) to ($XA_{F1,32}$)
		Sharing processes	4	$q_{8,j}$	($XA_{F1,33}$) to ($XA_{F1,34}$)
		Predictability of the results of the models	6	$q_{9,j}$	($XA_{F1,35}$) to ($XA_{F1,41}$)
Methods ($XM_{i,j}$)	**Credit Risk Assessment Method**	Neural network	4	$q_{1,j}$	($XM_{F1,42}$) to ($XM_{F1,46}$)
		Genetic algorithm	6	$q_{2,j}$	($XM_{F1,47}$) to ($XM_{F1,53}$)

	($XM_{F1,j}$)	Combining audit analysis and neural network	4	$q_{3,j}$	($XM_{F1,54}$) to ($XM_{F1,57}$)
		Data Envelopment Analysis	5	$q_{4,j}$	($XM_{F1,58}$) to ($XM_{F1,63}$)
		Combined support vector machine	3	$q_{5,j}$	($XM_{F1,64}$) to ($XM_{F1,66}$)
		Decision tree	2	$q_{6,j}$	($XM_{F1,67}$) to ($XM_{F1,68}$)
		Combined decision tree and neural network	5	$q_{7,j}$	($XM_{F1,69}$) to ($XM_{F1,73}$)
		Logistic regression	4	$q_{8,j}$	($XM_{F1,74}$) to ($XM_{F1,78}$)
		Kmv structural model	6	$q_{9,j}$	($XM_{F1,79}$) to ($XM_{F1,85}$)
		Bee colony oriented neural network	4	$q_{10,j}$	($XM_{F1,86}$) to ($XM_{F1,89}$)
		Application of survival analysis theory	6	$q_{11,j}$	($XM_{F1,90}$) to ($XM_{F1,96}$)
		Multi-criteria hybrid algorithm for neuro-fuzzy ant colony neural network	4	$q_{12,j}$	($XM_{F1,97}$) to ($XM_{F1,100}$)
		Regression and decision tree	5	$q_{13,j}$	($XM_{F1,101}$) to ($XM_{F1,105}$)
		Support vector machine and hybrid genetic algorithm	3	$Q_{14,j}$	($XM_{F1,106}$) to ($XM_{F1,109}$)
Strategic Plan ($XE_{i,j}$)	**Developing a strategic credit risk assessment**	Managing the Continuity of work operations	4	$q_{1,j}$	($XE_{F1,1}$) to ($XE_{F1,4}$)
		Formulate a written and comprehensive	2	$q_{2,j}$	($XE_{F1,5}$) to ($XE_{F1,7}$)

	program ($XE_{F1,j}$)	program of affairs			
		Recovering the operation of the credit institution	4	$q_{3,j}$	($XE_{F1,8}$) to ($XE_{F1,11}$)
		A comprehensive picture of goals, attitudes and operational orientations of the credit institution	2	$q_{4,j}$	($XE_{F1,12}$) to ($XE_{F1,16}$)
		Establishing a long-term program (for a period of 3 to 5 years)	3	$q_{5,j}$	($XE_{F1,17}$) to ($XE_{F1,20}$)
Performance ($XP_{i,j}$)	**Developing a credit risk performance program** ($XP_{F1,j}$)	Development of a short term program (6 months to 1 year)	4	$q_{1,j}$	($XP_{F1,1}$) to ($XP_{F1,4}$)
		Development of a midterm program (2 to 3 years)	6	$q_{2,j}$	($XP_{F1,5}$) to ($XP_{F1,10}$)
		Development of a short term program (3 to 5 years)	4	$q_{3,j}$	($XP_{F1,11}$) to ($XP_{F1,14}$)
Reference: Researcher Findings (field observations)					

Table 11. Identified factors by exploratory factor analysis

Name and symbol of the components	Name and symbol of subcomponents	Description of the research items	Number of items	Symbol of the items ($Q_{i,j}$)	Number of related items
Obstacles ($XOI_{i,j}$)	**Structural** ($XOI_{F1,j}$)	Social and cultural	4	$q_{1,j}$	($XOI_{F1,1}$) to ($XOI_{F1,4}$)
		Weaknesses in software and hardware systems	6	$q_{2,j}$	($XOI_{F1,5}$) to ($XOI_{F1,10}$)
		Management weakness	4	$q_{3,j}$	($XOI_{F1,11}$) to ($XOI_{F1,14}$)

	Juridical and legal problems **($XOI_{F2,j}$)**	The lack of knowledge and education on Islamic banking obstacles	5	$q_{4,j}$	($XOI_{F2,15}$) to ($XOI_{F2,20}$)
	Ownership structure **($XOI_{F3,j}$)**	Caution in the lending behavior of state-owned banks	5	$q_{5,j}$	($XOI_{F3,21}$) to ($XOI_{F3,25}$)
		Management Ownership and Risk-taking behavior	4	$q_{6,j}$	($XOI_{F3,26}$) to ($XOI_{F3,30}$)
		Focus on ownership and risk behavior	6	$q_{7,j}$	($XOI_{F3,31}$)to ($XOI_{F3,34}$)
Underlying factors **($XU_{i,j}$)**	**Corporate governance mechanisms** **($XU_{F1,j}$)**	Board size	4	$q_{1,j}$	($XU_{F1,1}$) to ($XU_{F1,4}$)
		Independency of the board	4	$q_{2,j}$	($XU_{F1,5}$) to ($XU_{F1,8}$)
		Duality in the role of CEO	2	$q_{3,j}$	($XU_{F1,9}$) to ($XU_{F1,10}$)
		Management ownership	3	$q_{4,j}$	($XU_{F1,11}$) to ($XU_{F1,13}$)
		Focused ownership	5	$q_{5,j}$	($XU_{F1,14}$) to ($XU_{F1,18}$)
		Unauthorized members of the board	2	$q_{6,j}$	($XU_{F1,19}$) to ($XU_{F1,20}$)
		Board bonus	4	$q_{7,j}$	($XU_{F1,21}$) to ($XU_{F1,24}$)
		Separation of the CEO from the members	2	$q_{8,j}$	($XU_{F1,25}$) to ($XU_{F1,26}$)
		Cabinet shares	3	$q_{9,j}$	($XU_{F1,27}$) to ($XU_{F1,30}$)
		Free float percentage	2	$q_{10,j}$	($XU_{F1,31}$) to ($XU_{F1,32}$)
		Ownership percentage of institutional shareholder	3	$q_{11,j}$	($XU_{F1,33}$) to ($XU_{F1,36}$)

		Ownership and influence of government in companies	4	$q_{12,j}$	($XU_{F1,37}$) to ($XU_{F1,40}$)
	Monetary and financial stability ($XU_{F2,j}$)	Integrated and two-peak surveillance model	4	$q_{13,j}$	($XU_{F2,1}$) to ($XU_{F2,4}$)
		Integrated monitoring model	5	$q_{1,j}$	($XU_{F2,5}$) to ($XU_{F2,9}$)
		Functional (with some two-peak structures)	3	$q_{2,j}$	($XU_{F2,10}$) to ($XU_{F2,13}$)
		A couple of two- peaks	6	$q_{3,j}$	($XU_{F2,14}$) to ($XU_{F2,19}$)
		Integrated	2	$q_{4,j}$	($XU_{F2,20}$) to ($XU_{F2,22}$)
Reference: Researcher Findings (field observations)					

of the credit processes of the banking system of Iran consists of four sub-components. The results of the first-order confirmatory factor analysis method in two states of the standard coefficients and significant values show that all the significant numbers are larger than 1.96. It is therefore concluded that all of the following sub-components of the strategic risk of the credit process (XSi, j), and its related items, have been reported at a 95% confidence level. Regarding the standard coefficients obtained in this section, it follows that the sub-components of the major dimension of the strategic risks of the credit process (XSi, j) affect the performance of credit risk management (XPi, j) of the banking system of Iran.

Measures (XAi, j): As indicated in the table 10, risk assessment measures (XAi, j) of the credit system of the banking system of Iran include two sub-components. The results of the first-order confirmatory factor analysis method in two states of the standard coefficients and significant values show that all the significant numbers are larger than 1.96. It is therefore concluded that all of the following sub-components of the credit risk assessment (XAi, j), and related items, have been reported at a 95% confidence level. Regarding the standard coefficients obtained in this section, it follows that the sub-components of the main dimension of risk assessment measures (XAi, j) affect the strategic risks (XSi, j) of the credit processes of the banking system of Iran.

Methods (XMi, j): As shown in Table 10, risk assessment methods (XMi, j) of the credit processes of the banking system of Iran include a sub-component. The results of the first-order confirmatory factor analysis method in two states of the standard coefficients and significant values show that all the significant numbers are larger than 1.96. It is therefore concluded that all of the following sub-components of the credit risk assessment (XMi, j), and related items, have been reported at a 95% confidence level. Regarding the standard coefficients obtained in this section, it follows that the sub-components of the main dimension of risk assessment measures (XMi, j) affect the strategic risks (XSi, j) of the credit processes of the banking system of Iran.

Strategic Plan (XEi, j): As shown in Table 10, strategic plan (XEi, j) of the credit processes

of the banking system of Iran include a sub-component. The results of the first-order confirmatory factor analysis method in two states of the standard coefficients and significant values show that all the significant numbers are larger than 1.96. It is therefore concluded that all of the following sub-components of the strategic plan (XEi, j), and related items, have been reported at a 95% confidence level. Regarding the standard coefficients obtained in this section, it follows that the sub-components of the main dimension of the strategic plan (XEi, j) affect the strategic risks (XSi, j) of the credit processes of the banking system of Iran.

Performance (XPi, j): As shown in Table 10, performance (XPi, j) of the credit processes of the banking system of Iran include a sub-component. The results of the first-order confirmatory factor analysis method in two states of the standard coefficients and significant values show that all the significant numbers are larger than 1.96. It is therefore concluded that all of the following sub-components of the performance (XPi, j), and related items, have been reported at a 95% confidence level. Regarding the standard coefficients obtained in this section, it follows that the sub-components of the main dimension of performance (XPi, j) affect the strategic risks (XSi, j) of the credit processes of the banking system of Iran.

Obstacles (XOi, j): As shown in Table 11, Obstacles (XOi, j) of the credit processes of the banking system of Iran include three sub-component. The results of the first-order confirmatory factor analysis method in two states of the standard coefficients and significant values show that all the significant numbers are larger than 1.96. It is therefore concluded that all of the following sub-components of the Obstacles (XOi, j), and related items, have been reported at a 95% confidence level. Regarding the standard coefficients obtained in this section, it follows that the sub-components of the main dimension of Obstacles (XOi, j) affect the strategic risks (XSi, j) of the credit processes of the banking system of Iran.

Underlying factors (XUi, j): As shown in Table 11, underlying factors (XUi, j) of the credit processes of the banking system of Iran include three sub-component. The results of the first-order confirmatory factor analysis method in two states of the standard coefficients and significant values show that all the significant numbers are larger than 1.96. It is therefore concluded that all of the following sub-components of the underlying factors (XUi, j), and related items, have been reported at a 95% confidence level. Regarding the standard coefficients obtained in this section, it follows that the sub-components of the main dimension of underlying factors (XUi, j) affect the strategic risks (XSi, j) of the credit processes of the banking system of Iran.

Summary of results of second-order confirmatory factor analysis:

In order to evaluate the structural validity of each of the major dimensions of the model, sub-components and their related items were used by second-order confirmatory factor analysis. The results are presented for each of the main dimensions of the model.

Strategic risks of credit processes (XSi, j): As in Table 9, strategic risk dimension (XSi, j) of the credit processes of the banking system of Iran consists of four sub-components. The results of the second-order confirmatory factor analysis method in two states of the standard coefficients and significant values show that all the significant numbers are larger than 1.96. It is therefore concluded that all of the following sub-components of the strategic risk of the credit process (XSi, j), and its related items, have been reported at a 95% confidence level.

Measures (XAi, j): As in Table 10, measures (XAi, j) of the credit processes of the banking system of Iran consists of four sub-components. The results of the second-order confirmatory factor analysis method in two states of the standard coefficients and significant values show that all the significant numbers are larger than 1.96. It is therefore concluded that all of the following sub-component of the measures (XAi, j), and its related items, have been reported at a 95% confidence level.

Methods (XMi, j): As in Table 10, methods (XMi, j) of the credit processes of the banking system of Iran consists of a sub-components. The results of the second-order confirmatory factor analysis method in two states of the standard coefficients and significant values show that all the significant numbers are larger than 1.96. It is therefore concluded that all of the following sub-components of the methods (XMi, j) and its related items, have been reported at a 95% confidence level.
Strategic plan (XEi, j): As in Table 10, strategic plan (XEi, j) of the credit processes of the banking system of Iran consists of a sub-components. The results of the second-order confirmatory factor analysis method in two states of the standard coefficients and significant values show that all the significant numbers are larger than 1.96. It is therefore concluded that all of the following sub-components of the strategic plan (XEi, j) and its related items, have been reported at a 95% confidence level.
Performance (XPi, j): As in Table 10, performance (XPi, j): of the credit processes of the banking system of Iran consists of a sub-components. The results of the second-order confirmatory factor analysis method in two states of the standard coefficients and significant values show that all the significant numbers are larger than 1.96. It is therefore concluded that all of the following sub-components of the performance (XPi, j) and its related items, have been reported at a 95% confidence level.
Obstacles (XOIi, j): As in Table 11, obstacles (XOIi, j) of the credit processes of the banking system of Iran consists of three sub-components. The results of the second-order confirmatory factor analysis method in two states of the standard coefficients and significant values show that all the significant numbers are larger than 1.96. It is therefore concluded that all of the following sub-components of the obstacles (XOIi, j) and its related items, have been reported at a 95% confidence level.
Underlying factors (XUi, j): As in Table 11, underlying factors (XUi, j) of the credit processes of the banking system of Iran consists of three sub-components. The results of the second-order confirmatory factor analysis method in two states of the standard coefficients and significant values show that all the significant numbers are larger than 1.96. It is therefore concluded that all of the following sub-components of the underlying factors (XUi, j) and its related items, have been reported at a 95% confidence level.

Structural equation modeling

Structural Equation Modeling (SEM) was used to investigate the relationships between the variables. Figures 2 and 3 show the diagram of the structural equations for this component in two states of standard coefficients and significant numbers. The summary of the results of these diagrams is presented in Table 13.

As can be seen in table 13 and diagrams 2 and 3, the measures variables (XAi, j) with path coefficient 0.36 and methods variables (XMi, j) with path coefficient 0.67, The variables of the strategic plan (XEi, j) with a path coefficient of 0.74 have a significant effect on the strategic risk variables of the credit process (XSi, j). Also, the variables of obstacles (XOIi, j) and underlying factors (XUi, j) have a significant effect with a path coefficient of 0.74 and path 0.56 on the strategic risk of the credit process (XSi, j), respectively. In addition, the strategic risks of the credit process (XSi, j) with a path coefficient of 0.86 have a significant effect on the performance of credit risk management (XPi, j) in the banking system of Iran.

Sobel test is used to study the effect of independent variables on dependent variables in the presence of mediator variables. The results of this test are presented in Table 14.

Table 14 shows that the significant values (p-value) are smaller than 0.05 and the significance of the path is significant at 95% confidence level. Thus, according to the results of Table 15, it is seen that: 1-The variables of measures (XAi, j) and obstacles (XOIi, j) have a significant effect on the strategic

Table 12. Chi-square statistics and fitness indexes of model

Quantities obtained by confirmatory factor analysis								
Standard Indicators	**First order**	**Second order**						
	Obtained quantities	**Strategic risks ($XS_{i,j}$)**	**Measures ($XA_{i,j}$)**	**Methods ($XM_{i,j}$)**	**Strategic plans ($XE_{i,j}$)**	**Performance ($XP_{i,j}$)**	**Obstacles ($XOI_{i,j}$)**	**Underlying factors ($XU_{i,j}$)**
Chi-square	151.97	358.52	141.97	524.91	202.81	367.49	145.89	109.62
Degree of freedom (DF)	138	192	79	280	124	136	83	97
Fit goodness index (GFI)	0.96	0.92	0.95	0.90	0.94	0.92	0.96	0.91
Normalized fit index (NFI)	0.93	0.97	0.97	0.95	0.96	0.97	0.98	0.95
Comparative fit index (CFI)	0.99	0.98	0.99	0.98	0.98	0.98	0.97	0.98
Incremental fit index (IFI)	0.99	0.98	0.99	0.98	0.98	0.99	0.98	0.99
Root mean squared error approximation (RMSEA)	0.016	0.048	0.046	0.048	0.041	0.043	0.046	0.027
root mean of the residual (RMR)	0.042	0.048	0.041	0.074	0.058	0.064	0.052	0.058

Table 13. The results of structural equations for the model

Path			Path coefficient	Standard error	The statistics t	Significance of the path
Measures ($XA_{i,j}$)	→	Strategic risk of credit processes ($XS_{i,j}$)	0.36	0.13	5.96	**Significant**
Methods ($XM_{i,j}$)	→	Strategic risk of credit processes ($XS_{i,j}$)	0.67	0.15	2.35	**Significant**
Strategic plan	→	Strategic risk of credit processes	0.74	0.092	6.61	**Significant**
($XE_{i,j}$)		($XS_{i,j}$)				
Underlying factors ($XU_{i,j}$)	→	Strategic risk of credit processes ($XS_{i,j}$)	0.56	0.092	3.93	**Significant**
Obstacles ($XOI_{i,j}$)	→	Strategic risk of credit processes ($XS_{i,j}$)	0.74	0.18	5.99	**Significant**
Strategic risk of credit processes ($XS_{i,j}$)	→	Performance of management of strategic risk ($XP_{i,j}$)	0.86	0.13	7.32	**Significant**

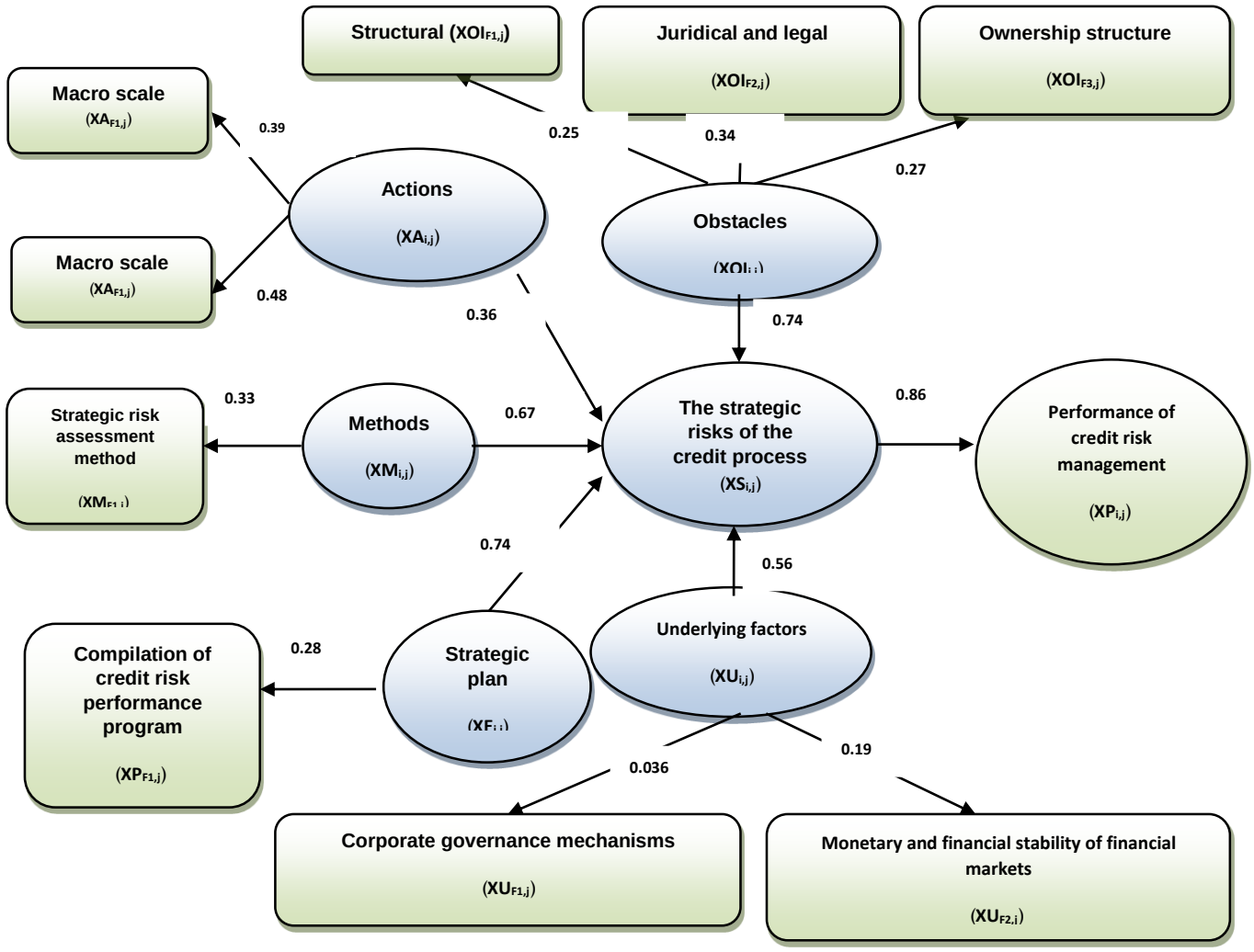

Figure 2. The result of structural equations for the research model in the state of the standard coefficients

Referrence: Research findings (calculated using Statistical software (Lisrel)).

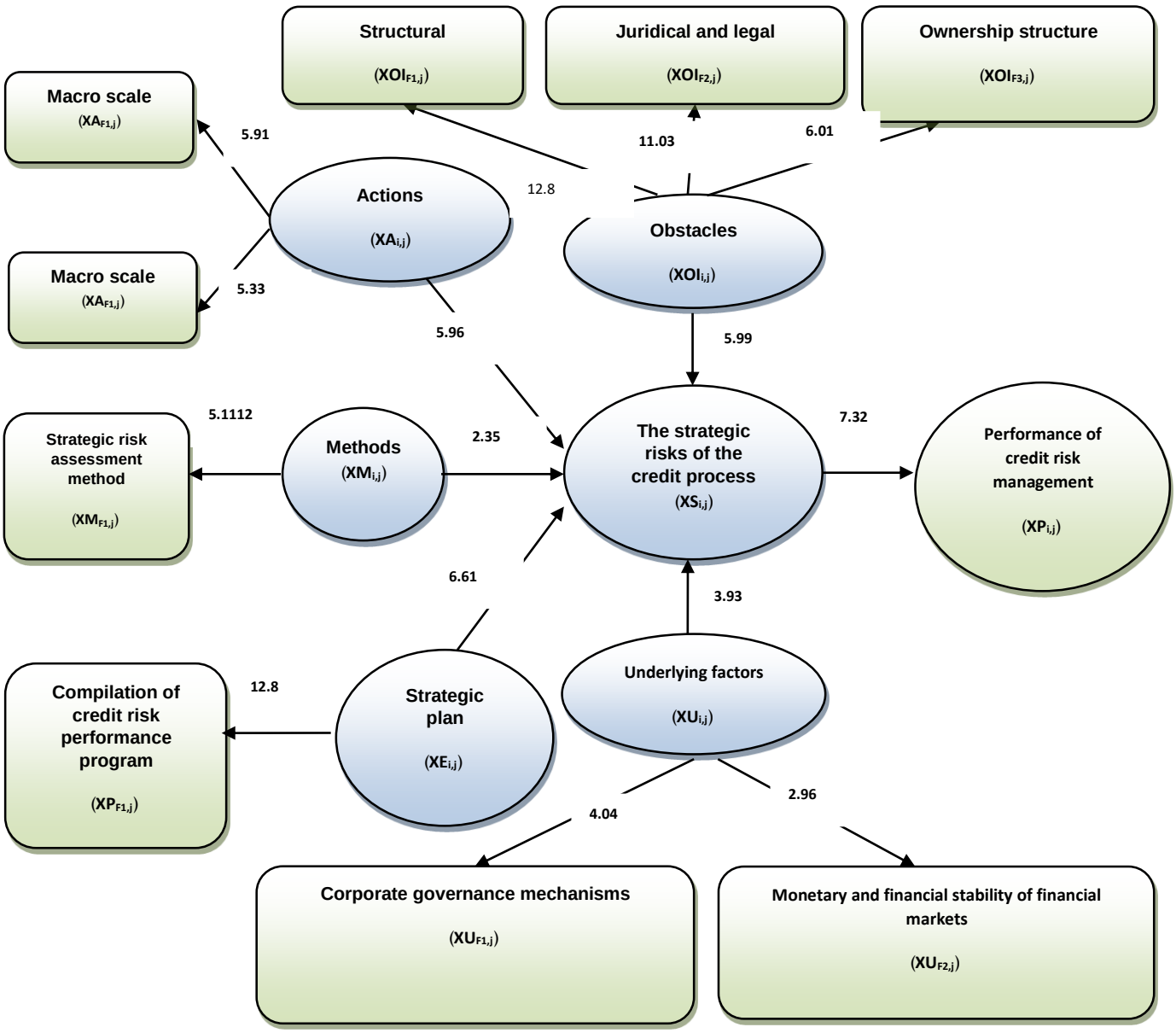

Figure 3. The result of structural equations for the research model in the state of the standard coefficients

Reference: Research findings (calculated using statistical software (Lisrel)).

Table 14. Results of the Sobel test

No.	independent variable	Underlying factors and Obstacles	The dependent variable	Test statistic	Standard error	Significance level (p-value)	Results
1	Measures ($XA_{i,j}$)	Obstacles ($XOI_{i,j}$)	Strategic risk of credit processes ($XS_{i,j}$)	3.723	0.094	0.0003	**Significant**
2	Methods ($XM_{i,j}$)	Obstacles ($XOI_{i,j}$)	Strategic risk of credit processes ($XS_{i,j}$)	3.255	0.172	0.0001	**Significant**
3	Strategic plan ($XE_{i,j}$)	Obstacles ($XOI_{i,j}$)	Strategic risk of credit processes ($XS_{i,j}$)	2.089	0.071	0.0002	**Significant**
4	Measures ($XA_{i,j}$)	Underlying factor ($XU_{i,j}$)	Strategic risk of credit processes ($XS_{i,j}$)	1.992	0.123	0.0001	**Significant**
5	Methods ($XM_{i,j}$)	Underlying factor ($XU_{i,j}$)	Strategic risk of credit processes ($XS_{i,j}$)	3.774	0.0214	0.0001	**Significant**
6	Strategic plan ($XE_{i,j}$)	Underlying factor ($XU_{i,j}$)	Strategic risk of credit processes ($XS_{i,j}$)	3.253	0.173	0.0003	**Significant**
7	Measures ($XA_{i,j}$)	Underlying factor ($XOI_{i,j}$)	Credit Risk Management ($XP_{i,j}$)	2.087	0.072	0.0001	**Significant**

8	Methods ($XM_{i,j}$)	Obstacles ($XOI_{i,j}$)	Credit Risk Management ($XP_{i,j}$)	1.999	0.154	0.0002	**Significant**
9	Strategic plan ($XE_{i,j}$)	Obstacles ($XOI_{i,j}$)	Credit Risk Management ($XP_{i,j}$)	3.019	0.143	0.0003	**Significant**
10	Measures ($XA_{i,j}$)	Underlying factor ($XU_{i,j}$)	Credit Risk Management ($XP_{i,j}$)	3.263	0.188	0.0001	**Significant**
11	Methods ($XM_{i,j}$)	Underlying factor ($XU_{i,j}$)	Credit Risk Management ($XP_{i,j}$)	2.055	0.076	0.0002	**Significant**
12	Strategic plan ($XE_{i,j}$)	Underlying factor ($XU_{i,j}$)	Credit Risk Management ($XP_{i,j}$)	1.993	0.121	0.0004	**Significant**

risk factors of the credit process (XSi, j) with a significant level (p = 0.0003); 2- The variables of methods (XMi, j), obstacles (XOIi, j) have a significant effect on the strategic risk factors of the credit process (XSi, j) at a significant level (p = 0.0001); 3- The variables of strategic plans (XEi, j) and obstacles (XOIi, j) have a significant effect on the strategic risk factors of the credit process (XSi, j) at a significant level (p = 0.0002); 4- The variables of measures (XAi, j) and underlying factors (XUi, j) have a significant effect on the strategic risk factors of the credit process (XSi, j) at a significant level (p = 0.0001); 5- The variables of methods (XMi, j) and underlying factors (XUi, j) have a significant effect on the strategic risk factors of the credit process (XSi, j) at a significant level (p = 0.0001); 6- The variables of strategic plans (XEi, j) and underlying factors (XUi, j) have a significant effect on the strategic risk factors of the credit process (XSi, j) at a significant level (p = 0.0003); 7- The variables of measures (XAi, j) and obstacles (XOi, j) have a significant effect on the strategic risk factors of the credit process (XSi, j) at a significant level (p = 0.0001); 8- The variables of methods (XMi, j) and performance of management of credit risk (XPi, j) have a significant effect on the strategic risk factors of the credit process (XSi, j) at a significant level (p = 0.0002); 9- The variables of strategic plans (XMi, j) and obstacles (XOi, j) have a significant effect on the strategic risk factors of the credit process (XSi, j) at a significant level (p = 0.0003); 10- 7- The variables of measures (XAi, j) and underlying factors (XUi, j) have a significant effect on the strategic risk factors of the credit process (XSi, j) at a significant level (p = 0.0001); 11- The variables of methods (XMi, j) and underlying factors (XUi, j) have a significant effect on the strategic risk factors of the credit process (XSi, j) at a significant level (p = 0.0002); 12- The variables of strategic plan (XEi, j) and underlying factors (XUi, j) have a significant effect on the strategic risk factors of the credit process (XSi, j) at a significant level (p = 0.0004).

Table 15. Chi-square statistics and model fitness indexes of model

Standard Indicators	**Obtained quantities**
Chi-square	201.53
Degree of freedom (DF)	139
Fit goodness index (GFI)	0.95
Normalized fit index (NFI)	0.91
Comparative fit index (CFI)	0.97
Incremental fit index (IFI)	0.97
Root mean squared error approximation (RMSEA)	0.034
root mean of the residual (RMR)	0.055

The fitness indicators of the major model of research are presented in Table 15. As shown in this table, the ratio of the Chi-square to the degree of freedom is less than 3, so the result is that the model has a good fit so fitting the model is confirmed. The root mean square error approximation (RMSEA) is 0.034, which is less than 0.05, so this index confirms the fitting model. Also, Table 15 shows that the indexes of the goodness of fit (GFI), normalized fit index (NFI), comparative fit index (CFI), incremental fit index (IFI) are all above 0.9. Therefore, according to these indices, the model has a good fit and therefore the fitting of the model is confirmed. The amount of root mean square residual (RMR) is also smaller than 0.08, which confirms fit for the model.

6. Discussion and Conclusion

In this research, the issue of strategic risk of the credit processes of the banking system of Iran was investigated. For this purpose, in the theoretical foundation, the issue of strategic risk assessment of the credit processes of the banking system is mentioned. In the next section, we also reviewed some of the research carried out in the credit risk of the banking system. Then, in the third section, the methodology is described and in the fourth section the data are analyzed and the findings of the research are presented. Finally, we discussed the conclusions of the research. The results show that all sub-components, along with their related items, have a significant effect on the assessment and on the performance of the risk management process in the banking system of Iran.

Research suggestions

In the following, some of the most important executive suggestions for operational risk management, strategic risk risks and, ultimately, comprehensive risk management are presented below.

It is suggested that managers and policymakers of the monetary system of the country in order to properly manage the resources and expenditures of banks, protect the interests of shareholders and stakeholders of banks, reduce the risk of potential losses, reduce the credit default of customers in the banking system, optimize the comprehensive risk management and credit risk managers and policymakers of the monetary system of the country should refer to the major and minor dimensions identified in this research.

Research constraints

Generally, in each scientific study, there are factors that lead to obstacles and problems for the researcher in the executive process of the research. Hence, the most important constraints of the present research are as follows:

1. Due to the large size of the statistic population, there were some constraints and obstacles to obtaining government, corporate, and household information that became minimal by adopting measures.
2. Researcher's lack of access to a robust database for collecting data and information about research variables that became minimal by adopting measures.

Therefore, it can be said that each of the above is the most important constraints of this research.

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